



**CHEMOTAXONOMIC INVESTIGATION OF FLAVONOIDS IN ANNUAL SPECIES OF *POLYGONUM* S. STR (POLYGONACEAE) IN IRAN**

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The genus *Polygonum* s.str (Polygonaceae) consists of about 300 species with cosmopolitan distribution in the world. In Iran, *Polygonum* comprises 9 annual and 16 perennial species with taxonomic problems. Some species of this genus have antioxidative, anti-bacterial and also remedial properties to treat inflammatory diseases of the kidney and digestive problems [2]. In this study, flavonoids of 8 annual species; *P. aviculare*, *P. arenastrum*, *P. molliaeforme*, *P. patulum*, *P. argyrocoleon*, *P. olivascens*, *P. polycnemoides* and *P. rottboellioides* were studied to separate them from each other. Studies were done using thin layer chromatography (TLC). Generally, the results of this study showed that flavonoid variety in *Polygonum* s.str is useful in differentiation of closely related species such as *P. argyrocoleon* and *P. olivascens* that are morphologically similar to each other.

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**EFFECT OF *TRIGONELLA FOENUM GRAECUM* L. ON LIPID PROFILE AND LIVER ENZYMES IN HIGH CHOLESTEROL FED RATS**

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Atherosclerosis is one of the most important causes of cardiovascular diseases. Cholesterol plays an important role in atherosclerosis. Medicinal plants are in the focus of attention because of their roles in prevention and treatment of some diseases. The aim of this study was to determine the cholesterol lowering effect of *Trigonella foenum-graecum* L. (Fenugreek) seeds powder in high cholesterol diet-fed rats. Sixty male rats weighting 180–200 g were kept under observation for about 2 weeks and then were randomly divided into three groups of 10 animals each: group 1 (fed with normal diet: ND), group 2, fed with high cholesterol diet, HCD (normal diet mixed with 2% cholesterol+0.5% cholic acid) and group 3 (fed with HCD mixed with fenugreek seeds powder, 8 g/kg body weight/day: HCD+FEN). After 6 weeks, the serum levels of triglycerid, total cholesterol, high density lipoprotein cholesterol (HDL-c), alanine aminotransferase (ALT) and aspartic aminotransferase (AST) and fasting blood sugar (FBS) were assayed by enzymatic methods. Low density lipoprotein cholesterol (LDL-c) and very low density lipoprotein (VLDL-c) were estimated by Friedewald equation and triglycerid/5 equation. In group received fenugreek, the serum levels of cholesterol, triglycerid, LDL-c and VLDL-c, ALT and FBS decreased ( $p < 0.001$ ) and serum level of HDL-c increased ( $p < 0.05$ ) as compared to group HCD. Fenugreek has hypolipidemic activity in high cholesterol diet fed rats and ameliorate high cholesterol diet induced dyslipidemia.



**A STUDY ON METHANOL HERBAL PLANT EXTRACT OF GREEN TEA  
(*CAMELLIA SINENSIS*) ON IMMUNITY LEVEL OF *MUGIL CEPHALUS***

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The aim of this study was to investigate the effect of green tea on a non-specific immunity of *Mugil cephalus*. Three hundred and sixty Grey mullet larvae with average weight of  $0.75 \pm 0.02$  g and an average length of  $4.40 \pm 0.81$  cm collected from Ramin port where is located at 5 km far from the Chabahar and finally transferred to lab of trial in Offshore Research Center. This research was designed based on 3 treatments, each with 3 replicates. In general, the results of this study showed that the addition of 200 mg of green tea extract per kilogram of diet led to a significant increase in final weight, food intake, daily growth rate and efficiency of protein grey mullet were compared to control. Fish fed diet 50 to 200 ppm green tea extract, showed a significant increase in the number of erythrocytes to control. The number of white blood cells from control with 200 ppm of green tea extract regularly gradually increased. The highest amounts of hemoglobin in the samples containing 200 ppm of green tea extract were measured. The hematocrit in control and the highest levels in samples with 200 ppm of green tea extract were measured. The total protein, albumin and globin in the blood serum fed treatments with green tea extract showed a significant increase compared to the control treatment ( $p < 0.05$ ). The highest total protein, albumin and globin treatment with 200 ppm of green tea extract of food was observed ( $p < 0.05$ ). The highest activity of lysozyme, phagocytosis and respiratory burst were observed in treatment green tea extract 200 ppm of food. Treatment with 200 ppm of food showed a minimal mortality after challenge with bacteria *photobacterium damsela* compared to the control treatment.



**A STUDY ON METHANOLIC HERBAL PLANT EXTRACT OF *ECHINACEA*  
(*ECHINACEA PURPUREA*) ON IMMUNITY LEVEL OF *MUGILCEPHALUS***

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The aim of this study was to investigate the effect of *Echinacea purpurea* on a non-specific immunity of *Mugil cephalus*. Three hundred and sixty Grey mullet larvae with average weight of  $0.75 \pm 0.02$  g and an average length of  $4.40 \pm 0.81$  cm collected from Ramin port where is located at 5 km far from the Chabahar and finally transferred to lab of trial in Offshore Research Center. This research was designed based on 3 treatments, each with 3 replicates. the results of this study showed that the addition of 100 and 200 mg of EP extract per kg of diet led to a significant increase in growth parameters (final weight, food intake, daily growth rate and efficiency of protein), hematology (RBC, WBC, Hb, Hct) and biochemical factors (total protein, albumin, globulin) in grey mullet were compared to control. The highest lysozyme activity, immunoglobulin, phagocytosis and respiratory burst was observed in treatment containing 200 mg EP extract per kg food. Treatment containing 200 mg EP extract per kg food showed a minimal mortality after challenge with bacteria *photobacterium damsela* compared to the control treatment. Finally, the present results suggest that diet containing 200 mg EP extract per kg food could improve growth, hematology, immunity and resistance against photobacteriosis of grey mullet.



**UMBELLIPRENIN AND AURAPTENE ARE CYTOTOXIC AGAINST  
CANCEROUS CELL LINES AND REGULATE MYELOID CELL LEUKEMIA  
TYPE-1 (MCL-1) GENE EXPRESSION**

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Induction of apoptosis in tumor cells is one of the mechanisms of chemotherapy. Myeloid cell leukemia type 1 (Mcl-1) is one of the Bcl-2 protein family that make an important role in chemoresistance to drugs. Thus down-regulation of Mcl-1 gene is one of the aims in chemotherapy. Umbelliprenin (Umb.) and Auraptene (Aur.) are naturally coumarins. Cytotoxicity and apoptosis induction is one of their effects. In this study we examined the cytotoxicity of these two coumarins against some cancerous cell lines by MTT assay method and compare them together. In next step, we tested the effect of Aur. on Mcl-1 gene expression in Jurkat cells by Real Time PCR method. We found that Umb. and Aur. have cytotoxic effect against cancerous cell lines. We showed that aur. and umb. have dose and time-dependent cytototoxicity against these cell lines. In general, aur. is more potent (has less IC<sub>50</sub>) than umb. in cytotoxic effects. We also found that Aur. down-regulates Mcl-1 gene expression in a pattern that different from Umb. increased expression of Mcl-1 mRNA from 1 hour to 3 hours incubation, but this increase has a scale down pattern. Aur. decreased expression of Mcl-1 mRNA for same incubation times.

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**INTRODUCTION OF VEGETATION COVER AND FLORISTIC COMPOSITION  
OF MEDICINAL PLANTS IN THE SHEIDA PROTECTED AREA  
CHAHARMAHAL VA BAKHTIARI PROVINCE, IRAN**

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Iran's Flora holds a special rank among those of the Middle East countries, it due to its unique features in terms of miscellaneous medicinal plants, especially production of various essential oils, as well as their countless therapeutic effects. Furthermore, the floristic investigation of each area is considered one of the most effective methods for managing and conserving genetic storage of existing biodiversity. Chaharmahal va Bakhtiari province due to various elated factors such as rich biodiversity, variable altitude classes along with shaping up of the numerous microclimates as one of the major floristic hotspots has substantial placement in Central Zagros area, Iran. The sheida protected area has been located in nothern part of the mentioned province in the suburb of Ben township. It has a lot of germination potential although it can have a lot of degradation effects there too. In order to collect, investigate and identify of medicinal plant species, research team did repeted field visits in various times and different parts of area and especially they used experiences of the local residents and intensive studies of existence scientific literatures in the field of medicinal plants. Also, some of most important features of identified medicinal plants namely longevities, life forms and chorotypes of them were investigated using existence literatures. The results indicated that there were 142 medicinal plant species in the mentioned area so that major plant families are as follows: Lamiaceae (31 species), Asteraceae (20 species) Apiaceae (12 species), Brassicaceae (9 species), Caryophyllaceae (8 species) Papaveraceae (6 species), Fabaceae and scrophulariaceae each of them (5 species) jointly. Finally, the life forms of plant species were examined according to Raunkier method and the chorotypes of plants species showed that 67.6 % (97 plant species) belonged to Irano–Touranian zone and the other species in addition to Irano- Touranian zone are distributed in other geobotanical zones too.

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**SESQUITERPENOIDS ISOLATED FROM AERIAL PARTS EXTRACT OF  
GUNDELIA TOURNEFORTII L. (ASTERACEAE) AND DOREMA AMMONIACUM  
D. DON. (APIACEAE) COUPLED WITH SOME OF THE MOST IMPORTANT  
THEIR SPECIFIC AND PROPRIETARY APPLICATIONS**

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Medicinal plants play a highly significant role in health of individuals and communities so that they are used in a large scale all over the world. Terpenoids, also referred to as terpenes, are one of the largest group of chemical bioactive compounds so that they are divided into more minor subclasses [1,2]. Sesquiterpenoids in terms of molecular structure are fits in the groups of 15 carbone compounds and they are derived by three isoprenoids units which the mentioned structure could be seen both acyclic and cyclic in nature. Also, sesquiterpenoids along with the other types of terpenoids are as one of the most important chemical compounds (secondary metabolites) of the essential oils in medicinal plants [3]. It is worth mentioning that two mentioned plants were collected from their natural habitats situated in Central Zagros area of Iran and phytochemical analysis of them were performed using hydrodistillation method and via clevenger-type apparatus. Also, all of their constituents were identified via GC/MS by authors and their results have been reported formerly. In this regard, number of 22 identified sesquiterpenoids compounds in them were investigated specifically and following that some of the most important specific characteristics of them were studied using existing scientific literatures along with taking advantage of research conducted in relation to their dedicated features and common applications in the past decades. It seems that, using combinations of plant origin for making diverse medicine instead of chemical origin due to advantages like less risky and high potential capacity and above all being affordable have been increased significantly.

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**EVALUATION OF THE EFFECT OF INTRAPERITONEAL ADMINISTRATION OF SILYMARIN IN PREVENTION OF POST-OPERATIVE PERITONEAL ADHESION IN ANIMAL MODEL OF RAT**

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Adhesion bands and adhesion formation is one of the most important post-surgical complication in pelvic and abdominal operations. Post operation adhesions are the most common cause of intestinal obstruction, female infertility and chronic abdominal pain. Major studies in prevention of adhesion formation have based on anti-inflammatory agent. Silymarin, Silybum marianum extract contains compounds with antioxidant, anti-inflammatory and antimicrobial activities thus could reduce adhesion formation. The aim of the present study was to examine its effect on intraabdominal adhesion. Fifteen 8-week-old male Sprague-Dawley rats were randomized into three groups. After cecal abrasion the Silymarin group received Silymarin 50 mg/kg, the vehicle and control groups received (ethanol alcohol + saline) and saline respectively. On day 15 the adhesions were assessed using a standardized scale (Evans model), and histopathological samples were taken and examined. Data analysis was performed using Graph Pad Prism, Version 5.05. The grade of adhesion was compared between these study groups using nonparametric (Kruskal –wallis). The parametric data were compared using one-way analysis of variance (ANOVA). Data are reported as the mean ± SD. P < 0.05 was considered statistically significant. There were no incisional hernias or wound dehiscences in any animals of the three groups. Our evaluation of macroscopic adhesion intensity showed statistically significant differences between the Silymarin and the control group, when compared in terms of adhesion score (P = 0.044). Also, the results of this study revealed that there were statistically significant differences between the groups when compared in terms of adhesion band length and numbers. P < 0.05. Histopathological findings showed that Silymarin decrease grade of adhesion; however the difference did not reach a significant value. In light of the macroscopic and histopathological findings obtained from relaparotomy and the statistical analysis of these findings, it was concluded that Silymarin could reduce the severity of adhesion band in Rat Model.





**STATIC HEADSPACE ANALYSIS OF FIVE FRESH FLOWERS GROWING IN  
IRAN BY COMBIPAL SYSTEM TECHNIQUE**

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The volatile components from flowers of *Matthiola incana* (L.) R.Br, *Cheiranthus cheiri*, *Tagetespatula* L., *Gaillardia grandiflora* Hort. and *Dahlia variabilis* Desf were identified and analyzed by SHS (static headspace)-GC-MS on the Combi PAL System technique. The numbers of volatile compound identified in the *M. incana* , *C.cheiri*, *T. patula*, *G. grandiflora* and *D.variabilis* were 8, 6, 25, 30 and 15, respectively. Hexanal (34.5%), Dimethyl trisulfide (66.7%), Terpinolene (38.4%), Pinene (35.7%) and Myrcene (28.5%) were the main components of *M. incana* , *C.cheiri*, *T. patula*, *G. grandiflora* and *d.variabilis*, respectively. Information about the compositional analysis volatile oils of five studied fresh flowers are lacking. The fresh flowers in this study are rich sources of different volatile compounds.

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**ESSENTIAL OIL COMPOSITION, ANTIOXIDANT ACTIVITY  
PHENOLIC COMPOUNDS AND TOTAL PHENOLIC CONTENT  
OF *LAVANDULA SUBLEPIDOTA* RECH.**

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*Lavandula sublepidota* Rech. is a member of family Lamiaceae. The essential oil of *L. sublepidota*, growing wild in south of Iran, was obtained by hydrodistillation and analyzed by gas chromatography (GC-FID) and gas chromatography/mass spectrometry (GC/MS). The extract was analyzed for polyphenol compounds identified by HPLC-DAD, antioxidant activity (DPPH(2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay) and total phenolic content (TPC). Sixty-two compounds were identified in the oil. The major volatile compounds (VCs) were Caryophyllene oxide (31.8%), Spathulenol (10.4%), (*E*)-Caryophyllene (6.8%). It was found that the predominant phenolic constituents were sinapic acid, trans-ferulic acid and rosmarinic acid. The antioxidant activity of methanolic extract from *L. sublepidota* was found 2146.6 µg/mL in DPPH scavenging assay. TPC of methanolic extract of *L. sublepidota* was 32.13 mgGal/g. There is no strict positive relationship between the polyphenolic content and antioxidant activity of extracts [1,2].

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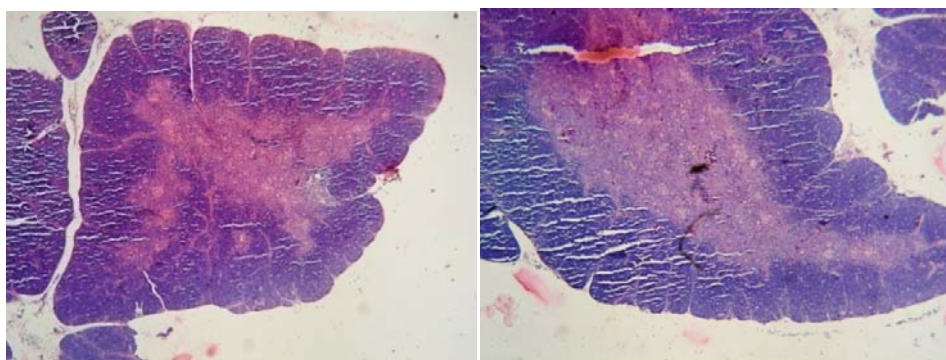
## EFFECT OF DIETARY INCLUSION OF CHICORYON HISTOLOGICAL PARAMETERS OF THYMUS IN BROILERS

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Poultry scientists today are challenged to find out new alternatives to antibiotic growth promoters with no side effects for poultry that could be more or as effective against harmful microorganisms in the gastrointestinal tract and to stimulate the growth by increasing the efficiency of feed utilization and to enhance the immunity. Regarding the remarkable role of Thymus as basic lymphoid organs in poultry, this study aimed to evaluate the effect of long term administration of chicory on histological features of this organ in broiler chickens. To this end, Fifty, one-day old chickens were randomly divided into five equal groups and fed with diets contained 0.5, 1, 1.5, and 2% of chicory (experimental groups) or basal diet (Control Group) for 45 days. On day 46 birds were slaughtered and thymus were dissected immediately. Six  $\mu\text{m}$ -thick transverse sections were made and stained with H&E for measuring lobular cortex and medullar thickness in thymus by linear graticule under light microscope. Results show that inclusion of chicory at the dose of 0.5 and 1% had the highest effect on lobular cortex and medullar thickness of thymus as compared to control. In conclusion, dietary inclusion of chicory during the rearing period of broilers at the dose of 0.5 and 1% can enhance histological features of immune structures in thymus.



**Figure 1:** Representative photomicrographs of thymus of birds in control group (left) and treated with Chicory 1% (right) (H&E, 400x).

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**ETHANOLIC EXTRACT OF LAVANDULA ATTENUATES SIGNS OF  
POST-TRAUMATIC STRESS DISORDER (PTSD) INDUCED BY  
ELECTRIC SHOCK IN RAT**

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Lavandula angustifolia is a medicinal plant which has been used in traditional medicine. Traditionally, this medicinal plant has sedative and anti-anxiety effects and has been used to cure different diseases such as headache, sleep disorders, and etc. The post-traumatic stress disorder (PTSD) is among the most important mental disorders of our century which causes great stress and several complications for the afflicted person. Nowadays, the definition of PTSD comprises not only those affected by the accident, but also those who have witnessed it. Therefore, in the current study, we aimed to investigate the effects of Lavandula angustifolia extract on hormonal signs of PTSD caused by electric foot shock. Male Wistar rats (250-300 g weight) were used in this study. The animals randomly received electric foot shock (0.1 mA) for 100 seconds over a period of 10 days. After returned to cages to repose for 21 days, the animals were put back into the stress box but received no stress. The animals received different doses of Lavandula angustifolia extract (2, 4, 8 mg/kg) intraperitoneally 10 min before placing into the stress box (n = 7-9 rats/group). Control group received saline (1 mg/kg). Plasma corticosterone levels were assessed in control and treated animals. One-way ANOVA showed that stress elevated plasma corticosterone level (129 nmol/L) concentration in the control animals. Intraperitoneal administration of the Lavandula angustifolia extract reduced plasma corticosterone level (91 nmol/L). These findings indicate that Lavandula angustifolia extract can reduce hormonal signs of PTSD and can use as an agency for moderation of PTSD signs.

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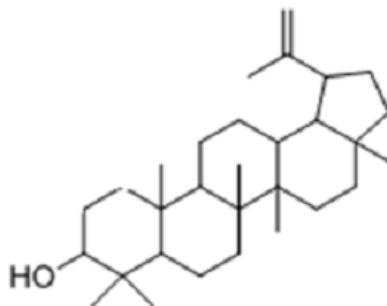


ISOLATION AND STRUCTURAL ELUCIDATION OF TRITERPENOID FROM  
*SALVIA LERIIFOLIA*

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The genus *Salvia* belongs to the Lamiaceae family and comprises numerous species that have been used since ancient times for the treatment of several disorders [1]. Diterpenoids, triterpenoids and polyphenols are very common in plants of this genus. Most *Salvia* species have been extensively investigated for their potential biological properties [2]. *S. leriifolia* Benth., that was introduced in the Iranian Flora in 1982, geographically grows in the southern and tropical regions of the Khorassan and Semnan provinces, Iran. Different pharmacological activities of this plant, such as the attenuation of morphine dependence, hypoglycemic, analgesic, and anti-inflammatory activities, and anticonvulsant, antiulcer, and antibacterial effects, were evaluated [3]. Fractionation of hexane extract of *S. leriifolia* led to the isolation of a triterpenoid(1). Its structure has been established by (1H NMR, 13C NMR and COSY), as well as HRESIMS.



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**ANTIMICROBIAL EFFECT OF *ERYNGIUM CAUCASICUM* EXTRACT  
FROM APIACEAE FAMILY**

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*Eryngium* L. is the largest and the most taxonomically complex genus of the family Apiaceae. This genus consist of nearly 250 species around the world and most of them have been used in folk medicine around the world[1]. different compounds like polyacetylenes, triterpenoides, Flavonoides, Monoterpens and flavonoids have been indicated from this genus and make it so potential for medical uses[2]. Total and lipophilic extracts of *Eryngium caucasicum* were screened for their antibacterial activity against *Escherichia coli*, *Pseudomonas aeruginosa* and *staphylococcus aureus*. The aerial part of *E.caucasicum* was extracted by using organic solvents like methanol and petroleum ether and agar well diffusion method was used for antibacterial effects assay. The results revealed that total extract of *E.caucasicum* had more antimicrobial effect than lipophilic extraction and the most inhibitory effect of total extracts was against the *P.aeruginosa*(10-12mm), *S.aureus*(8-11mm) and *E.coli*(6-8mm), respectively. Besides, lipophilic extraction of *E.caucasicum* had no inhibitory effect against *E.coli* and showed the most inhibitory effect against *S.aureus* (9-12mm). The results of present study supports traditional use of this genus as a antimicrobial plants and also suggests that methanol aerial extract possesses compounds with antimicrobial property that can be used as an antimicrobial agents in new drug for the therapy of infectious diseases caused by pathogens.

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**ANALYSIS SOME OF THE EFFECTS OF CADMIUM AND NICKEL ON SOME  
MORPHOLOGICAL AND BIOCHEMICAL TRAITS OF BASIL PLANTS  
(*OCIMUM BASILICUM*)**

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Basil plants as a high consuming vegetable are been cultured in fields which are contaminated by heavy metals in Zanjan province. research, in order to evaluate the effects of cadmium and nickel on morphological and biochemical traits of basil plants. Seeds were cultured in plastic pots containing perlite and  $\frac{1}{2}$  concentrations of Hoagland's culture medium in a hydroponic conditions. Seedlings with enough growth were treated by different concentrations of Cd including: 0, 2, 4 and 8 mM and Ni including: 0, 0.2, 0.4 and 0.8 mM for two weeks. Results showed that, Leaf area and the amount of carotenoid in all Cd treatments were decreased in compare to the control plants in such a way that they reached to about 40 and 45 of the control plants in all of measured traits at 8 mM Cd and 0.8 Mm Ni treatment. The content of proline in root and shoot of 8 mM Cd and 0.8 Mm Ni treated plants increased 21 and 41 times more than that of control plants respectively. The amount of catalase activity in root and shoot at 8 mM Cd and 0.8 Mm Ni treatment were decreased about 40 and 49 of the control plants. The amount of peroxidase activity in root and shoot at 8 mM Cd and 0.8 Mm Ni treatment were increased about 61 and 60.5 of the control plants. The content of protein in root and shoot of 8 mM Cd and 0.8 Mm Ni treated plants increased 45 and 36 times more than that of control plants respectively. This demonstrate that basil plants can respond to these heavy metal elements by increasing of proline and protein and also increasing of the activity of antioxidant enzymes such as peroxidase.



**ANALYSIS OF NICKEL ACCUMULATION AND SOME OF ITS  
PHYSIOLOGICAL EFFECTS ON BASIL PLANTS (*OCIMUM BASILICUM*)**

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Basil (*Ocimum basilicum*) is a high using edible and medicinal plant. As some places of Zanjan province in which basil plant is cultured are contaminated by heavy metals, such as toxic nickel metal, a research for analyzing Ni accumulation and its effects on some physiological traits of this plant was performed. Seeds were cultured in plastic pots containing perlite and ½ concentrations of Hoagland's culture medium in a hydroponic conditions. Seedlings with enough growth were treated by different concentrations of Ni including: 0, 0.2, 0.4 and 0.8 mM for two weeks. Results showed that, root and shoot length, root and shoot dry weight as well as total chlorophyll content in all Ni treatments were decreased in compare to the control plants in such a way that they reached to about 42 of the control plants in all of measured traits at 0.8 mM Ni treatment. The content of soluble sugars in root and shoot of 0.8 mM Ni treated plants increased 37.66 and 53.69 times more than that of control plants respectively. The amount of Ni in root and shoot at 0.8 mM Ni treatment were 88.46 and 37.69 times more than control plants respectively. This demonstrate that basil plants are able to prevent Ni translocation from root to the aerial parts of plant, so if these plants are subjected to Ni, the edible parts of plant will be lower contaminated which is too low harmful for human.





**ANALYSIS SOME OF THE EFFECTS OF CADMIUM AND NICKEL ON SOME  
PHYSIOLOGICAL FACTORS OF *MEDICAGO SATIVA***

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Soil contamination by heavy metals through food chain causes real threat for human being. Alfalfa (*Medicago sativa*) is a high consuming fodder and medicinal plant which is cultured in fields which are contaminated by heavy metals in Zanjan province. research, in order to evaluate the effects of cadmium and nickel on morphological and biochemical traits of basil plants. Seeds were cultured in plastic pots containing perlite and ½ concentrations of Hoagland's culture medium in a hydroponic conditions. Seedlings with enough growth were treated by different concentrations of Cd including: 0, 25, 50 and 100 µM and Ni including: 0, 0.2, 0.4 and 0.6 mM for two weeks. Results showed that, Leaf area and the amount of carotenoid in all Cd treatments were decreased in compare to the control plants in such a way that they reached to about 52.4 and 44 of the control plants in all of measured traits at 100 µM Cd and 0.6 Mm Ni treatment. The content of protein in root and shoot of 100 µM Cd and 0.6 Mm Ni treated plants decreased 51 and 45 times more than that of control plants respectively. The amount of catalase activity in root and shoot at 100 µM Cd and 0.6 Mm Ni treatment were decreased about 1.8 and 2.07 of the control plants. The amount of peroxidase activity in root and shoot at 100 µM Cd and 0.6 Mm Ni treatment were increased about 1.75 and 1.71 of the control plants. alfalfa plants can respond to these heavy metal elements by increasing of the activity of antioxidant enzymes such as peroxidase. In addition, the content of both heavy metal elements in the root were more than aerial parts of treated plants in compare to control plants. This show that Alfalfa plants are able to prevent HMs translocation from root to the aerial parts of plant, so if these plants are subjected to HMs the edible parts of plant will be lower contaminated which is too low harmful for consumers.



**EXTRACTION AND ANALYSIS OF PHYTOCANNABINOIDS AND OTHER  
CANNABIS CONSTITUENTS FROM LEAVES OF WHITE WIDOW  
“MARIJUANA” (*CANNABIS SATIVA* × *INDICA*)**

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Cannabis plants have been cultivated in Europe, Asia, Africa and the Americas for hundreds, perhaps even thousands of years as a source of three main products hemp fibre, cannabis seeds and medicinal or narcotic preparations. The main illicit products of cannabis plants are female flowering tops with or without leaves, the resin from the flowering tops and an oil extracted or distilled from the resin, or more rarely, directly from the leaves and flowering tops [1]. According to the 2010 World Drug Report issued by the United Nations Office on Drugs and Crime (UNODC), between 155 and 250 million people, or 3.5 to 5.7% of the population aged 15–64, is estimated to have used illicit substances at least once in the previous year. Cannabis users comprise by far the largest number of illicit drug users (129–190 million people), followed by amphetamine-type stimulants, opiates and cocaine. Although these numbers have remained relatively stable over the last decade, the incidence of abuse of “designer drugs”, clandestinely produced drugs that are structurally and pharmacologically very similar to a controlled substance but are not themselves controlled substances, has increased [2]. In other hand, in this research we extracted phytocannabinoids using solvent-solvent method and analyze hexane fraction using gas chromatography and gas chromatography/mass spectrometry. Identification of the components was based on GC retention index computer matching with Wiley GC/MS library, and by comparison of the fragmentation patterns of the mass spectra with those reported in the literature [3]. The main constituents of the hexane extract of plant were 87.14% Cannabidiol mono methyl ether (CBDM), 3.3% Cannabichromene (CBC) and 1.72% Cannabinol (CBN) of non-hallucinogenous constituents accounted for 97.96% of the components. The hallucinogenous delta-9-tetrahydrocannabinol (THC) was not found in the solvent extract of leaves.

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## HISTOPATHOLOGIC STUDY OF THE EFFECT OF SAFFRON EXTRACT ON OXYMETHOLONE-INDUCED HEPATOTOXICITY IN RATS

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Saffron is one of the highly prized spices known since antiquity for its color, flavor and medicinal properties. It is the dried "stigma" or threads of the flower of the *Crocus sativus* plant. In traditional medicine and modern pharmacy, it has been reputed to be useful in the treatment of numerous illnesses. During recent decades different aspects of saffron like anti-microbial, anti-depressant, anti-convulsant, and anti-tumor properties have shown by such extensive surveys [1, 2]. It has been reported that saffron is a powerful scavenger of oxygen free radicals, and restoring the intracellular level of glutathione as an antioxidant defense. Omidi et al (2014) investigated the hepatoprotective effect of *Crocus sativus* (saffron) petals extract against acetaminophen toxicity in male Wistar rats and they concluded that the antioxidant property of saffron resulted in reducing the oxidative stress complications of toxic levels of acetaminophen in intoxicated rats. Oxymetholone is an anabolic androgenic steroid and it is a synthetic compound. Its primary clinical applications include treatment of osteoporosis and anaemia, as well as stimulating muscle growth in malnourished or underdeveloped patients. However, complications and the development of more efficacious drugs have limited the medical use of anabolic-androgenic steroids. Severe hepatic dysfunction is one of its adverse reactions. Saffron extract has been previously used to decrease oxidative. Here, we studied the effect of aqueous saffron extract on oxymetholone toxicity. Forty male Wistar rats were divided randomly into 4 equal groups. In the group 1 (G1), the rats were gavaged with oxymetholone that was dissolved in water (40 mg/kg). Another rats were grouped as G2 (were gavaged with oxymetholone and aqueous saffron extract), G3 (saffron extract) and G4 (normal saline). All treatments were done for thirty consecutive days. Oxymetholone-administered rats showed severe injuries to the hepatocytes including, cell swelling, severe inflammation and necrosis while saffron co-administered rats revealed lower necrosis and mild hepatocyte degeneration. Rats treated with saffron did not show any change in their livers. Our study has shown the protective effect of saffron on oxymetholone-induced hepatotoxicity in rats.

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**THE EFFECT OF HYDROETHANOLIC EXTRACT FROM *PORTULACA OLERACEA* AND ALPHA LINOLENIC ACID ON ANTI-OXIDANT ENZYMES OF STIMULATED AND NON-STIMULATED HUMAN LYMPHOCYTE IN-VITRO**

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Anti-inflammatory and anti-oxidant effects of *Portulaca oleracea* L. (*P. oleracea*) were reported previously. In the present study, the effect of the extract of the plant and its constituent alpha-linoleic acid (ALA) on oxidant and antioxidant markers in non-stimulated and stimulated human lymphocytes was examined. The effect of three concentrations (10, 40 and 160 µg/ml) of *P. oleracea* and ALA (5, 15 and 45 µg/ml) or dexamethasone as positive control on nitric oxide (NO), malondialdehyde (MDA), thiol, superoxide dismutase (SOD) and catalase (CAT) in the media of PHA-stimulated and non-stimulated lymphocytes were examined (n=6 for each group). In non-stimulated cells, dexamethasone and high concentration of the extract (160 µg/ml) and ALA (45 µg/ml) significantly increased thiol, CAT and SOD values. Dexamethasone and high concentration of ALA also significantly reduced MDA value (p<0.01 to p<0.001). However, the values of NO and MDA due to dexamethasone and high concentration of the extract and two higher concentrations of ALA treatment were reduced in PHA stimulated cells (p<0.001 for all cases). Treatment of stimulated lymphocyte by dexamethasone and two higher concentrations of the extract and ALA also lead to increased levels of thiol, CAT and SOD (p<0.05 to p<0.001). *P. oleracea* and its constituent, ALA decreased NO and MDA levels and increased antioxidant agents such as thiol, CAT and SOD levels in human PHA-stimulated lymphocytes comparable to the effects of dexamethasone. Therefore, the antioxidant effect of *P. oleracea* is mainly due to its constitute ALA. These results suggest that the plant is of therapeutic value in diseases associated with enhancement oxidation as an antioxidant drug.



**EFFECT OF METHYL JASMONATE TREATMENT ON BIOMASS  
AND SILYMARIN PRODUCTION IN CELL SUSPENSION CULTURE  
OF *SILYBUM MARIANUM***

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*Silybum marianum* is an important medicinal herb of the Asteraceae family. Biologically active compounds of *S. marianum* are mixture of several flavonolignans generally known as silymarin. In the current study, the effect of different concentrations of methyl jasmonate (0, 0.5, 50, 100 and 200  $\mu\text{m}$ ) during 5 time periods (0, 24, 48, 72 and 96 hours) were investigated on growth (dry and fresh weight) and silymarin production in cell suspension culture of *Silybum marianum*. For this purpose, the seeds were surface sterilized and transferred to MS medium to achieve sterile seedlings. Then root explants from sterile seedling were cultured on MS basal medium containing optimal concentrations of 1 and 0.5 mg/l 2,4-D and Kin, respectively, to induce callus production. The produced callus was collected after 20 days. Then produced callus were transferred to liquid MS medium at the desired time intervals and treated with different concentrations of methyl jasmonate. The results showed that the highest amount of fresh weight was observed after 96 hours treatment with 50  $\mu\text{m}$  of methyl jasmonate. Meanwhile, the maximum dry weight was recorded after 96 hours treatment with 100  $\mu\text{m}$  of methyl jasmonate. Whereas, minimum callus dry weigh was observed in MS medium supplemented with 0.5  $\mu\text{m}$  methyl jasmonate after 24, 48 and 72 hours. In addition, the highest amount of silymarin was produced after 72 hours treatment with 0.5  $\mu\text{m}$  of methyl jasmonate.



## EVALUATION OF CROCIN MODULATORY EFFECT ON INFLAMMATORY PHENOTYPE IN MACROPHAGES

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Macrophages have the ability to initiate and direct all immune responses and are able to change their phenotypes and release inflammatory or anti-inflammatory mediators. M1 polarized macrophages release inflammatory cytokines like TNF- $\alpha$  and IL-6, inhibit cell division and cause tissue injury. M2 polarized macrophages release anti-inflammatory cytokines like IL-10 and stimulate cell division and repair tissue damages. The imbalance between M1/Kill and M2/repair responses has an important effect in many pathological events and diseases like cancer, atherosclerosis, infections and autoimmune diseases [1]. It seems that carotenoids and flavonoids from fruits and vegetables are capable of modulating immune responses. Since past time saffron stigma has been used as food flavouring and colouring agent. It has been also used as remedy to cure some diseases in folk medicine. In different studies it has been shown that crocin has high efficacy and low toxicity and the potential to eliminate free radicals. It has anti-oxidant activity that is involved in its anti-inflammatory capacities [2]. In this study we evaluated the potential of crocin as a modifier of macrophage phenotype in pre- and concurrent treatments with LPS (100 ng/ml)-INF $\gamma$  (20ng/ml)-induced inflammatory state. Elisa assays were used to measure macrophage-secreted IL-6 and TNF- $\alpha$  (associated with classical M1 phenotype) and Arginase-I (arg-I) mRNA expression (a prototypic M2 marker) was assessed using quantitative RT-PCR. Pre-treatment of the cells with crocin (25, 50 and 100  $\mu$ M) not only could not block the LPS-INF $\gamma$ -induced secretion of TNF- $\alpha$ , but also potentiated it significantly (1.4 to 1.7 fold). Moreover treatment with crocin alone (25-100  $\mu$ M) caused significant elevation of TNF $\alpha$  secretion (1.6 to 1.8 fold increase compared to basal level secretion). On the other hand co-treatment with crocin and LPS-INF $\gamma$  kept TNF $\alpha$  secretion at the basal level. Neither pre-treatment, nor Co-treatment with crocin could modify the effect of LPS-INF $\gamma$  on IL-6 secretion by macrophages. In accordance with the result of cytokine secretion assay, treatment of the cells with LPS-INF $\gamma$  or Crocin caused down-regulation of the Arg-I mRNA expression and co-treatment of the cells with the crocin and LPS-INF $\gamma$  could reverse Arg-I-downregulation induced by LPS-INF $\gamma$ . Our results showed that crocin by itself could induce M1 phenotypic switch in macrophages. However, in concurrent treatment with inflammation-inducing mediators, crocin was able to subside the inflammatory response of the macrophages.

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**EVALUATION OF THE ANTIBACTERIAL ACTIVITY OF THE METHANOLIC  
EXTRACT ASTRAGALUS VERUS OLIVER ON *E. COLI* AND *S. AUREUS***

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The use in Astragalus the traditional medicine of it was customary in many countries for treating of diseases such as yellow fever and bacterial infections. infection are one of the most common causes are wide spread. Antibiotic consumption increased antibiotic resistance. The purpose of this study, Evaluation of the Antibacterial Activity of methanol extract Astragalus verus species was on *Escherichia coli* and *Staphylococcus Aureus* [1,2]. The aerial parts of the endemic plants (As.v) were collected from Mountains at Kermanshah Province and air-dried in the shade. Solvent methanol, were used for extraction. The plant sample were Soxhlet extracted at 60 °C for 12 h. The extracts were then vacuum evaporated. After preparing various concentrations of extract (800,400,200,100,50 and 25mg/ml). The method agar diffusion and Disk diffusion, MIC and MBC of dilution series for *E. Coli*(ATCC10536) and *S. aureus* (ATCC25923)strains, were used in Mueller Hinton Broth. Tetracycline and Vancomycin as a positive control and 10% of dimethyl sulfoxide (DMSO) was used as a negative control respectively [3,4]. Disk diffusion test results showed. Average Diagonal zone of growth inhibition dilution to 25,50,100, 200,400 and 800mg/ml Extract ,were respectively  $8\pm 0/11$  , $8\pm 0/29$  , $8\pm 0/57$ , $9\pm 0/57$  ,  $9/33\pm 0/37$  ,  $10/66\pm 0/22$  mm and Vancomycin  $19\pm 0/33$ mm for *S. aureus* and  $6\pm 0/27$   $6\pm 0/32$ , $7\pm 0/23$ , $8\pm 0/57$  ,  $9\pm 0/57$  ,  $10/11\pm 0/57$  mm and Tetracycline  $17\pm 0/39$ mm for *E.Coli*. The results showed an increased concentration, the Diagonal zone of growth inhibition increased. The methnolic extract was observed inhibition zone diameter have  $10/66\pm 0/22$  mm the greatest impact on *S. aureus* and had the least  $10/11\pm 0/57$  mm impact on *E. coli*. The results showed MIC value for 25,50,100,200,400,800 mg/ml. The results achieved in this study showed that *Astragalus Verus Olivier* methanolic extract have Antibacterial Activity and growth inhibitory impact on both *E. coli* and *S. aureus* (*S.aureus* is known as more sensitive to the extract than *E. coli*).

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**EFFECTS OF THE IMMUNO MODULATORY METHANOLIC EXTRACT OF  
ASTRAGALUS IN MALE NMRI MICE**

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*Astragalus verus Olivier*, has been used as an immuno promoting remedy in Kurdish Ethno Medicine, Asia (traditional medicine) and aim of present survey was to determine of the effects of immuno modulatory activities of methanol extract of *A.verus* in a mice model . Animals injected with the methanol extract (5, 10 and 20mg/kg) of *Astragalus verus olivier*, intra peritoneal and hem agglutinating antibody titers of serum, as a factor of humeral mediated immunity were investigated at days 0 and 14 .Also, footpad swelling test was used to determine delayed type hypersensitivity (DTH) for cell mediated immunity in animals that received extract via gavage. It was found that the methanol extract (5, 10, 20mg/kg) of *Astragalus verus olivier* did not appear to have hem agglutinating activity on SRBC, indicating that this extract have not Lectin-like activity. Moreover, the DTH reaction promotes on 14 days after administration of 10mg/kg ( $p<0.05$ ) of *Astragalus verus olivier*, showing the CMI response of the extract. In this study, by attention to the above lines, we could conclude that *Astragalus verus olivier* has the potential in vivo immunomodulation activities and these new findings support our pervious in vitro studies.

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**EVALUATION THE PSEUDO-PARKINSONISM EFFECTS OF  
RESERPINE IN OVARIECTOMIZED RATS**

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The administration of reserpine to rodents was one of the first models used to investigate the pathophysiology and screening for potential treatments of Parkinson's disease (PD). The reserpine model was critical to the understanding of the role of monoamine system in the regulation of motor and affective disorders, as well as the efficacy of current PD treatments. To create a model of Parkinson's, drug reserpine subcutaneously at a rate of 3 mg was used. Rats were surgically ovariectomized before administration of reserpine. 8 groups, each consisting of 8 rats were used in the study. The authors studied a total of 48 rats were ovariectomized. After the 24h of behavioral and motor tests were performed. In this study, rats were ovariectomized and received reserpine. Increased behavioral disorders and motor dysfunction. Also in the non-ovariectomized groups were treated with reserpine motor activity and behavior disorder than control groups had lower increased. The present study affirms that reserpine, symptoms of Parkinson's disease model increased in parkinsonian animals model. This symptom occurs more in ovariectomized rats.

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**ANTIOXIDATIVE POTENTIAL OF *SATUREJA AVROMANICA* MAROOFI. ON  
MALATHION INDUCED OXIDATIVE STRESS IN RATS**

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Malathion is an organophosphate (OP) pesticide that has been shown to induce oxidative stress in various organisms through the generation of free radicals and alteration of the cellular antioxidant defense system independent of its anticholinesterase effects. *Satureja avromanica* Maroofi (SAM) species has been extensively investigated as a source of natural products with potential antimicrobial and antioxidant activity. The aim of this study was to investigate the possible protective role of hydroalcoholic extract effects of SAM on total antioxidant capacity (TAC) and lipid peroxidation (LPO) in male rats poisoned with malathion. Effective doses of malathion (150 mg/kg/day) and SAM extract (1000 mg/kg/day) were administered alone or in combination for 7 days by intraperitoneal injection. At the end of the experiment, the plasma of the animals was separated and (TAC) and LPO were measured. The results showed that the SAM caused increased serum TAC levels in rats, which this difference was significant compared to both control and malathion groups. In addition, it was observed that SAM group showed significantly decreased in LPO level, compared to the group treated with malathion. As the results display, SAM plant improves the oxidative stress damage in malathion toxicity.



## PREPARATION, CHARACTERIZATION AND APPLICATION OF MOLECULARLY IMPRINTED POLYMERS FOR NARINGENIN EXTRACTION

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Naringenin is a flavonoid which occurs naturally in citrus fruits, exerts a variety of pharmacological effects mainly including anti-inflammatory, antioxidant and anti-cancer. The dried pericarp of citrus which contains naringenin has been widely used as an important medicinal in the world. Little research has been reported about the naringenin in the flesh of Citrus. Due to the complexity of natural matrices, the extraction and purification methods are necessary for the utilization of naringenin from citrus. The conventional extraction methods of active components from natural products are usually based on the liquid-liquid extraction, solid-phase extraction and matrix solid phase dispersion. These methods are lacking of selectivity and lead to the co-extraction of many compounds which have similar physicochemical characteristics. Over the last decades, molecularly imprinted solid-phase extraction (MISPE) has received increasing attention due to the advantages of low cost, storage stability, high mechanical strength, robustness, and the resistance to a wide range of pH, solvents and temperatures. The molecularly imprinted polymers (MIPs) are synthetic receptors with a predetermined selectivity toward a specified analyte. The recognition sites were generated with a “memory” for the shape, size and functional group positions of the template molecule. They were able to specifically rebind the target molecule and offer significantly higher affinity and selectivity, avoiding the co-elution of interfering species. Owing to these reported high selectivity, affinity and simplicity, MIPs have been applied as selective sorbent material for the cleanup and pre-concentration of several molecules such as nucleosides, analgesics, pesticides, carbohydrates, and steroids. Extraction of some flavonoids has been reported. However, neither the synthesis of naringenin MIPs nor the application of the MISPE method in the extraction of naringenin from the flesh of Citrus has been reported, yet. Therefore, based on the expectation that MISPE could offer advanced specificity and affinity, MIPs were introduced to extract naringenin directly from the flesh of citrus. In this study, non-covalent imprinted polymers using naringenin as the template molecule were synthesized (via precipitation polymerization method) adopting methacrylic acid (MAA) as a functional monomer, and trimethylolpropane trimethacrylate (TRIM) as cross-linker in the porogen of acetonitrile. The prepared MIPs had a proper binding capacity which can be suggested as a suitable method for the extraction of naringenin. MIPs were characterized by SEM and FTIR analysis.

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**EFFECT OF *HEDERA HELIX* L. HYDROALCOHOLIC EXTRACT ON LEARNING AND MEMORY IN WISTARRATS**

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Memory is an organism's mental ability to store, retain and recall information. The hippocampus plays an important role in learning and memory. The present study was undertaken to investigate the effect of *Hedera helix* root extract on learning and memory in male Wistar rats. The hydroalcoholic extract of root of *Hedera helix* was administered orally in four doses (75, 150, 225, and 300 mg/kg) for 4 weeks. Elevated plus-maze and Morris water maze were conducted to evaluate the learning and memory parameters and served as the exteroceptive behavioral model. Diazepam induced amnesia served as the interoceptive behavioral model. The hydroalcoholic extract of root of *Hedera helix* showed improvement in learning and memory in a dose dependent manner. However, 150 and 225 mg/kg doses have shown a significant ( $p < 0.01$ ) enhancement in learning and memory which is comparable to control. Hydroalcoholic extract of *Hedera helix* (150 and 225 mg/kg, p.o) administered for 4 weeks reversed amnesia induced by Diazepam. Hence *Hedera helix* appears to be a promising drug for improving memory and it would be worthwhile to explore the potential of this plant in the management of impaired learning, dementia, Alzheimer's disease and other neurodegenerative disorders. However, further studies are necessitated to identify the exact mechanism of action.

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**THE EFFECT OF PRETREATMENT WITH DIFFERENT DOSES OF  
*LEPIDIUM DRABAL*. ESSENTIAL OIL AND ITS MAJOR CONSTITUENT  
3-BUTENYLISOTHIOCYANATE ON MEMORY  
SYNAPTIC PLASTICITY AND NOCICEPTION**

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One of the key concerns of people is the experience memory loss. In addition, pain is an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage. This study investigated the effects of pretreatment with different doses of *Lepidium draba* essential oil (LdEO) on memory, synaptic plasticity, and nociception in male wistar rats. In this experimental study, 50 male wistar rats were studied in five groups. The control group received distilled water, three treatment groups received oral essential oil and one group, treated with 3-butenylisothiocyanate. For evaluating of memory, Morris water maze and shuttle box test had been performed. To study the analgesic activity formalin and tail-flick test were used. The rats received orally LdEO one hour prior to beginning of the experiment for analgesic activity. The treatment groups with doses of 20, 50, and 100 mg/kg of the essential oil improved learning and memory compared with the control group in final trails in Morris water maze test. In addition, results from electrophysiological records from dentate gyrus of hippocampus showed that LdEO increased both EPSP slope and PS amplitude in compare to control group. Also, LdEO with dose of 100 mg/kg significantly ( $P < 0.001$ ) decreased pain score in both acute and chronic phase of formalin test. The results indicate that LdEO improves memory and learning, and might be beneficial in patients with Alzheimer's disorders, particularly the patients with suffering pain.

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**THE USE OF TRADITIONAL MEDICINE IN THE TREATMENT OF  
BREAST CANCER IN WOMEN**

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The use of traditional medicine is of special importance for the health of the society and the treatment and prevention of diseases. The use of complementary and alternative medicine is on the rise, especially in patients with life-threatening conditions such as AIDS and cancer. It should be noted that the application of this method in conjunction with conventional medicine practices are allowed and accepted. The present study is a descriptive one. The research community included all the patients with breast cancer, referring to selected hospitals in Mashhad. Of these, 458 were selected using aimed sampling method. Data were collected using a structured questionnaire during the interview and were analyzed using SPSS software. The results of the study showed that 83% of women with breast cancer from use of these methods. Different methods, which are selected by the people include the use of herbs, supplements, yoga, special diets, energy therapy, acupuncture, etc. 79.5 % of the patients had not consulted their doctors about the use of traditional medicine. That This is especially the use of herbal medicines is very important because there is a risk of drug interactions. Professional care not aware of the use of these methods can have different causes that including lack of belief that many of the doctors and nurses to the effectiveness of these methods are named. Medicine and the effect on the body and mind are two things that can be combined together as a good approach until the performance of different aspects of life in breast cancer patients to their maximum. However, these methods should be used for patients, given the necessary training.



ANTIOXIDANT ACTIVITY AND PHENOLIC AND FLAVONOID CONTENTS  
OF THE EXTRACT AND SUB-FRACTIONS OF  
*EUPHORBIA SPLENDIDA* MOBAYEN

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Harmful action of the free radicals which cause the oxidative stress can be blocked by antioxidant substances and different plant extract showed antioxidant activity. The aim of this study is evaluation the antioxidant activity of total methanol extract and sub-fractions of *Euphorbia splendida* mobayen. Aerial part of *E. splendida* was extracted by maceration with methanol and then sub-fractionated with liquid-liquid fractionation using petroleum ether (PE), chloroform, ethyl acetate and water. Antioxidant activity was assessed by 2, 2'-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity assay, reduction of ferric ions and ferrous ion chelating potential. Total phenolic contents (TPC) and Total flavonoid contents (TFC) were estimated with folin-cio caltue and AlCl<sub>3</sub> methods, respectively. The findings revealed that *E. splendida* methanol extract and sub-fractions showed a dose-dependent antioxidant activity. Methanol extract (ME) showed the highest antioxidant activity based on total reduction capability and Ferrous ions chelating assay tests. Aqueous fraction (AQF) and then Ethyl acetate fraction (EAF) showed the best IC<sub>50</sub> in DPPH radical scavenging test in comparison to Butylated hydroxytoluene (BHT). ME showed the highest value of TPC and TFC (270.74 ± 0.01 g/g and 208.23 ± 0.01 g/g respectively). This study showed that methanol extract and sub-fractions of *E. splendida* have antioxidant activity and ME and AQF showed the best antioxidant activity. Although there was a positive correlation between phenolic contents and antioxidant activity of extract and fractions, Investigation for determining active antioxidant compounds of *E. splendida* is recommended.

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**FLORA, LIFE FORM AND CHOROLOGY OF PLANTS OF THE HIR AND  
NEOR RANGELANDS IN ARDEBIL**

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The purpose of this study was introduced the flora and plant life forms in the Hir and Neor rangelands. Field sampling were conducted at the time of maximum plant growth in 2016. Then, the plant samples collected on the basis of taxonomic method and was identified using available resources. Results this study showed 124 species belongs to 96 genera and 33 plant families were identified. The most dominant families were Asteraceae, Fabaceae and Lamiaceae with 22, 12 and 11 plant species. Hemicryptophytes with 66 species (54%), Therophytes with 37 species (30%), Geophytes with 14 species (11%) And Chamaephytes with 7 species (5%) were the most important life forms according to Raunkiaer classification. Chorological classification of the flora showed that the majority of the species (52%) belong to the Iran-Turanian region, in addition 30% belong to the Iran-Turanian and Europe-Siberia, 6% in parts of Iran-Turanian, Europe-Siberia and the Mediterranean. Evaluation of the dominance of Hemicryptophytes is represents specific flora mountainous regions of Iran.





## THE IMPACT OF TURMERIC CREAM ON HEALING OF CAESAREAN SCAR

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The aim of this study was to assess the impact of turmeric cream on the healing of Caesarean wound. This study was done as a randomized double blind trial in three groups of women who had a Caesarean operation. The redness, oedema, ecchymosis, drainage, approximation (REEDA) scale was used to evaluate the wound healing process. The  $\chi^2$ , analysis of variance (ANOVA) and Tukey tests were used for statistical analysis. Seven days after the surgery, the averages of REEDA score in the intervention, placebo and control groups were respectively, 0.46, 0.88 and 1.17 ( $p < 0.001$ ), while on day 14, it was 0.03, 0.22 and 0.36 ( $p < 0.001$ ), showing a significant statistical difference. Similarly, there was a difference between the intervention and placebo groups in the amount of oedema on the 7<sup>th</sup> and 14<sup>th</sup> days after the surgery (respectively,  $p = 0.066$  and  $p < 0.001$ ). The observed difference between the intervention and control groups in the amount of oedema was statistically significant on the 7<sup>th</sup> and 14<sup>th</sup> days after the surgery ( $p < 0.001$ ). Turmeric was effective in faster healing of wounds of Caesarean operation. The use of turmeric is suggested to reduce the complications of the wounds from Caesarean section.



**THE USE OF COMPLEMENTARY AND ALTERNATIVE MEDICINE  
IN THE TREATMENT OF BREAST**

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The use of complementary medicine is of special importance for the health of the society and the treatment and prevention of diseases. The use of complementary and alternative medicine is on the rise, especially in patients with life-threatening conditions such as AIDS and cancer. It should be noted that the application of this method in conjunction with conventional medicine practices are allowed and accepted. The present study is a descriptive one. The research community included all the patients with breast cancer, referring to selected hospitals in Mashhad. Of these, 458 were selected using aimed sampling method. Data were collected using a structured questionnaire during the interview and were analyzed using SPSS software. The results of the study showed that 83% of women with breast cancer from use of these methods. Different methods, which are selected by the people include the use of herbs, supplements, yoga, special diets, energy therapy, acupuncture, etc. 79.5 % of the patients had not consulted their doctors about the use of complementary and alternative medicine. That this is especially the use of herbal medicines is very important because there is a risk of drug interactions. Professional care not aware of the use of these methods can have different causes that including lack of belief that many of the doctors and nurses to the effectiveness of these methods are named. Complementary and Alternative Medicine and the effect on the body and mind are two things that can be combined together as a good approach until the performance of different aspects of life in breast cancer patients to their maximum. However, these methods should be used for patients, given the necessary training.



## APPLICATION THE USE OF HERBAL PLANTS IN THE PATIENTS CANDIDATE FOR HEART SURGERY

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The use of herbal plants is of special importance for the health of the society and the treatment and prevention of diseases. But since the simultaneous use of herbal plants and chemical medicine before surgery can result in complications, the present study was conducted to examine the simultaneous use of cardiac medication and herbal plants with the potential of interaction within 2-3 weeks before surgery. The present study is a descriptive one. The research community included all the patients who were candidates for heart surgery, referring to selected hospitals in Mashhad. Of these, 458 were selected using aimed sampling method. The information required for the questionnaire was divided in to three types: first, personal information; second, information about the disease and the use of cardiac medication, and third, the use of herbal plants 2-3 weeks before surgery. To validate the results of the study, the content validation method and the re-test were used. Also, to analyze the data, descriptive and inferential statistics and SPSS software (version 19) were used. The findings of the study showed that 100% of the patients used herbal plants, among which onion, tea, garlic, black pepper were the most frequent. 79.5 % of the patients had not consulted their doctors about the use of herbal plants and in 95.4% of the cases, no mention of the use of herbal plants had been made in the patients' history. More than 90% of the patients had no idea they were not supposed to use herbal plants a few days before surgery. 59% of the patients taking Atorvastatin also took garlic. 22-23 of the patients took grape-fruit and tea herb, 82% of the patients taking metoprolol took tea as well, 25% of the patients taking Lozartan ate grape-fruit; 25% of the patients taking captopril used green and red pepper simultaneously and finally more than 70% of the patients took aspirin and onion, or black pepper and plavix and garlic simultaneously. The results of the study highlights the importance of conducting regular and effective educational programs aimed at promoting the knowledge of patients and health workers. Such programs should be able to provide them with a knowledge of what to take, what not to take and the side effects and the possible interactions of the chemical drugs and herbal plants. The study also emphasizes the importance of recording the use of herbal plants in the patient's history.



**EFFET OF OXALIC ACID AS AN UNSPECIFIC PHYTOTOXIN OF *SCLEROTINIA SCLEROTIORUM* ON CHANGES IN PROTEIN PROFILE OF SUSCEPTIBLE AND PARTIAL RESISTANT OF SUNFLOWER LINES**

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*Helianthus annuus* L. has been known as a medicinal herb. Its flower used for lung ailments and malaria fever. The seeds and leaves have been employed for treatment of diuretic, expectorant, bronchial, coughs and colds. The oil of sunflower also has been recommended in the treatment of arteriosclerosis. One of the most destructive and devastating diseases of sunflower is white mold caused by *Sclerotinia sclerotiorum*. Oxalic acid is the main pathogenicity factor of this necrotrophic fungus. It is important to further characterize plant responses to this non-specific toxin. Sunflower partial resistant (AC4122) and susceptible lines (HA89) were exposed to 40 mM oxalic acid (pH 3.7) of fungus culture filtrate and samples were taken 24, 48 and 72 hours after inoculation. Oxalic acid concentration in culture media has been measured by HPLC. Proteins were extracted by TCA-acetone method and separated by two-dimensional gel electrophoresis on pH 3-10 IPG strips. Twenty four spots were identified using MALDI/TOF-TOF mass spectrometry. All identified proteins had mascot score higher than 80. Our proteomic investigation demonstrates an increase in expression of proteins only in partial resistant lines, such as those related to antioxidant defense (peroxidase, pyrroline-5-carboxylate reductase), primary metabolic pathways (malate dehydrogenase), response to stress (adenosine kinase), cell redox homeostasis (disulfide isomerase), lignin biosynthetic process (laccase) and abscisic acid-activated signaling pathway (protein phosphatase 2C). In the susceptible lines, decreased levels of these enzymes, especially those involved in antioxidant defense, and increased abundance of proteins such as voltage-dependent anion channel increased cell death in plant tissues and consequently facilitate growth and development of pathogen in host. Proteins which were only up-regulated in the partial resistant lines have a significant role in mediating the defense against *Sclerotinia* and could be considered for enhancing resistance against this pathogen.

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**PHYTOCHEMICAL ACTIVITIES AND EVALUATION OF HEAVY METAL  
ACCUMULATION IN *MENTHA PIPPERITA* L. CULTIVATED  
IN BAFGH, YAZD PROVINCE**

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*Mentha piperita* L., belong to labiate family, was cultivated extensively in Bafgh city, Yazd province, Iran. Existence and exploration of mine (zinc, Fe, pb), disposal and trace of heavy metal in herbal plant has become a serious problem. So identification of Essential oil, probably trace of heavy metal and biochemical activities of *Mentha piperita* L., is necessary. Therefore, objectives of this research were to determine the antioxidant activity and total phenolic content (TPC), analysis of essential oil compound by GC-Mass and evaluate presence of heavy metal in aerial parts of *Mentha piperita*. Results showed, there are no significant heavy metal trace in Aerial parts of *Mentha piperita*. Mean range of TPC (mg/ml) was  $353.03 \pm 0.34$  -  $464.6 \pm 0.87$ . Antioxidant activity was between  $10.36 \pm 0.52$  -  $17.06 \pm 0.56$  ( $\mu\text{g/g}$ ). The most abundant components found in the leaf oil were Menthol (47.12%), Menthofuran (16.44%), Isomenthone (7.59%), Menthyl acetate (15.52%), Menthone (1.43%), Piperitol (1.22%), Limonene (3.43%), Caryophyllene (1.23%).

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COMPARISON OF MORPHOLOGICAL TRAITS AND ESSENTIAL OILS  
CONTENT IN *LIPPIA CITRIODORA* L. CULTIVATED  
IN GREENHOUSE AND FIELD

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*Lippia citriodora* L., Verbenaceae family, is cultivated due to useful secondary metabolites like essential oil compound, which apply in the food, cosmetics industries. This plant is used as decreasing blood sugar, anti-blood releasing of nose and enteral. There are a lot previous studied which investigated essential oil compound in *Lippia Citriodora* L. Because *L. citriodora* were cultivated in greenhouse and field in Yazd province extensively. Knowing more about yield (morphological and essential content) in both locations is very important. This study was designed with objective to evaluate the performance of *L. citriodora* for morphological and essential oil (yield and content) under different conditions of cultivation (greenhouse and field). Our results showed Location exerted a highly significant influence ( $P < 0.01$ ) on all the parameters. Year showed a highly significant influence ( $P < 0.01$ ) on all the traits. Fresh leaf yield/plant, dry leaf yield/plant in *Lippia* is considered as economic traits. Location, years and interaction of Location  $\times$  Year were significantly difference for these both parameters. The main compounds were Limonene (6.68%, 5.35%), Linalol (5.78%, 4.89%), Z-Citral (6.88%, 5.64%), E-Citral (4.65%, 4.25%), Neral (5.52%, 4.58%), Caryolhyllene (8.21%, 7.72%), Geranyl (3.52%, 3.48%), spathulenol (3.04%, 3.47%), in field and greenhouse respectively.

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**EFFECTS OF EXTRACTION METHODS ON ANTIOXIDANT PROPERTIES OF  
*HERACLEUM PERSICUM* AND *VIOLA ODORATA***

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Medicinal plants are a rich source of secondary metabolites and antioxidants. In recent years has been focused high attention on natural antioxidants (extracted from the plants). Today, the discussion about the adverse effects of artificial antioxidants has been done, so study antioxidant effects of this compounds is necessary. Angelica plant has medicinal properties including relieve bloating of gastrointestinal, diuretic, antiseptic and strong germicidal, increasing gastric secretion and excretion of toxins in the body. There are a variety of flavonoid compounds in fragrant violet that has antioxidant and anti-cancer effects. The purpose of this study was evaluation the different methods of extraction [solvent (aqueous, hydroalcoholic and ethanolic), soxhlet and essential oil extraction (Clevenger)] on the antioxidant properties of the extracts and essential oil of angelica seed and violet flower. The plants samples dried after collection in a dark room and away from the direct sunlight. Then after preparation of essential oil and various extracts, total phenolic and flavonoid contents, total antioxidant capacity and DPPH radical inhibition was evaluated. Fragrant violet showed higher total phenols and flavonoids content, antioxidant capacity and inhibition percent compared to Angelica. Both plants have higher phenols and flavonoids content in soxhlet extraction, while higher percent of DPPH was observed in extraction by hydro alcoholic solvent. In our studied plants there was a positive significant correlation ( $P < 0.05$ ) between total phenols and flavonoids content as well as between total antioxidant capacity and free radical (DPPH) inhibition percent. According to the results of present study, it be concluded that among studied plants, fragrant violet can be suggested as a natural antioxidant in food and aromatic industries because of high flavonoid content and antioxidant capacity.

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**EVALUATION OF ANTIOXIDATIVE ACTIVITY OF *CICHORIUM INTYBUS*  
AND *PETROSELINUM CRISPUM* BY DIFFERENT EXTRACTION METHODS**

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Any molecule that is able to inactivate free radicals, called antioxidants. Plants are one of important source of antioxidants. Antioxidants are compounds that prevent free radical reactions and lead to reduced cell death, reduction of cardiovascular disease and cancer. Many nutritionists extracted antioxidants from plants that have fewer side effects and greater effectiveness. Chicory is stimulant of bile and its effects on liver failure and biliary disorders is obvious. Parsley contains high vitamins, antioxidants and minerals. Phenolic compounds and flavonoids are important secondary metabolites with anti-inflammatory, anti-cancer and anti-edema properties. DPPH free radical scavenging as one of the most important factors used to evaluate the antioxidant activity. A suitable extraction method can increase significantly the plant antioxidative efficiency. The aim of this study was evaluation of different extraction methods [solvent (aqueous, hydroalcoholic and ethanolic), soxhlet and clevenger] on total phenols and flavonoids content, antioxidant capacity and DPPH free radical-scavenging of chicory and parsley. After collection the plants dried in a dark room and away from the direct sunlight. In chicory and parsley, the highest phenols and flavonoids content was obtained from soxhlet method. Analysis of variance showed that the differences between plants, extraction methods and extraction method×plant was significant ( $P<0.05$ ). According to our results extraction by soxhlet method showed the highest antioxidative activity in both plants, also maximum inhibition percent (DPPH free radical scavenging) was observed in solvent hydro alcoholic method. There was a significant positive correlation ( $P<0.01$ ,  $r>0.8$ ) between total phenols and flavonoids content, also between total antioxidative capacity and inhibition percent of DPPH. Parsley plant showed higher phenols, flavonoids and antioxidative activity compare to chicory.

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**EXTRACTION AND ANALYSIS OF EFFECTIVE CONSTITUENTS FROM  
DIFFERENT PARTS OF *NECTAROSCORDUM TRIPEDALE* (TRAUTV.) GROSSH.  
EXTRACT FROM CENTRAL ZAGROS**

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*Nectaroscordum tripedale* (Trautv.) Grossh. is a weedy plant from liliaceae family. Summery onion (*N. tripedale*) have boll and tall strong stem with 50 to 150 cm length that in the head have umbel inflorescence. We collect *N. tripedale* from the origin of this plant in DarrehShahr city in zagros foot a mountain, Iran, in March 2015. in this research we extracted constituents using solvent-solvent method and analyze hexane fraction using gas chromatography and gas chromatography/mass spectrometry. Identification of the components was based on GC retention index computer matching with Wiley GC/MS library, and by comparison of the fragmentation patterns of the mass spectra with those reported in the literature. The main constituents of the hexane extract for aerial parts of *N. tripedale* were 99% Octylphthalate, 0.38% Bis (2-ethylhexyl) phthalate and 0.22% 1- Hentetracontanol for 99.66% of the components and the main constituents of the hexane extract for terrestrial parts of *N. tripedale* were 43.84% Palmiticacid, 20.08% Linoleic acid and 8.99% Telfairicacid for 90.01% of the components.

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**EXTRACTION AND ANALYSIS OF EFFECTIVE CONSTITUENTS FROM  
DIFFERENT PARTS OF *ASTRODAUCUS ORIENTALIS* (L.)  
DRUDE EXTRACT FROM KASHAN**

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Medicinal plants constitute a significant part of the flora and are extensively distributed in Iran. Therefore, identifying and expansion of information toward biological activity of these plants which can be appropriate foundation for the development of pharmaceuticals substances, is indispensable. In this direction, *Astrodaucus orientalis* (L.) Drude (Apiaceae Family) were selected and collected. *A. orientalis* (L.) Drude is regarded as a pleasant carrot-parsley flavor and so are used as a food additive or a salad vegetable in some parts of Iran and Turkey. In this research we extracted constituents using solvent-solvent method and analyze hexane fraction using gas chromatography and gas chromatography/mass spectrometry. Identification of the components was based on GC retention index computer matching with Wiley GC/MS library, and by comparison of the fragmentation patterns of the mass spectra with those reported in the literature. The main constituents of the hexane extract for aerial parts of *A. orientalis* were 65.96% Di-n-octyl phthalate, 3.41% N-Formylcytisine and 2.36% 1,2-dihydro-2-(2-methoxyphenyl)-4-methylquinoline for 73.82% the components and the main constituents of the hexane extract for stems and roots of *A. orientalis* were 10.92% 1,2-dihydro-2-(2-methoxyphenyl)-4-methylquinoline, 3.07% Isooctyl phthalate and 0.56% Hexadecyl acetate for 81.03% of the components.

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**ENDOCRINE DISRUPTIVE EFFECTS OF *CUMINUM CYMINUM* L.  
ESSENTIAL OIL: TOXICITY STUDY IN MICE**

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Cumin (*Cuminum cyminum* L.) seeds have many nutritional values and wide range of dietary and therapeutic applications. Hypothesis: Long term administration of cumin caused toxic effects and infertility in male rodents but its hormonal effects in females remained unclear. We aimed in present study to determine the acute and repeated dose toxicity of cumin essential oil with investigating the biochemical, hormonal and histopathological effects. After providing the essential oil and analyzing by GC\_MS analysis, toxicity assessments performed by OECD 425 and 407 guidelines. Acute test didn't show any sign of toxicity in doses up to 2000 mg/kg but in repeated dose test hepatotoxic and nephrotoxic effects were recorded by biochemical and histopathological evidences. Significant weight gains in all dose groups ( $p \leq 0.001$ ) which were exposed to cumin essential oil showed its obesogenic effects but significant weight gains in the uterus ( $p = 0.001$ ), mild edema in endometrium, moderate edema in perimeter layers of animals which were exposed to low and medium cumin doses, as well as its hyperplastic effects in endometrial epithelium of high dose group suggested the endocrine disruptive effects which was confirmed by marked estradiol elevation and antiprogestronic properties in all dose groups. Cumin essential oil caused estrogen like effects if female mice in doses upper than 25 mg/kg but more studies in lower doses could be beneficial for its future therapeutic application as a phytoestrogen.



**PHYTOCHEMICAL STUDIES OF BITTER APPLE AND ITS ROLE  
IN THE TREATMENT OF TYPE II DIABETES  
BY TOPICAL ADMINISTRATION**

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Various medicinal plants such as nettle, garlic, bitter apple (*Citrullus colocynthis*) have been used to reduce the blood glucose level. Bitter apple is traditionally used as antidiabetic medication in the most Mediterranean countries. This plant also contains large amount of phenolics and flavonoids that results to antioxidant activity. In spite of widespread oral administration of bitter apple, such a treatment is plagued with side effects. The goals of this study are to evaluate the antidiabetic effects of bitter apple topical administration on type II diabetes mellitus in 40 male *Wistar* rats as well as phytochemical characterization. Phytochemical tests were performed to investigate the effect of active ingredients. These included flavonoid and phenolic tests and also scavenging effect of the plant. Flavonoids, alkaloids, saponins and glucosides routine tests were positive. Topical administration of enriched cream, two times daily, on the shaven skin, resulted in a 100-150 mg/dl decrease in blood glucose after 3 days of contact. The measurements were carried out in the morning and afternoon for 3 months. Liver enzyme level was measured in both the normal and the treated rats and confirmed the significant long-term anti-diabetic effects of the treatment.

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**THE EFFECTS OF HUMIC ACID FOLIAR APPLICATION ON  
MORPHOLOGICAL CHARACTERISTICS AND ESSENTIAL OIL YIELD OF  
HYDROPONICALLY GROWN *OCIMUM BASILICUM* L.**

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Common basil (*Ocimum basilicum* L.) is a cosmopolitan herb and aromatic plant commonly growing in all parts of the world. Basil is a multipurpose plant with great applications in pharmaceutical, food and fragrance industries. Medicinally, this plant and its essential oil have long been used to treat nausea, dysentery, mental fatigue colds and rhinitis. The effects of applications of humic acid 18% (0, 500, 1000 and 2000 mg.l<sup>-1</sup>) on some growth characteristics such as leaf number, height, total plant fresh and dry weight, fresh and dry yield and essential oil yield were investigated under hydroponic production. This experiment was carried out at the research greenhouse of department of Horticultural Sciences, University of Maragheh, during spring-summer of 2016. This study was conducted by completely randomized design. In general, it appears that humic acid had a promising effects on morphological characteristics and essential oil yield. The result showed that the application of humic acid had significant effects on growth characteristics despite of leaf number in compare with control. There was no significant difference between the leaf number of plant which treated by several concentration of humic acid but in other characteristics increased by application of humic acid. The result of this experiment showed that dry and fresh yield was increased by application of humic acid. Furthermore, humic acid could increase the essential oils yield and the 1000 mg.l<sup>-1</sup> of humic acid was showed highest essential oil yield between other treatments. According of the result, 1000 mg.l<sup>-1</sup> of humic acid had the best result in all factors which measured in this experiments. In summary, it seems that regarding the results of this experiment, basil plant has the production potential under hydroponic condition and humic acid could have positive effects on growth factors and essential oil production.

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**GROWTH PERFORMANCE, CARCASS COMPOSITION AND SURVIVAL RATE OF JUVENILE GREAT STURGEON (*HUSO HUSO LINNAEUS*, 1754) FEED WITH DIFFERENT LEVELS OF *PADINA GYMNOSPORA*.**

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In recent years much focus and attention has been paid towards dietary supplements such as microalgae or herbal plants in order to improve growth performance, non-specific immune responses of aquatic animals and efficiency of dietary intake. *Padina gymnospora* is a microalgae (filamentous Cyanobacteria) which is recognized as an excellent food supplement that contains high levels of protein, vitamins, minerals, carbohydrates, carotenoids, beta-carotene, *xanthophyll* and  $\gamma$ -linolenic acid. This study was conducted to evaluate the effects of different levels of prebiotic *P. gymnospora* on growth factors, body composition and survival rate of cultured juvenile beluga (*Hous huso*) in the sturgeon culture center (Samandak, Sari). Four groups of beluga sturgeon with mean weight of  $100.4 \pm 8.2$  g were raised for 56 days in fiber glass tanks (18 fish to each tank) and feeding with different levels of *P. gymnospora* with concentrations of % 0, % 1, % 2.0 and % 3.0 (Three replicates were used for each concentration). At the end of the trial, growth factors (final weight, weight gain, SGR, CF feed conversion ratio (FCR), body weight and survival rate) were determined and compared with control group. Our results confirmed that juveniles fed on diet supplemented with 3% *P. gymnospora* had significantly higher growth factors and survival rate compared to other treatments ( $P < 0.05$ ). The study of body composition showed no significant difference between different treatments ( $P > 0.05$ ). Survival rate was increased during this study and significantly higher in 3% treatment compared to other treatments ( $P < 0.05$ ). Based on the results, using of *P. gymnospora* at the level of 3.0% in order to improve the growth performance and survival rate of farmed beluga is recommended.

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**THE EFFECT OF DIFFERENT LEVEL OF ENCAPSULATION FORM OF  
ACHILLEA WILHELMSII ON THE HEMATOLOGICAL AND IMMUNE  
PARAMETERS OF CASPIAN WHITE FISH.**

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Kutum roach (*Rutilus frisii kutum*, Kamensky 1901, Cyprinidae family) also known as Caspian white fish and Caspian roach, is the most popular fish in Iran due to its highest economic value [1]. Due to the increased bacterial resistance to common antibiotics, there is tendency towards using herbal extracts in order to increase the non-specific immune system [2]. This study was conducted to evaluate the effects of different levels encapsulation form of *Achillea wilhelmsii* on hematological and immune parameters of Caspian white fish. For this purpose, fish with mean ( $\pm$ SD) weight of  $1.14 \pm 0.16$  g were raised for 8 weeks in Vniro tanks (200 l water), 30 fish to each tank and feeding with different levels of encapsulation form of *A. wilhelmsii* (with concentrations of % 0, % 1, % 2.0 and % 3.0, three replicates were used for each concentration). At the end of the trial, blood samples were collected to determine some hematological and immunity parameters in different groups and compared to one another. Results showed significant differences in RBC and WBC count, neutrophil and lymphocyte percentage, haemoglobin (Hb), haematocrit (HCT) value, IgM, lysozyme and respiratory burst activity and alternative complement activity in fish fed encapsulation form of *A. wilhelmsii* (especially at 2 and 3.0% concentrations) when compared with control and 1% groups. The results suggest that encapsulation form of *A. wilhelmsii* could enhance the non-specific immune system of *R. frisii kutum*. Thus, using this supplement especially at of 3.0% level as immunostimulants was recommended in this valuable fish diet.

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**EFFECT OF DIFFERENT *AGROBACTERIUM RHIZOGENES* STRAINS ON  
HAIRY ROOT INDUCTION IN *CANNABIS SATIVA* L.**

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Hemp (*Cannabis sativa* L.) is a traditional Central Asia annual dioecious plant that has gained popularity throughout the world due to its psychoactivity. Currently, more than 80 known compounds have been isolated from cannabis plant, which have pharmaceutical effects. Cannabinoids and in particular the main psychoactive THC (Tetrahydrocannabinol) are promising substances for the development of new drugs. Hairy root induction is the result of the infection of plant tissues with *Agrobacterium rhizogenes* and subsequently integration of root induction plasmid (PRi) T-DNA into the plant genome and its subsequent expression. In the present study, the effect of different *A. rhizogenes* strains on hairy root induction in *C. sativa* were investigated. The seeds of *C. sativa* cultured in solid MS medium (pH 5.6) and 8 weeks after germination and production of seedlings, leaf and cotyledon explants were infected by three strains of *A. rhizogenes* (A7, A13 and 15834). The leaf and cotyledon explants were cultured on solid 1/2 MS medium for co-cultivation with *Agrobacterium*. After 48h, in order to elimination of bacteria, these explants transferred on MS medium supplemented with cefotaxime and after one week transformation efficiency was determined. Hairy roots were observed in leaf explants but no hairy roots were induced from cotyledon explants of *C. sativa*. The highest frequency of hairy roots induction was obtained by A13 strain (60%). Frequency of hairy roots induction in A7 and 15834 strains were 41% and 33%, respectively. According to our results, A13 strain is suitable for induction transgenic hairy roots in *C. sativa*.

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**CHANGES IN ESSENTIAL OIL COMPOSITION IN TWO POPULATIONS OF  
*ZATARIA MOLTIFLORA* DURING THEIR PHENOLOGICAL CYCLE**

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An experiment was conducted in order to determine the effects of phenological stages on yield and quality of essential oil in *Zataria multiflora* in two populations. Essential oil was obtained using hydrodistillation method. The quality of essential oil was evaluated using GC and GC/MS. For this experiment, plants were harvested in four different phenological stages *i.e.* vegetative, pre-flowering, flowering and after-flowering for each population from Neireez in Fars province. Results showed the significant effects of phenological cycle on yield and quality of *Zataria multiflora* essential oil. Results also showed that thymol content was rich in both populations a and b in pre-flowering and flowering, respectively. The maximum amount of its precursors; p-cymen and  $\gamma$ -terpinene was detected in vegetative stage for population b and in after-flowering and pre-flowering stages for population a, respectively. The essential oil yield was in the maximum percentage harvesting after-flowering stage for both populations. Results show that phenological stages affect not only on the yield, but also on the secondary metabolites (active substances).

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**ANALYSIS OF ESSENTIAL OIL COMPOSITION OF THE *CITRUS AURANTIUM*  
AND *CITRUS LATIFOLIA* PEELS USING GC/MS AND GC**

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The essential oil composition in peels of *citrus aurantium L.* and *citrus latifolia* were identified by a gas chromatography (GC) and a GC technique coupled with mass spectrometry (GC/MS). A total of 30 and 24 compounds were detected using these techniques for *citrus latifolia* and *citrus aurantium* essential oils, respectively. Meanwhile, 100% and 99.75 % of compounds were successfully identified in the study of *citrus latifolia* and *citrus aurantium* peel essential oil, respectively. The main component was limonene in both plants which was 78.14% for *citrus latifolia* and 94.72% for *citrus aurantium*. Also about 8.2% of Linalool, 3.43% of myrcene, 1.20%  $\alpha$ -pinene, 1.38% n-Octanal and 1.32% -Terpineol were detected as the other main components in *citrus latifolia* peel volatile oil. The essential oil yield was 1.1% for *citrus aurantium L.* and 0.6% for *citrus latifolia*.

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**HYPOGLYCEMIC EFFECT OF AQUEOUS AND METHANOLIC EXTRACT OF  
*AJUGA CHAMAECISTUS* SSP. *TOMENTELLA* IN STREPTOZOTOCIN  
INDUCED DIABETIC MICE**

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The genus *Ajuga* (Kamaphytus), as a medicinal plant in traditional Iranian medicine (TIM), has been used for treatment of some diseases such as joints pains, gout, jaundice and wound healing. Some of *Ajuga* species has been used to treat diabetes in other traditional systems. [1-3] In this regards, we aimed to evaluate hypoglycemic effect of aqueous and methanolic extracts from aerial parts of *Ajuga chamaecistus* ssp. *tomentella*, collected from Tehran province, in streptozotocin induced diabetic mice. This study were performed on 10 separate groups including six groups of diabetic mice received 200, 400 and 800 mg/kg of each aqueous or methanolic extract orally per day, two groups of diabetic mice that received 500 mg/kg of metformin and 5 mg/kg of glibenclamide as positive controls. Group 9 was considered as a negative control and received normal saline. Group 10 contain non-diabetic mice that received 800 mg/kg of aqueous extract to study the acute hypoglycemic effects of it. The blood glucose was measured on days 14 and 28 of the study. According to the results, 400 mg/kg of aqueous and methanolic extract showed more hypoglycemic activity that was significant in statistical analysis. Nevertheless measurement of Hb1AC after treatment with aqueous extract did not show significant effects. Administration of 800 mg/kg of aqueous extract indicated a reduction of blood glucose after two hours that was not significant and may need further studies.

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**NEUROPROTECTIVE EFFECT OF *MATRICARIA CHAMOMILLA* EXTRACT ON  
MOTOR DYSFUNCTIONS-INDUCED BY TRANSIENT GLOBAL CEREBRAL  
ISCHEMIA AND REPERFUSION IN RAT**

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Stroke can cause paralysis, muscle weakness and loss of balance. This may affect walking and everyday activities. The aim of this study is to evaluate the effect of ethyl alcohol extract of Chamomile on cerebral ischemia-induced motor dysfunctions in rats. Forty two Wistar rats were divided into 7 groups including control group (received no treatment), sham group, I/R group (subjected to ischemia/ reperfusion: I/R) and 3 test groups (received 50, 100, and 200 mg/kg of extract respectively and subjected to I/R). Acute ischemic stroke was induced by occlusion of the common (right and left) carotid arteries for 60 min followed by reperfusion. Motor coordination and balance was evaluated using Rotarod apparatus. At the end of the experiment, total antioxidant capacity, malondialdehyde (MDA) and nitric oxide (NO) levels both in serum and brain were determined. Chamomile extract significantly ameliorated motor dysfunction induced by I/R. Induction of I/R in rats leads to an increase in serum MDA level and Chamomile extract significantly reduced its level. Our finding suggested that the *Matricaria chamomilla* extract could ameliorate motor dysfunction.

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**EFFECT OF MICRONUTRIENTS FOLIAR APPLICATION AND DROUGHT STRESS ON SOME QUANTITATIVE AND QUALITATIVE TRAITS OF CALENDULA OFFICINALIS**

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An investigate concerning the effect of foliar feed of micronutrients and drought stress on Marigold plant was conducted in the greenhouse of Islamic Azad University of Bojnurd in 2013. This experiment was conducted as a factorial design with 3 replications. The experiment factors were: A) drought stress with 3 levels including irrigation at 100, 50 and 25% of the soil's Field capacity, B) foliar feed of micro nutrients with 5 levels including: 1) control (no foliar feed), 2) foliar feed with 0.004 Fe density, 3) foliar feed with 0.003 Zn density, 4) foliar feed with 0.002 B density, and 5) foliar feed with mixture of Fe, Zn, and Br in 0.004, 0.003 and 0.002 densities. The results showed that the effect of drought strees on the plant height, the flower diameter, the number of flowers per Plant, the dry weight of flower, the number of secondary branches, and the dry flower yield was significant. A reduction of irrigation from 100% of Field capacity to 25% decreased the vegetative and yield characteristics. The effect of foliar feed of micronutrients on characteristics like the number of secondary branches, the dry weight of flower, the number of flowers per plant and the flower diameter was not significant and the interaction of foliar feed and drought stress had a significant level (5%) on the flower diameter, the number of flowers per Plant and the number of secondary branches. The results showed that the essential oils percentage increased by reduction of irrigation from 100% to 25%, of field capacity while essential oils yield were decreased.

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**THE EFFECT OF *TEUCRIUM POLIUM* EXTRACT ON SKIN WOUND HEALING IN MALE RAT**

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Teucrium polium is a plant which its biological properties including anti-inflammatory and antimicrobial properties has been widely reported. In traditional medicine, Teucrium polium is also used to treat inflammation, rheumatism, or scars. Seemingly, this plant can also be effective in accelerating skin wound healing. In the present research, effect of hydroalcoholic extract of Teucrium polium on skin wound healing in rats is investigated. Sixty male Wistar rats were randomly divided into 3 equal groups: as follow: the treatment group, negative and positive control group. Following an intraperitoneal local anesthesia of rats with the Ketamine-Xylazine mixture under aseptic conditions, a 10-mm scar was made in each rat. In the treatment (experimental) group, 10% extract of the plant was put on the scar each day. The negative control and positive control groups also received normal saline and Phenytoin ointment respectively. On the third, seventh, fourteenth, and twenty-first days, five rats were euthanized (using ether) and their tissue samples were sent to the laboratory for histopathological examination. Appropriate samples were fixed in 10% neutral buffered formalin, dehydrated in graded ethanol, cleared in xylene, and embedded in paraffin wax. Sections in 5 µm thickness were stained by hematoxylin and eosin (H&E) and studied microscopically. Histopathological examinations revealed that the wound healing indices (including the presence of inflammatory cells, vessel formation, granulation tissue formation, collagen threads arrangement, and formation of the epidermis and dermal appendages) were always better in the experimental group rats than the negative control group rats. Based on the microscopic results of the present research, it could be concluded that hydro-alcoholic extract of Teucrium polium accelerates skin wound healing process and decreases the duration of complete wound healing, particularly in first hours after wound creation. Since the commencement of healing calls for mitigation of wound inflammation and since infections delay the healing process, it is concluded that the anti-inflammatory and anti-microbial properties of this substance can accelerate wound healing. However, further research on the mechanism and the type of Teucrium polium substance affecting skin wound healing deems necessary.

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**EFFECT OF WATER DEFICIT STRESS ON GROWTH, YIELD AND  
ESSENTIAL OIL CONTENT OF *CARUM COPTICUM***

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Ajwan (*Carum Copticum* L.) is an important plant in Apiaceae family and has many medical uses. To study the effects of different levels of water stress on growth, yield and essential oil content of Moldavian balm, a pot experiment in randomized complete block design with four treatments and four replications was conducted. Water stress treatments were: 85% of field capacity (mild water stress), 70% of field capacity (moderate water stress) and 50% of field capacity (severe water stress). According to the results of statistical analysis, water stress had significant effect on growth parameters, herb yield and essential oil yield. As the soil water content decreased, plant height, stem diameter, number and length of auxiliary shoots, fresh and dry herb yield in pot and essential oil yield decreased. There was no significant difference between water stress treatments for essential oil content. The highest amounts of essential oil content (3/96 ml/100gr dry weight) and essential oil yield (28/6 kg/hect) were observed in 70% and 85% of field capacity, respectively.

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**THE EVALUATION OF BALANGU (*LALLEMANTIA ROYLEANA* BENTH.)  
GROWTH AND YIELD INTERCROPPING WITH  
CHICKPEA (*CICER ARIETINUM* L.)**

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In order to evaluate the possibility of the balangu intercropping with chickpea in the rainfed condition at Mashhad during 2015-16. A factorial experiment was conducted in the randomized completed block design with three replications at the research farm of Ferdowsi University of Mashhad. Treatments were included plant ratio of balangu / chickpea (0:100, 100:100, 75:100, 50:100, 25:100, 100:0) and weeding time (50 and 70 days after planting). Results showed that the weeding time had significantly ( $p \leq 0.1$ ) increased the balangu dry matter and seed yield. Weeding, 70 days after planting increased 10 and 24.5 percent of dry matter and seed yield respectively. By increasing balangu plant ratio, biomass and seed yield significantly increased. According to the results, planting ratios (100:50, 100:75) can be useful and economic so that had the most (LER) was obtained at those planting ratios.

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**DILL *ANETHUM GRAVEOLENS* L. IS AN EFFICIENT ANTIOXIDANT AGAINST ROS SPECIALLY SINGLET OXYGEN IN THE OLEIC ACID MEDIA**

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In this work antioxidant activity of dill (*Anethum graveolens* L.) as a natural antioxidant on fatty acid oxidation was investigated in the presence of OH<sup>•</sup>, H<sub>2</sub>O<sub>2</sub>, O<sub>2</sub><sup>•-</sup> and specially <sup>1</sup>O<sub>2</sub>. In order to evaluate antioxidant activities of dill extract, oleic acid oxidation was monitored by peroxide value (PV (meq O<sub>2</sub>/kg)) and UV-Vis spectroscopy. The rate of fatty acid oxidation by <sup>1</sup>O<sub>2</sub> reduced in the presence of dill as a natural antioxidant which shows dill has an efficient role on restrict fatty acid photooxygenation (Fig1). Also UV-Vis spectroscopy showed in the oleic acid oxidation with OH<sup>•</sup> and H<sub>2</sub>O<sub>2</sub>, absorption gaps of oleic acid as a result of oxidation was compacted in the presence of dill which demonstrated dill is effective on control of fatty acid against these types of Reactive Oxygen Species (ROS).

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**IN VITRO ANTIBACTERIAL ACTIVITY OF CINNAMUM AGAINST SOME  
GRAM NEGATIVE AND POSITIVE BACTERIA**

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Medicinal and aromatic plants are used on a large scale in medicine against drug-resistant bacteria, which are considered one of the most important reasons for the lack of success of treatment in infectious diseases. Medicinal plants are the major sources of new medicines and may constitute an alternative to the usual drugs. In this study, 5 gr of dried powder *cinnamon casia* weighing; then methanol and aqueous extracts of them were obtained by maceration method. They were tested against different bacteria include gram positive (*Staphylococcus aureus*, *Streptococcus pyogenes* and *Enterococcus*) and gram negative (*E.coli*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa*). Minimal inhibitory concentration values of each extracts were determined. The results obtained show the methanolic extract of *cinnamon casia* was 0.5 mg/ml on enterococcus, *Klebsiella pneumonia* and *E.coli*; also MIC aqueous extract of *cinnamon casia* was 2 mg/ml on *Klebsiella pneumonia* and *E.coli*; but they had no effect on the growth of bacteria. The results suggest that these extracts can be used in pharmaceutical and food formulations for inhibiting pathogenic bacterial species.

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**IN VITRO ANTIBACTERIAL ACTIVITY OF *CROCUS SATIVUS* L.  
AGAINST SOME GRAM NEGATIVE AND POSITIVE BACTERIA**

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Many people are used medicinal plants due to natural, low risks and complications, and low costs as compared with the synthetic drugs. Incidence of drug resistance against chemical antimicrobial drugs has led the use of medicinal plants for treatment of infections in recent years. In this study, 5 gr of dried powder *crocus sativus* l. (stigma) weighing; then aqueous and methanol extracts of it was obtained by maceration method. They were tested against different bacteria include gram positive (*Staphylococcus aureus*, *Streptococcus pyogenes* and *Enterococcus*) and gram negative (*E.coli*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa*). Minimal Inhibitory Concentration values of each extracts were determined. The results obtained show the methanolic extract of *crocus sativus*l. was 2 mg/ml on *Streptococcus pyogenes*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*isolates; also MIC aqueous extract of *crocus sativus* l. was 2 mg/ml and 1 mg/ml on *Streptococcus pyogenes*, *Staphylococcus aureus* and *E.coli* respectively. The results suggest that these extracts can be used in pharmaceutical and food formulations for inhibiting pathogenic bacterial species.

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**ANTIMICROBIAL ACTIVITIES OF *ZATARIA MULTIFLORA* BOISS. ESSENTIAL OIL AGAINST *STAPHYLOCOCCUS AUREUS* ISOLATED FROM RAW MILK**

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Staphylococcal raw milk poisoning results from the consumption of raw milk in which enterotoxigenic staphylococci have grown and produced toxins. Essential oil (EO) of *Zataria multiflora* Boiss. contains components with antibacterial and antifungal properties. Therefore, the present study was conducted to determine the minimum inhibitory concentration (MIC) of *Zataria multiflora* Boiss. EO against *Staphylococcus aureus* isolated from raw milk. A total of 84 samples of raw milk were analyzed for the presence of *Staphylococcus aureus*. There were 14 *S. aureus* isolated from these samples. The chemical composition of hydrodistilled EO of *Zataria multiflora* was analyzed by GC/MS. A total of 25 compounds representing 98.59% of the oil were identified: carvacrol (50.53%), thymol (14.7%), p-cymene (7.9%), Carvacryl acetate (3.85%) and Trans-caryophyllene (3.4%). The MIC of *Zataria multiflora* Boiss. EO against *S. aureus* isolates was determined using broth microdilution method and was 0.027. Therefore results here show that the EO and methanol extract of *Zataria multiflora* Boiss possess antibacterial activity on *Staphylococcus aureus* isolated from raw milk.

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## INHIBITORY EFFECT OF HERBAL FLAVONOID “CALYCOPTERIN” ON CELLULAR MODEL OF PROSTATE CANCER

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Cancer is one of the most important causes of death in developing countries. So far so many studies have been done to control cancer cell growth and metastasis. Since chemical methods for curing cancer involves high toxicity and side effects, herbal compounds with inhibitory effects on cancer cells and with lower toxicity on healthy cells have been introduced. Flavonoids are a group of herbal compounds which known as effective substances in controlling cancer. They play inhibitory roles in processes such as cell proliferation, angiogenesis, invasion and metastasis. In the present study, the effects of a natural flavonoid named Calycopterin on prostate cancer cells is under investigation. Prostate cancer is one of the most common cancers in men all over the world and in Iran. LNCaP prostate cancer cell line was cultured in RPMI 1640 containing 10% FBS. Following 24h pre-incubation time, the cells were treated with different concentrations of Calycopterin (0, 20, 50, 100, 150, 200, 250, 400  $\mu\text{M}$ ) for periods of 24 and 48h. The assessment proliferation rate was done with MTT assay and the drug IC<sub>50</sub> were calculated with statistical analysis. Afterwards, the effect of Calycopterin on the cell migration and colony formation was done with colony formation assay. Finally Giemsa staining was employed in order to show morphological changes in presence of the Calycopterin. The results showed that Calycopterin caused growth inhibitory effects on prostate cancer cells in a dose dependent manner. The IC<sub>50</sub> concentration was 120  $\mu\text{M}$  in LNCaP cells. Calycopterin treatment induced rounded cell morphological changes and also reduced cell attachment to culture dish surface. In addition, reducing cell migration and cologenic ability were observed. The present data indicated that Calycopterin as a natural flavonoid is capable to repress prostate cancer cell proliferation. This process is probably done via apoptosis induction, which leads to metastasis inhibition.

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**THE STUDY OF SOMACLONAL VARIATION IN TISSUE CULTURE  
REGENERATED PLANTS OF *CATHARANTHUS ROSEUS* L. (*G*) *DON* SEED**

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*Catharanthus roseus* L. (*G*) *Don* is a very essential medicinal plant that produces anticancer compounds (such as Vinblastin and Vincristin), which are used for the treatment of a wide variety of cancers. Genetic changes are one of possible ways to increase medicinal components of *C. roseus*. Somaclonal variation is a method for genetic changes. In this research genetic changes of tissue culture regenerated *C. roseus* plants were studied. Genetic changes nine ISSR loci were used, in total, they produced 81 bands, of which 32.09 % were polymorphic. Also, the percentage of polymorphism, Shannon index, and genetic diversity were  $P = 36.00\%$ ,  $I = 0.207\%$  and  $He = 0.143\%$  respectively. PCoA ordination showed genetic differentiation among regenerated plants. Genetic changes by tissue culture and somaclonal variation is a possible way to introduce new resources for this plant.

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**EFFECT OF VERMICOMPOST AND MYCORRHIZAL SYMBIOSIS ON MICRO NUTRIENT CONCENTRATION, UPTAKE AND ESSENTIAL OIL CONTENT OF MINT (*MENTHA PIPERITA* L.) IN A CHEMICAL LESS AGRO- ECOSYSTEM**

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This experiment was done in order to analyze the effect of vermicompost and mycorrhizal symbiosis on the performance and essence of pepper mint (*Mentha piperita* L.) in a chemical free agroecosystem in a factorial experiment with three replications and three levels of vermicompost with animal bases (0, 4, 8 ton/ha) and 2 levels of mycorrhizal 250-300 spores for each cutting (no inoculation and inoculation with *G.mosea* species). The experiment was conducted in land with no history of cultivation in Shazand, Iran in 2011. Results show increased in concentration of Cl (38%) and Cu (26%) in leaves was higher in mycorrhizal treatment than the ones using mycorrhizal fungi. Although the concentrations of Fe (25%) and Zn (%96) reduced yet they were more menthol obtained in mycorrhizal treatment alone. Vermicompost showed different effects on different levels. On 4 ton/ha the concentration of Cu, Zn and Cl in leaves decreased, but the concentration of Fe increased. The interaction between mycorrhizal and vermicompost in concentration of Cu and Fe was synergist and in Cl was antagonist.



**MEDICINAL AND ENDEMIC PLANTS IN SALDARAN PROTECTED REGION  
FROM CHAHARMAHAL VA BAKHTIARY PROVINCE**

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Saldaran protected region is located in south-east of Kouhrang at latitude of 32° 6' N and longitude of 50° 35' E from central Chaharmahal va Bakhtyari. The elevation ranging from 1700-2400 m is important in term of vegetation diversity. Consequently, the medicinal and endemic plants were investigated in this research. All of the specimens were collected during different vegetative seasons and several stages in 2015-2016. The collected specimens were identified using authentic floras. All research data are first reported from this region. The results of this study show the number of 171 species including 36 families, 121 genera, 18 subspecies and 12 varieties. The most important families with the highest frequency are namely as Asteraceae, Apiaceae, Brassicaceae, Boraginaceae, Caryophyllaceae, Lamiaceae and Euphorbiaceae. Furthermore, the medicinal dicotyledons (93%) and monocotyledons (6%) specimens were identified. 98 medicinal and 18 endemic species represent considerable position. Some of the medicinal species in this region are namely as *Bunium elegans* (Fenzl) Freyn. (Apiaceae), *Bupleurum croceum* Fenzl. (Apiaceae), *Centaurea solstitialis* L. (Asteraceae), *Cousinia onopordioides* Ledeb. (Asteraceae), *Tanacetum polycephalum* Sch.Bip. (Asteraceae), *Chardinia orientalis* L. Kuntze (Asteraceae), *Asperugo procumbens* L. (Boraginaceae), *Rochelia persica* Bunge ex Boiss. (Boraginaceae), *Sideritis montana* L. (Lamiaceae), *Erysimum repandum* L. (Brassicaceae), *Fibigia clypeata* L. Medik. (Brassicaceae), *Morina persica* L. (Morinaceae), *Pterocephalus canus* Coult. ex DC. (Dipsacaceae), *Crucianella gilanica* Trin. (Rubiaceae) and *Valerianella dactylophylla* Boiss. and Hohen. (Valerianaceae). It is noted that *Equisetum giganteum* L. (Equisetaceae) is introduced as a medicinal Pteridophyte. Moreover, the most important endemic species in this region include *Helichrysum oligocephalum* Moore (Asteraceae), *Scorzonera rupicola* Hausskn. (Asteraceae), *Tragopogon acanthocarpus* Boiss. (Asteraceae), *Onosma kilouyense* Boiss. and Hausskn. (Boraginaceae), *Erysimum koelzii* Pol. and Rech. f. (Brassicaceae), *Stachys pilifera* Benth. (Lamiaceae) and *Euphorbia grossheimii* (Prokh.) Prokh. (Euphorbiaceae). Consequently, the significant existence of medicinal and endemic species in this protected region illustrates valuable genetic resources in chahrmahal va Bakhtiary province.

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**STUDY OF ROOT COLONIZATION PERCENTAGE OF MEDICINAL PLANT BY  
*PIRIFORMOSPORA INDICA* AND *GLOMUS MOSSEA***

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The roots of the majority of crops and medicinal and other plants are heavily colonized by arbuscular mycorrhizal fungi and *Piriformospora indica*. The effect of inoculation Mycorrhizal and like-mycorrhizal on the tow family Brassicaceae (*Descoriana sophia* and *Brassica nigra*) was studied in a pot experiment in 2016. Experiment was conducted using a completely randomized design in five replication. After germination seeds, three germinate seeds was transferred to each pot. Pot were filled with a substrate containing 1:1 sterile mixture of soil and sand. Pots were placed in a greenhouse in 20°C. Before sowing, inoculation fungus added in each pot. After eight weeks, aboveground plants were cut at the soil surface, and in laboratory oven dried (80C) and weighed to determine biomass. Soil was separated from plant roots and washed. Root of two plant in pot were oven dried (80 C) and weighed and other plant root taken for root colonization determination by fungi. Mycorrhizal growth responses (MGR) were calculated. No colonization was observed in control plants for any of the species. The percentage of colonized root different among plant species. The highest colonization values 20.50% was found in *D.sophia* inoculated with *P.indica*. A much lower percentage of colonized roots were found in *B.nigra*( 7.50%) by *G.mossea*. The analysis of the total biomass showed that the effect of fungus was highly dependent on the plant species. Shoot and root dry weights of inoculated plants of *D.sophia* were higher in comparison to control *P. indica* decreased *B.nigra* (17%). growth response *D.sophia* and *B.nigra* plant with *P.indica* 42.83 and -16.28 were observed respectively. *P.indica* fungi was reduced biomass *B.nigra*.

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**THE EFFECT OF HYDRO-ALCOHOLIC EXTRACT OF *ROSA DAMASCENA* ON UTERINE SMOOTH MUSCLE CONTRACTION IN VIRGIN RAT**

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Few studies have evaluated the effect of *Rosa damascena* (*R.damascena*) on uterus and dysmenorrhea, but their results seems inconsistent. The aim of the study was to consider the effect of alcoholic extracts of *R.damascena* flower on uterine smooth muscle contraction amplitude, duration and frequency in virgin rats. In this experimental study 30 virgin female Wistar rats (180-220 g) were randomly divided into 3 groups including control, extract and oxytocin plus extract. After animal anesthesia, about 1.5 cm of the uterine horn was cut and placed in an organ bath. The response of the uterine smooth muscle to cumulative alcoholic extract of *R.damascena* flower (1, 2 and 4 mg/ml) and in addition to oxytocin (4mU/ml) plus alcoholic extracts of *R.damascena* were recorded. the alcoholic extract of *R.damascena* (4 mg /ml) reduced basal contractions of the uterine horn. *R.damascena* (4 mg/ml) significantly diminished oxytocin –induced uterine contractions. *R.damascena* extract had no significant effect on the duration of normal or oxytocin induced contractions in uterine horn. However *R.damascena* (4 mg/ml) significantly reduced frequency of uterine contraction in normal or oxytocin induced contractions. *Rosa damascena* extract reduced the amplitude and frequency of the basal and oxytocin induced contractions in the uterine of virgin rat. The extract may relieve dysmenorrhea pain and premature labour; further study is needed for more clarification.

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**ANTIBACTERIAL EFFECTS OF NATIVE *NEPETA CATARIA* L. ESSENTIAL OILS AGAINST SOME HUMAN STRAINS OF THE ENTEROBACTERIACEAE FAMILY IN KHORRAMABAD, IRAN**

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Side effects of chemical preservatives necessitate research on the use of natural oils to prevent the growth of bacteria. The aim of this study was elucidating the antibacterial effect of the essential oils of Native *Nepeta cataria* L. on some human strains of the Enterobacteriaceae family in Khorramabad city. An in vitro assay measuring the antimicrobial activity of essential oils against some strains of the Enterobacteriaceae family (*Escherichia coli*, *Kelbsiella pneumonia*, *Salmonella typhimurium*, *Salmonella enterica* and *Salmonella paratyphi*) were studied using disk-diffusion and agar-dilution methods CLSI, 2009. The composition of essential oils was studied using gas chromatography-mass spectrometry. Total phenolic content was measured by Folin-Ciocalteu method. *Nepeta cataria* oil inhibited all the microorganisms at the highest concentration, 5.3 mg mL<sup>-1</sup>. Major compounds detected in the oil of *Nepeta cataria* was  $\beta$ -Nepetalactone (53.83%). By chemotyping, higher inhibitory capacity was observed in the *Nepeta cataria* oil with a higher percentage of phenolic components (1.36 mg g<sup>-1</sup> Gallic acid equivalent). The results of this work confirm the antimicrobial activity of Native *Nepeta cataria* oils, as well as their potential application in the treatment and prevention of some strains of the Enterobacteriaceae family.

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**CYTOTOXIC EVALUATION OF ESSENTIAL OIL FROM *DRACOCEPHALUM KOTSCHYI* BOISS. ON HUMAN CANCER CELL (HELA) AND LYMPHOCYTE**

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The genus *Dracocephalum* L. is composed of approximately 60 species; there are eight species of *Dracocephalum* growing wild in high altitude regions of Iran. *Dracocephalum kotschyi* Boiss is aromatic native plant to Iran that grows wild at an altitude of 2000 to 3200 m in the Lorestan, Fars, Golestan, Hamadan, Mazandaran and Tehran provinces. The purpose of the present work was to determine cytotoxic activity of the essential oil of *D. kotschyi* on the human cervical carcinoma HeLa cell line and the human normal healthy lymphocyte cell line. Flowering aerial parts of wild growing *D. kotschyi* Boiss. were collected in July 2014 from Garin Mountain in the Lorestan province. A portion of the dried and finally ground aerial parts of *D. kotschyi* was submitted, for 3 h, to water distillation using a Clevenger-type apparatus (British type). The essential oil was analyzed by using gas chromatography with flame ionization detection (GC-FID) and gas chromatography-mass spectrometry (GC-MS) [2]. The human cervical carcinoma HeLa cell line (NCBI code No.: 115; ATCC No.: CCL-2) and the human normal healthy lymphocyte cell line (NCBI code No.: 124; ECACC No.: 91112124) were obtained from the Pasteur Institute, Tehran-Iran. The cytotoxicity assay detected the reduction of MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide] by mitochondrial dehydrogenase to the formazan blue product, which reflects the normal functioning of mitochondrial and cell viability. Forty-three components were identified in the essential oil, and the main components were Geraniol (12.1%),  $\alpha$ -Pinene (10.34%), Geraniol acetate (10.27%), Geraniol (9.55%), Neral (8.9%) and Limonene (6.95%). *D. kotschyi* oil displayed good cytotoxic action towards the human tumor cell line. Regarding the cytotoxic activity based on the MTT assay, the IC<sub>50</sub> values for HeLa and lymphocyte cells were calculated to be 26.4  $\mu$ g/ml and 4266.7  $\mu$ g/ml, respectively. The IC<sub>50</sub> shows that the cytotoxicity of *D. kotschyi* oils toward the human tumor cell line was much higher compared to the requirement for healthy human cells.

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**STUDY ON PHENOLOGY STAGES OF *ALLIUM JESDIANUM* BOISS. AND  
BUHSE IN LORESTAN REGIONS**

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*Allium jesdianum* is an endangered species patchily distributed in Zagros Mountain and has nutritive and medicine uses in the regions. Temperature is a primary factor affecting the rate of plant development. Plants require a specific amount of heat to develop from one point in their lifecycle to another stage. Growing degree days (GDD) are frequently used as weather-based indicator for assessing plant phenology. Therefore, all growth and development stages of plant may be estimated more accurately on the basis of GDD rather than calendar method. In this study phenological stages of *Allium jesdianum* was detected based on growth degree days (GDD). Phenological data were recorded in eight regions and interpreted using climatic data to calculate GDD in each region. The results showed that onset and end of growth varied in different regions and these changes occurred based upon temperature. Phenological period of all studied plants in cool regions was longer than that of warm regions. But required GDD for all mentioned plants were almost similar. Early stage of growth at 5 degrees- the day started in the leaves of vegetative and flowering stages of shoot growth to continue. The late stage of the inflorescence at 687 degrees days of growth, the plant seeding began in 923 and the loss rate start to 1289 growing degree days of continued growth.

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**THE EFFECTS OF POLYANILINE GRAPHENE OXIDE NANOPATE ON GERMINATION BEHAVIOUR AND SEEDLING VIGOR INDEX OF LEMON BALM (*MELISSA OFFICINALIS* L.)**

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Lemon balm (*Melissa officinalis* L.) is a valuable medicinal plant native to southern Europe and western Asia. Seed germination is a crucial stage in the life cycle of plants and tends to be highly unpredictable over space and time. Successful establishment of plants largely depends on successful germination. The dramatic development of carbon nanoscience and nanotechnology in recent years has offered numerous opportunities and innovative solutions in various fields and applications. Of the carbonaceous nanomaterials, graphene has been more widely and rapidly developed compared with other materials. Graphene oxide (GO), a novel engineered nanomaterial, is widely used in various fields (e.g. biology, chemistry, medicine, exploration and environmental protection) is considered to be relatively biocompatible. Polyaniline-co-graphene oxidenanoplates (PANI/GO) were prepared by in situ chemical oxidative polymerization of aniline in the presence of GO nanoplates. The morphology of the composite is examined by scanning electron microscopy (SEM) and transition electron microscopy (TEM). In this research, the influence of different concentrations of PANI/GO (0, 100, 200, 400 and 800 mg/L) were studied on seed germination parameters including germination percentage (GP %), mean germination time (MGT), germination rate (GR), germination index (GI) and seedling vigor index (SVI) in *M. officinalis* L for 7 days. Results showed that significant differences in examined traits were found among the employed PANI/GO concentrations. The highest (93%) and the lowest (57%) GR were observed at 200 and 800 mg/L PANI/GO concentration, respectively. However, minimum (2.45 day) and maximum (6.24) MGT were obtained at 100 mg/L PANI/GO and control treatments, respectively. Furthermore, the highest (421.6) and the lowest (162.8) SVI were calculated at 200 and 800 mg/L of the aforesaid nanocomposite treatments. The mechanisms by which carbon nanomaterials facilitate seed germination are not fully understood yet. However, it has been suggested that they can penetrate seed coats and create new pores, which subsequently allow the entry of water, oxygen, nutrients and external molecules in the germinating seeds.

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**STUDY ON RELATIONSHIP BETWEEN PHENOLOGICAL TRAITS WITH  
GRAIN YIELD AND ESSENTIAL OIL YIELD OF ANISE *PIMPINELLA ANISUM* L.  
IN ZANJAN CONDITIONS**

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Medicinal plants consider as a rich resources of ingredients which can be used in drug development, synthesis, biological functions and source of nutrition. *Pimpinella anisum* L., a plant belonging to the Umbelliferae family, is one of the oldest medicinal plants. It is an annual grassy herb with 30–50 cm high, white flowers, and small green to yellow seeds, which grows in the Eastern Mediterranean Region, West Asia, the Middle East, Mexico, Egypt, and Spain. Fruits of anise are used in medicine as carminative, appetizers, sedative, a mild expectorant, a treat dyspeptic complaints, and used in the food industry and agents to increase milk secretion. They are also used as bactericidal, virucidal, fungicidal, antiparasitical, antiinsecticidal, beside their cosmetic applications. Anise fruits known also as aniseed contain 1.5-5.0% essential oil with trans-anethole, a phenylpropanoid, as predominant component. In addition, the essential oil of the anise fruits contains also small quantity of estragol, anisaldehyde,  $\gamma$ -himachalene and *cis*-anethole. Fruit and essential oil yields are the main target for anise plants, so they are the approach of the scientific research for intensification and development quality and quantity. The yield may noticeably vary depending on ecological conditions such as temperature, precipitation and soil fertility. The world production of anise essential oil amounts to 40-50 tons per annum and Russia, Spain and Poland are among the largest producers of anise oil. There is no distillation of anise oil and no production of *trans*-anethol in many of the countries which cultivate the crop. In this study 12 iranian anise populations from different regions of Iran, were evaluated in a randomized complete block design with three replications at the research farm of the agricultural faculty, University of Zanjan (36°41' N longitude, 48°27' E latitude, and 1620 m in elevation) in 2014 and 2015. The traits consisted of days to flowering, days to maturity, grain filling period, grain yield and essential oil yield. After harvest, the essential oil of seeds extracted by Clevenger (hydro-distillation) according to the method recommended by European pharmacopoeia. Combined analysis of variance for traits showed the significant differences among the evaluated populations in all traits. The highest grain yield and essential oil yield was in Markazi, Hamedan, Kermanshah and Isfahan populations. All phenological traits had positive correlation with yield and essential oil yield. Grain yield had positive and significant correlation with days to maturity, also essential oil yield had positive and significant with days to maturity and grain filling period.

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**COMPARATIVE STUDY OF MEDICINAL PLANTS PACKAGING IN IRAN  
AND OTHER COUNTRIES**

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From ancient times medicinal plants were used in Iran. Packaging has an important role in marketing products. Export of medicinal herbs provides a low income due to the lack of sufficient attention to the packaging. There are some reports of second packaging in the foreign countries with higher profit for those countries. Iran's in world trade of medicinal herbs is about 2%. Nowadays large medicinal companies of the world do huge investment on packaging and product appearance. Medicinal plants of Iran with proper packaging and appearance could produce wealth and in resistive economy could be considered. Successful trade of medicinal plants requires proper packaging based on plant material which can simultaneously attracts buyers by its aesthetics and gives the sufficient information. In medicinal packaging medicine type and the way it is used is considered. The proper and correct figures are emphasized. In present study packaging of medicinal herbs of Iran is compared with some other countries from the graphic and aesthetics points of view. Strengths and weaknesses of each are discussed.

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## ETHNOBOTANICAL STUDY OF GOLPAYEGAN COUNTY ISFAHAN PROVINCE

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Traditional medicine was in relation with popular culture from ancient times and this information is transferred from generation to generation. Iran has a long history in medicinal plants and traditional medicine too. The purpose of ethnobotany is identification of medicinal and valuable plants from different ethnic groups and geographic regions of the country. Over generations, a substantial portion of indigenous knowledge in this field is declining. In addition, careless harvesting of medicinal plants especially in some regions put most valuable plants in danger of extinction. Therefore, study, identification, protection and preservation of medicinal plant species and systematic use from nature, is the most important step in protecting plant species. In this study, Ethnobotany of Golpayegan County was investigated. Gathering information was done through designed questionnaires from domestic residents aged 33-95 years old. Plants were gathered in different seasons during 2015-2016 and identified with different references. Our study showed that 47 species belonging to 21 families has been frequently used in this region. The most and least frequently parts of plants are leaf and shoot respectively. Asteraceae and Lamiaceae are the most and Thymelaeaceae and Zygophyllaceae are the least locally used families. The highest application of studied species was reported for healing digestive system disorder and infections.

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**FLORISTIC STUDY OF MEDICINAL PLANTS IN CHIN AND GELAL REGIONS  
FROM KOHGILOUYEH VA BOYER-AHMAD PROVINCE**

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Chin and Gelal regions with 1450-2800 m above sea level are located 120 km from north-west of Yasouj in Kohgilouyeh va Boyer-Ahmad province at longitude 50° 42' E, latitude 30° 57' N and longitude 50° 55' E, latitude 31° 0' N, respectively. The aim of this research was to assess the floristic spectrum, chorology analysis and life forms varieties of medicinal plants from Chin and Gelal regions. All specimens were collected during 2015-2016 and studied using known taxonomic methods. The life forms and chorological distribution of each plant species were assessed using Raunkiaer's method and Zohary's classification. Based on the results, a total of 200 species, 96 genera and 56 families were identified in both regions. Moreover, the highest number of genus and species belonged to families such as Brassicaceae, Fabaceae, Asteraceae, Lamiaceae and Apiaceae. It is remarkable that 62 medicinal plants were determined including *Eryngium billardieri* Delile (Apiaceae), *Smyrniium cordifolium* Boiss. (Apiaceae), *Prangos ferulacea* (L.) Lindl. (Apiaceae), *Echinophora cinerea* (Boiss.) Hedge and Lamond (Apiaceae), *Arnebia hispidissima* (Lehm.) Dc. (Boraginaceae), *Conyza Canadensis* (L.) Cronquist (Asteraceae), *Tanacetum polycephalum* Sch.Bip. (Asteraceae), *Helichrysum oligocephalum* Moore (Asteraceae), *Daphne mucronata* Royle (Thymelaeaceae), *Alyssum simplex* Rudolph (Brassicaceae), *Neslia paniculata* (L.) Desv. (Brassicaceae), *Hypericum scabrum* L. (Hypericaceae), *Ebenus stellata* Boiss. (Fabaceae), *Astragalus cephalantus* Dc. (Fabaceae), *Verbascum songaricum* Schrenk (Scrophulariaceae), *Muscari neglectum* Guss. ex Ten. (Liliaceae) and *Allium jesdianum* Boiss. and Buhse (Alliaceae). In addition, different life forms were recognized containing hemicryptophyte (53%; the overwintering buds of perennial plants located at the soil surface), therophyte (16%; the plants which survive unfavorable seasons in the form of seeds), chamaephyte (10%; the resting buds of woody plants are near the ground), geophyte (8%; a perennial plant with an underground food storage organ), phanerophyte (8%; the buds of perennial plants are above the surface of the ground) and cryptophyte (5%; the buds of perennial plants are below the soil or water surface). In terms of chorological purpose, Irano-Touranian (80%), Mediterranean (11%), Euro-Siberian (6%) and Saharo-Sindian (3%) elements were identified. The results of this research indicate extensive medicinal vegetation biodiversity in the Chin and Gelal regions which needs to protect the seed plants in the area.

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**ANALGESIC AND ANTI-INFLAMMATORY EFFECTS OF THE ESSENTIAL OIL FROM *ARTEMISIA SIEBERI* FRUIT IN MICE AND RATS**

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Inflammation and pain are caused by many diseases. For this reason and many side effects of non-herbal drugs, it seems to be necessary to do more researches on anti-inflammatory and analgesic effects of plants. The *Artemisia* genus (*Asteraceae*) is represented by 34 species in Iran. *A.sieberi* grows wild in different regions of Iran and grows in desert and semi-desert climate and has nutritional value for animals and also medicinal properties for humans. Regarding the medical use of *A.sieberi* fruit as a natural painkiller and anti-inflammatory agent, and high content of essential oil in the fruit, we studied the analgesic and anti-inflammatory activities of *A.sieberi* fruit oil. The essential oil from *A.sieberi* fruit was extracted by Clevenger apparatus and hydrodistillation method. The analgesic and anti-inflammatory activities of the oil were studied by formalin and carrageenan tests respectively at the doses of 200, 400 and 800 mg/kg for the experimental groups. Control group received sweet almond oil as the vehicle of essential oil. Standard groups received 2mg/kg morphine for formalin test and 5mg/kg Indomethacin for carrageenan test. Comparisons between the groups were carried out using one-way analysis of variance (ANOVA), and post hoc tukey test. The chronic phase of formalin test showed significant effect at all doses ( $p < 0.05$ ), but the maximum effect was observed at the dose of 800 mg/kg ( $p < 0.001$ ). In carrageenan test all the doses of *A.sieberi* significantly reduced the inflammation ( $p < 0.05$ ). There was no significant difference between effects of all doses. The anti-inflammatory effect of the oil in all doses was compared to Indomethacin. *A.sieberi* fruit essential oil showed anti-inflammatory effect which might be attributed to camphor and 1,8-cineole as major components.

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**EFFECT OF ZINC NUTRITION AND IRRIGATION ON GROWTH AND YIELD  
OF ESSENTIAL OIL *SALVIA OFFICINALIS* L.**

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To study the effect of irrigation and zinc nutrition on yield and essential oil production of (*Salvia officinalis* L.), a field experiment was conducted at College of Agriculture, Islamic Azad University of Khoy during spring of 2013. The experiment was conducted as a factorial based on complete randomized block design with four replications. The effects of zinc nutrition in four levels including 0 (control), 2.5, 5, 10 mg/kg ( $ZnSO_4$ ) and irrigation in four levels including 100, 80, 60, 40 % (FC) were investigated. The results showed that zinc spraying on the height, number of branches, number of leaves, number of internodes, fresh and dry weight, and percentage of essential oil was significant ( $p \leq 0.01$ ). The results also showed that the effect of irrigation on plant height, number of leaves, stem diameter, fresh weight and dry weight were significantly ( $p \leq 1\%$ ). The highest oil yield (20.91 kg/ha) were obtained with 100% humidity. Zinc Spraying and watering on only the main stem diameter and plant height was significant ( $p \leq 0.05$ ). The highest essential oil yield (15.81) was obtained in of 2.5 mg/kg ( $ZnSO_4$ ). Recommended to increase the essential oil yield used 100% humidity and 2.5 mg/kg ( $ZnSO_4$ ) in (*Salvia officinalis* L.).

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**EFFECT OF PUTRESCINE AND GAMMA IRRADIATION ON  
MORPHOLOGICAL CHARACTERISTICS OF  
*CHATHARANTHUS ROSEUS* PLANTS**

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*Catharanthus roseus* has been considered as an important medicinal plant belong to the family Apocynaceae. In this study, the effect of putrescine (50mM) and gamma irradiation (60Gy) on morphological characteristics were investigated in in-vitro cultured plants. Root and stem lengths, leaf surface and fresh leaf weight, were evaluated in four groups including control, 60 gamma radiation, putrescine and 60 gamma radiation + 50mM putrescine. Morphological traits showed significant difference between putrescine and control as well as putrescine+60Gy gamma radiation treatment and control samples ( $p < 0.05$ ). The average weight of fresh leaves and leaf surface of plants treated with putrescine + gamma irradiation were increased. The average of root and stem lengths in putrescine treated plants compared to other groups, showed significance increase ( $p < 0.05$ ). Based on our findings, putrescine and gamma radiation may cause morphological changes in regenerated *C. roseus* plants.

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**CARVACROL AS A POSSIBLE AGENT FOR ATTENUATING LEFT VENTRICULAR HYPERTROPHY: IN-VITRO STUDY IN H9C2 CELL LINE**

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Cardiac hypertrophy is the most important risk factor for heart failure. This study aimed at investigating the effect of Carvacrol, or cymophenol, C<sub>6</sub>H<sub>3</sub>CH<sub>3</sub>, a monoterpenoid phenol isomeric which is present in essential oil of genera *Origanum*, *Thymus*, *Coridothymus*, *Thymbra*, *Satureja* and *Lippia*, on angiotensin II (Ang II)-induced hypertrophy in H<sub>9</sub>C<sub>2</sub> cardiomyoblasts. The H<sub>9</sub>C<sub>2</sub> cardiomyoblasts were cultured in DMEM and treated with different concentration of carvacrol (Car) (100, 50, 25, 10, 5, 2.5, 1, 0.1, 0.01 μmol/l) for 24 h. The cell viability was evaluated using MTT test. Based on the results of MTT, cells pretreated with 0.01, 0.1 and 1 μmol/l of carvacrol were used to evaluate its preventive effect on cardiac hypertrophy. To promote hypertrophy the cells were treated with Ang II (1 μM, for 24 h). Cell size was measured using Crystal Violet staining. Gene expression of atrial natriuretic peptide (ANP) and brain natriuretic peptide (BNP) was evaluated by real-time RT-PCR technique. In H<sub>9</sub>C<sub>2</sub> cells, which were treated with 0.01, 0.1 and 1 μM of carvacrol, cell viability was more than 90%. Cell size analysis revealed that in Ang group, cell size increased by 38±10.5% in comparison with control cells (P<0.001). A significant decrease in cell size was observed when hypertrophied cells were treated with 0.01, 0.1 and 1 μM of Carvacrol (P<0.001, P<0.001 and P<0.05 vs. Ang group, respectively). Regarding the transcription of ANP and BNP as the genetic markers of hypertrophy, it has been shown that Ang II increased ANP mRNA level to 65.5 ± 10.5% (P<0.001 vs. Ctl). In Car-0.01+Ang and Car-0.1+Ang groups ANP mRNA levels were increased by 16±1% and 25±6% ± 6%, respectively which shows a significant difference in comparison with Ang group (P<0.01 and P<0.05 respectively). BNP transcription level was also notably increased in Ang group (P<0.01, vs. Ctl), whereas it did not significantly change among carvacrol-treated groups. In summary, our findings demonstrated that Carvacrol decreases hypertrophy markers including cell size and ANP mRNA level in response to Ang II-induced hypertrophy in H<sub>9</sub>C<sub>2</sub> cells. Consequently, due to the anti-hypertrophic effects of Carvacrol, it could be considered as a therapeutic target in treating cardiac hypertrophy.

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## INTRODUCTION AND IDENTIFICATION OF MEDICINAL PLANTS OF NORTH OF ZARGHAN REGION IN FARS PROVINCE

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Historically, plants have a great importance in the development of human societies. Due to the role of medicinal plants in providing hygiene and human health it has been under the attention of human being. Because of side effects of chemical drugs and negative effects of chemical environmental pollutions on human health nowadays, the use of medicinal plants and natural products in general have a special place in drug industries and modern medicine. In this research, the vegetation of Zarghan was investigated. Sampling was done from 14 locations. The plants were collected by survey and field work method, and all the necessary information were recorded in a notebook. Afterwards, all of the selected plants were pressed over the standard cardboard. By the help of key characteristics, the families of plants were recognized and by the help of other characteristics their genus and species were identified. In this study Latin and Persian references were used. Totally 52 species of medicinal plants were identified which classified in 25 families. The most prevalent species were belong to Asteraceae, Fabaceae, Lamiaceae and Brassicaceae families. Some species such as *astragalus* sp., *Lepidium* sp. and *Plantago* sp. were the most frequent medicinal plants in the region. Dicotyledonous plants were the dominant species. However, native people prefer using medicinal species such as *Descurainia Sophia*, *Cichorium intybus*, *Fumaria officinalis*, *Plantago lanceolata* and *Plantago major* more than other medicinal plant species.

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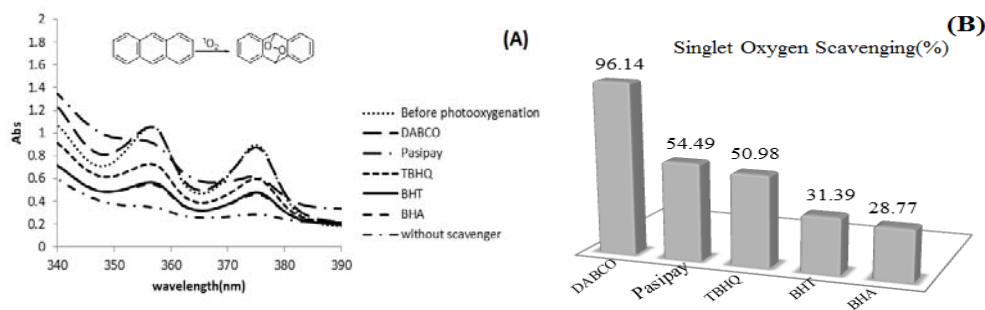


SCAVENGING EFFECT OF PASIPAY PASSIFLORA INCARNATA L. ON  
SINGLET OXYGEN GENERATION AND FATTY ACID PHOTOOXYGENATION

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Light energy, however, particularly in combination with oxygen, can be very harmful, causing damage to cells and tissues via singlet oxygen ( $^1\text{O}_2$ ) and oxidizing a broad types of biological targets. Anthracene as a chemical probe is usually used to trap the singlet oxygen and then detection and quantification can be based on absorbance. In this study oxidation of anthracene declared that rate of singlet oxygen quenching in the presence of Pasipay (passiflora incarnata L.) as a natural antioxidant, 1,4 Diazabicyclo [ 2.2.2] octane (DABCO) as a well-known singlet oxygen scavenger and highly effective chemical antioxidant such as Butylated hydroxytoluene (BHT), Butylated hydroxyanisole (BHA), tert-Butylhydroquinone (TBHQ) decreased in the order DABCO > PASIPAY > TBHQ > BHT > BHA. On the other hand Lipid photooxidation is the undesirable chemical process in which singlet oxygen result in the peroxidation of fatty acids. The results of this study also showed that fatty acid oxidation with singlet oxygen in the presence of Pasipay considerably diminished which shows Pasipay has an efficient role on Lipid peroxidation .



**Fig1.**Uv-vis spectra of anthracene photooxygenation with singlet oxygen in presence on different kind of singlet oxygen scavenger ( $\lambda_{\text{max}}=375$  nm ) after 5 min irradiation with air (1 atm) and 288 power LED lamps, 1 W, 2.3 V (59660LUX) (A), The scavenging capacity of different kind of singlet oxygen scavenger after 5 min irradiation with air (1 atm ) and 288 power LED lamps, 1 W,2.3 V(59660 LUX) (B).

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## ECOLOGICAL STUDY OF THREE ENDEMIC SPECIES OF NEPETA

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In this study, ecological factor of three species of exclusive medicinal plants as *Nepeta prostrata*, *Nepeta cephalotes*, *Nepeta gloeocephala* is studied. This genus is from Lamiaceae family, some of the species used in the food and pharmaceutical industries. In order to implement this project, the plant species from *Nepeta* genus were identified and isohyetal, the temperature, slope, soil and topography of their habitate were studied. Then, referring to natural habitats, ecological characteristics, including soil texture, evaporation, climate type, average annual precipitation, annual temperature, slope, aspect, elevation, points of distribution, cover percentage, the best site in terms of frequency and intensity, the dominant vegetation communities, vegetation types of the plants were examined. Research shows that these species habitates are ultracold and cold, and need wet and humid climate. *Nepeta cephalote* was found in mountainous areas and dry slopes, On slopes of 30 - 60% and between prickly species, in the shelter and need high humidity. *Nepeta gloeocephala* species is between pebble dirt and rocky slopes, at an altitude above 2000 m can be seen. *Nepeta prostrata* species was found in semi-desert areas in Irano turanian region.

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## THE PROBABLE MISTAKES IN COMMON MEDICINAL PLANTS BOTANICAL DIAGNOSIS WHICH PRESENTED IN MEDICINAL HERBS STORES

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Using the correct plant genus that confirmed in the valid medicinal plants Pharmacopeia with defined medicinal actions is the first main step to start using them in an accurate way to be healthy. In the present study, botanical diagnosis of the presented genus in the medicinal plants sellers in Shiraz city was studied. First of all, *Bassia eriophora* that is not a common medicinal genus, no distinctive research was found on this special species. In some stores, *Bassia* sold instead of *Teucrium polium* that is common in folk medicine from ancient times to cure various gastrointestinal problems and many other remedies. Another more consumed medicinal plant is *Mellisa officinalis* that used for its medicinal and aromatic purposes from the past up until now, but our research showed that in some cases by mistake *Stachys inflata* sold instead of *Mellisa officinalis*. Another plant that is sold a lot named, *Caccinia kotschyi*, that there is no professional and clinical research on this plant so maybe it has some side effects that is not denote yet. The main reasons of these errors are low ability of native collectors to identify right genera, low knowledge of sellers and high apparent similarity of many genera and species. Above all, an easy-use scientific standard is needed available for everyone who is in touch with medicinal plants and folk medicine. Careful identification by professional herbalists would solve most of these basic problems.

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**THE EVALUATION OF CATALASE AND PEROXIDASE ACTIVITY IN  
YOUNG AND OLD LEAVES AND TEA FLOWERS**

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The origin of tea plants *Camellia sinensis* L. is in the south China and nowadays tea is a well-known source of biological and pharmacological plants which are beneficial for human health. Catalase EC: 1.11.1.6 and peroxidase EC:1.11.1.7 are from oxidoreductase family. Catalase and peroxidase catalyze H<sub>2</sub>O<sub>2</sub> and prohibits the oxidation and demolition activity of H<sub>2</sub>O<sub>2</sub> in nature cells. Such characteristics of the two enzymes have extra applications in different industrial fields such as, food industry, medicine, cosmetic, sanitary, textile, etc. In this study, the evaluation of catalase and peroxidase enzymes' activity in old and young leaves, and tea flowers were examined. The two enzymes were assayed from different parts of the tea plants (young and old leaves and flowers), with the phosphate buffer of 0.1 M in pH of 7.2. Studying about catalase and peroxidase activity from tea plants at different pH values, i.e. 3 to 12, suggested that catalase enzyme has two optimum pH values of 7 and 10, and peroxidase enzyme has two optimum pH values of 5 and 8. This could be due to the fact that both enzymes have two iso-enzymes in tea plants. More comprehensive study on the effect of temperature on catalase activity illustrated that optimum temperature activity of catalase was in 35°C and 30°C (at optimum pH 7 and 10 respectively). Optimum temperature activity of peroxidase was in 40°C (in both optimum pH 5 and 8). In this research study, the evaluation of catalase and peroxidase activity was performed based on unit/mg protein. Results showed that catalase and peroxidase activity in the optimum pH value and temperature was more than that of the temperature when was not in its optimum value. Likewise, enzymes' activity in both iso-enzymes, in young leaves was more than that of the old leaves and flowers.

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## THE COMPARISON BETWEEN BIOCHEMICAL CHARACTERISTICS OF CATALASE ACTIVITY IN TEA, ALOEVERA AND ROSEMARY PLANTS

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Tea *Camellia sinensis* L. is one of the most widely consumed beverages, and its medicinal properties have been widely explored. The Aloe vera plant *Aloe vera* L. has been known and used for centuries for its health, beauty, medicinal and skin care properties. *Rosmarinus officinalis* L. known as rosemary, widely used in folk medicine, cosmetics, phytocosmetics and food flavor products. Catalase EC:1.11.1.6 is an antioxidant enzyme that decomposes H<sub>2</sub>O<sub>2</sub> into water and O<sub>2</sub>. Catalase exists to almost all living aerobic organisms which is the first defensive line to protect against the oxidative stress. Catalase activity was performed spectrophotometrically for the crude extract by monitoring the decrease in A<sub>240</sub> as a result of elimination of H<sub>2</sub>O<sub>2</sub>. Studying about catalase activity from the tea and the aloe vera plants at different pH values, i.e. 3 to 12, suggested that catalase enzyme has two optimum pH values of 7 and 10 in tea, 7 and 9 in aloe vera plants. This could be due to the fact that catalase has two iso-enzymes in tea plants and aloe vera both. On the other hand, catalase had just only 1 optimum pH in rosemary plants (pH optimum 7). Further study on the effect of temperature on catalase activity revealed that optimum temperature activity was in 35 and 30C (in tea plants for optimum pH 7 and 10 respectively and in aloe vera for optimum pH 7 and 9 respectively). Optimum temperature activity of catalase in rosemary was in 25°C at optimum pH7. electrophoresis results would have confirming kinetics studies. In this way, specific staining of catalase enzyme showed 2 separate bands in tea and aloe vera plants. As a result, pH profile and optimum temperature activity of catalase in tea and aloe vera are almost the same. By contrast, catalase activity in rosemary had only just 1 optimum pH. Overall, the evidence demonstrates that the number of iso-enzymes in tea and aloe vera plants are more than rosemary. Regarding pH profile and optimum temperature, catalase antioxidant activity in tea plants and aloe vera is much more than rosemary. Consequently, tea and aloe vera are more suitable for catalase extraction with the aim of Industrial and health benefits.

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**WITHANIA COAGULANS EXTRACT INDUCES CELL APOPTOSIS AND  
INHIBITS COX-2 EXPRESSION IN A RAT MODEL OF  
BENIGN PROSTATIC HYPERPLASIA**

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Phytotherapy is a popular treatment option in cases of benign prostatic hyperplasia (BPH), with many different herbal products being used for the treatment of this condition. *Withania coagulans* (WC) is an herbal medicine that has shown anti-tumoral, anti-inflammatory, and antioxidant effects. This study examined the effect of *Withania coagulans* extract (WCE) on prostatic cell apoptosis and cyclooxygenase-2 (COX-2) expression in cases of benign prostatic hyperplasia (BPH) in rats. Forty Wistar rats were equally divided into five groups: control, sham, BPH, BPH+WCE, and BPH+CLX (celecoxib) as a positive control group. The induction of BPH was achieved via the subcutaneous injection of 3 mg/kg of testosterone propionate (TP) daily for 28 days. The animal received WCE, celecoxib, or distilled water by oral gavage accompanied by the TP injection. After four weeks, the prostate glands of the rats were weighed to measure the prostatic index (PI). The ventral lobes of the prostates were dissected and processed with paraffin blocks in order to study the number of mast cells. ATUNEL analysis was performed to evaluate the cell apoptosis, while the expression of COX-2 was examined using immunohistochemistry. BPH was obvious in the ventral lobe of the prostate, and the administration of WCE markedly decreased the PI and the number of mast cells ( $P < 0.001$ ) in the BPH rats. Additionally, the WCE treatment induced prostatic cell apoptosis when compared to the BPH group. Furthermore, following the WCE treatment, the expression of COX-2 in the prostatic tissues was significantly decreased when compared to the BPH groups. According to the results of this study, WCE was effective in the treatment of BPH in rats. It may therefore have beneficial effects in the treatment of patients with BPH.



**ANTIBACTERIAL EFFECT OF ALCOHOLIC EXTRACT OF  
*CALENDULA OFFICINALIS* VAR. *NANA* APRICOT FROM VARAMIN ON  
GROWTH OF *BACILLUS ANTHRACIS* AND *B. CEREUS*.**

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Calendula is a herbaceous plant annual and from family Asteraceae. this plant is a medicinal plant and antimicrobial effects of calendula is proven in the past. In this project alcoholic extraction of calendula were extracted by maceration method and thickened vilution of the extract were prepared and their antimicrobial effect on the bacteria Bacillus anthracis and B.Cereus was evaluated by well diffusion method and inhibition zone with the inhibition of specific antibiotics (each of the strains) were compared. The effective dilution of the extract was used to obtain the amount of MIC. The maximum inhibition at concentration of 1000 mg/ml was observed in dilution 1000mg/ml. Interstingly enough, the inhibitory effect of extract on B.anthraxis was more than of B.Cereus. MIC after 24 hour culture for *B.anthraxis*, *B.Cereus* respectively was 125 and 250 mg/ml.

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## BOTANICAL SOURCES FOR MULTIPLE SCLEROSIS-LIKE DISORDERS IN TRADITIONAL PERSIAN MEDICINE (TPM)

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Among various neurological disorders, Multiple sclerosis (MS) is often recognized as an expanding global immune-related inflammatory disease with complexity of etiologies. On the other hand, there is an increasing demand toward the use and administration of natural medicaments for this disorder. TPM is a school of medicine and a medicinal plants-based resource for various clinical studies from standpoints of Persian scholars. Accordingly, current investigation aimed to gather and study the effectiveness of all medicinal plants from most popular Persian Pharmacopeias. Five main Persian Pharmacopeias as *Kitab al-hawi fi al-tibb* (9<sup>th</sup> -10<sup>th</sup> centuries A.D.), Canon of Medicine (10<sup>th</sup> -11<sup>th</sup>), *Ikhtiyarat-i Badii* (14<sup>th</sup>), *Tuhfat al-mu'minin* (17<sup>th</sup>) and *Makhzan al-adviyah* (18<sup>th</sup>) were studied to filter related plants for this disorder. Also PubMed and Scopus databases were checked to derive the relevant mechanisms and activities for each plant. *Khaddar* (numbness), *Esterkhā* (Palsy) and *Fālej* (hemiplegia, paraplegia, and quadriplegia) are traditional definitions which are clinically close to what is known as MS in today's medicine. In all, 118 medicinal plants, related to 65 families, were authenticated out of 157 filtered medicaments. Apiaceae was the most frequent family (13 reports). Fruits and roots of plants were the most reported botanical parts (34 and 32 items). Employed routes of administration were topical, oral or a combination of those (27, 57 and 34 sequentially). Fifteen medicines were reported for *Khaddar*, *Esterkha* and *Falej*, simultaneously. Antioxidant and lipid peroxidation inhibition activities, immunomodulatory and anti-inflammatory properties of medicines are known as some main related mechanisms to manage MS. These functions were respectively possessed by 81%, 36% and 48% of the studied plants. 21 of all medicinal plants possessed all of those activities, via related assays and animal studies. Hence, conducting adducible clinical trials and highly approved experimental tests in an accepted experimental model (experimental autoimmune encephalomyelitis  $\approx$  EAE) of MS, may lead to novel drugs with lesser undesirable and much more therapeutic effects on controlling MS.

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**CYTOTOXIC SCREENING OF *ECHINOMETRA MATHAEI* EXTRACT FROM THE PERSIANGULF**

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There are various animals and plants growing in the sea and oceans which are rich sources of natural drugs. *Echinometra* (Sea Urchin) is one of the animal genus which is found in the Persian Gulf and Oman Sea. There are reports on antibacterial, antioxidant, antidiabetic and anti-inflammatory activities of *Echinometra mathaei*. In continuous investigations of biological activities of *E. mathaei* we decided to study the *E. mathaei* extract cytotoxicity on HeLa cell line. In this experimental study, *E. mathaei* was collected from Persian Gulf. The animal was cut into pieces, dried by freeze drier and extracted with EtOAc-MeOH (1:1). After solvent evaporation, the cytotoxicity of the extract was evaluated by MTT assay using HeLa cell line (cervix carcinoma). The cells were cultured in RPMI (Roswell Park Memorial Institute) medium and 10% FBS (Fetal Bovine Serum). Three concentrations of the extract were used and repeated for three times. Cell viability in MTT assays was calculated as a percentage of untreated cells (control value) by SPSS20 ( $P < 0.05$ ). The cytotoxicity value presented as IC<sub>50</sub> (the median growth inhibitory concentration) of the reagents compared to control. The cell viabilities for different concentrations of the extract (0.0015, 0.015, 0.15  $\mu\text{g/ml}$ ) on HeLa cell line, after 72 hours, were 108.81%, 97.35%, 74.77% respectively and IC<sub>50</sub> was calculated as 0.032  $\mu\text{g/ml}$ . A significant reduction ( $P = 0.028$ ) in cell viability of the dose of 0.15  $\mu\text{g/ml}$  was observed. Our study document the potential influence of *E. mathaei* extract against HeLa cell line. The intensity of HeLa cell density was decreased by increasing the concentration of extracts from 0.015  $\mu\text{g/ml}$  to 0.15  $\mu\text{g/ml}$ . This infers the existence of dose dependent properties of the extracts which was found effective. These results show that *E. mathaei* decreased cell viability in carcinoma.

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**EVALUATION THE EFFICACY OF LEUCOREX IN TREATMENT OF  
VAGINAL CANDIDIASIS IN MICE ANIMAL MODEL**

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Vulvovaginal candidiasis often is caused by *Candida albicans* in vagina that is associated with dermatitis in vulva. The prevalence of Vulvovaginal candidiasis and antifungal resistant *C. albicans* are high in Iran. Due to high resistant strains and the side effects related to antifungal treatments, scientists have been interested in treatment by plant essential oil. In this study, we evaluate the efficacy of leucorex (*Z. multiflora* essential oil 0.1%) in treatment of candidal vulvovaginitis in mice animal model. 50 Female mice C57BL/6 (6-8 weeks old) with average weight 23 g were used in this study. Six days before the infection of mice by *C. albicans* ATCC 10231, the mice were injected intraperitoneally by estradiol valerate and injection continued every other day. The mice were divided in five groups including A) leucorex, B) clotrimazole C) positive group (infected without treatment), D) negative groups (without treatment and infection) and E) placebo. The treatments were started on day 5 after the inoculation. The vaginal samples were removed by sterile swab on days 3, 5, 7, 11 and 15. The samples were diluted in normal saline and cultured on Sabouraud dextrose agar containing chloramphenicol and gentamicin. The vaginal samples were evaluated histopathologically. The results were statistically analyzed by SPSS software by independent t-test and one-Way Anova test. The results of log CFU/g for *C. albicans* in leucorex and clotrimazole showed significant reduction from starting time of treatment ( $p < 0.05$ ). The time of treatment was shorter in clotrimazole group than that of leucorex. Histopathological examinations showed no inflammation and mycelium growth in vagina of mice treated with clotrimazole or leucorex creams. There was no significant difference between placebo and positive group in term of logCFU/ml, inflammation score and mycellial growth ( $p > 0.05$ ). The results of our study showed the efficacy of leucorex in treatment of candidal vulvovaginitis as comparable to clotrimazole.

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**MORPHOLOGICAL DIVERSITY FROM FOUR *SCUTELLARIA* L. SPECIES  
(LAMIACEAE) IN CENTRAL ZAGROS, IRAN**

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*Scutellaria* L. genus is one of the most important medicinal genera belonging to Lamiaceae (family) and Scutellarioideae (Dumort.) Caruel (sub-family). This genus is represented by 22 species in Iran growing at north, west, south-west and center of this country. Due to the high morphological similarities, high polymorphism and inter-specific hybridization, species limit is unclear. Consequently, the study aims are to survey the taxonomic status and morphological diversity of *Scutellaria* species (Section *Lupularia*). For this purpose, 33 accessions of four *Scutellaria* species were collected from natural habitats of central Zagros. Then, 23 qualitative and 20 quantitative morphological characters were investigated using stereomicroscope Nikon and the data were analyzed with NTSYSpc. 2.2 software. The results of this research showed that *Sc. farsistanica* Rech. f. displayed close relationship to *Sc. tomentosa* Betrol. It is revealed that *Sc. farsistanica* with seven groups, *Sc. multicaulis* Boiss. with five groups and *Sc. nepetifolia* Benth. with four groups represented the greatest morphological diversity. It seems that there is a high percentage of hybridization and polymorphism in *Sc. multicaulis* and *Sc. farsistanica* accessions. The characters such as length of calyx teeth, the form of leaf, leaf base, leaf margin and leaf apex are discriminative characters for *Scutellaria* species. Moreover, indumentum of leaf, stem, calyx, calyx teeth and corolla exhibit high variations among *Scutellaria* species and their accessions. Different trichomes are also identified in *Scutellaria nepetifolia* including glandular, tomentose, granulate, lanate, strigose and pilose. Accordingly, the results of this research indicate the existence of biological reservoirs of *Scutellaria* genus in central Zagros.

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**ANTIFEEDANT ACTIVITY OF AQUEOUS AND HYDROALCOHOLIC  
EXTRACTS FROM *THUJA ORIENTALIS* ON RED FLOUR BEETLE**

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*Thuja orientalis* is an evergreen, monoecious trees used in various forms of traditional medicines in various ways. In this study, antifeedant activity of the aqueous and hydroalcoholic extracts from leaves of *Thuja orientalis* was tested against *Tribolium castaneum* (Herbst) adults. Flour disc bioassay was employed to assess the nutritional indices such as relative growth rate (RGR), relative consumption rate (RCR), efficiency of conversion of ingested food (ECI) and feeding deterrence index (FDI). Experiments were done in the dark, at  $27\pm 1^\circ\text{C}$  and  $60\pm 5\%$  R.H. Aliquots of 10  $\mu\text{l}$  of each extract several concentrations (0.25, 0.5, 0.75, 1.0, 1.5 and 2.0%) with control were spread evenly on the flour discs. The solvent was allowed to evaporate and then 10 adult insects were introduced into each treatment. After 72 h, nutritional indices of adults were calculated. One-way analysis of variance for comparing between different extract concentrations and General Linear Model (GLM) for comparing between different extracts with Duncan's multiple range tests ( $P < 0.05$ ) were used to determine differences between means. Also correlations between measured factors were calculated. Results indicated that RGR, RCR and ECI were significantly decreased in *T. castaneum* adults as extract concentrations increased. Both of plant extracts increased FDI as the extract concentration was increased. The difference between extracts and treatments was significant ( $P < 0.05$ ). There was significant positive correlations ( $P < 0.05$ ,  $r^2 > 0.9$ ) between RGR and RCR or ECI, also there was significant negative correlation between RGR and FDI. It was shown that hydroalcoholic extract from *T. orientalis* leaf had a strong effect on a feeding behavior and growth of this pest. With increases of concentration of aqueous extracts, the feeding deterrent index increased at the same rate, also the efficiency of conversion of ingested food has not decreased. The results indicated that the antifeedant effect of aqueous extracts was more than post-ingestive toxicity. While the hydroalcoholic extracts affect considerably both feeding deterrence and post-ingestive toxicity. In fact, the feeding deterrent agents contained in plant extract caused the reduction in growth rate of the insect pest. The results of the investigation would indicate a significant potential for this plant as a possible source of natural insecticide.

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**THE EFFECT OF DIFFERENT HORMONAL LEVELS AND EXPLANTS ON  
*FERULA GUMMOSA* BOISS. CALLUS INDUCTION**

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*Ferula gummosa* Boiss. as a valuable pharmaceutical and industrial plant which is endangered by extinction, grows in Iran naturally. Restricted propagation of this plant due to its monocarpic flowering behavior and also prolonged seed dormancy period leads to facing problems in its massive production. In order to minimize seed dormancy period and germination time, *in vitro* embryo culture, and also for maximizing the proliferation and micropropagation, callus induction were evaluated. The plantlet of the seed was separated after sterilization and cultured in the basal 1/2 MS medium. After 12 days, root, hypocotyl, cotyledon and leaf explants were prepared from proper and strong plantlets. Then they were transferred to the basal MS medium containing 0, 0.5, 1 and 2 mg l<sup>-1</sup> BA, 0, 1.5, 3, 4.5 mg l<sup>-1</sup> NAA and 0, 1.5, 3, 4.5 mg l<sup>-1</sup> 2,4 -D. Seedlings 2-3 days after locating in 1/2 MS medium germinated and whole plantlet was obtained after 12 days. In the callus induction phase hormone composition of NAA in 1.5 mg l<sup>-1</sup>, BA in 0.5 mg l<sup>-1</sup> and root explants had proper results. Consuming *in vitro* culture of embryo to accelerate germination and elimination of long dormancy period, utilizing variable culture mediums, different hormone levels and explants in the callus induction phase for producing strong and high quality calli, are strongly suggested for massive production of this plant so this valuable local plant may survive from extinction too.

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**INVESTIGATION OF ANTIBACTERIAL PROPERTIES OF *PEGANUM HARMALA*  
L. AGAINST GRAM POSITIVE AND NEGATIVE BACTERIA**

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In the past decade, the extraction of active principles of medicinal plants bearing antimicrobial properties with the aim of combating antibiotic-resistant bacteria received a great attention from the researchers. *Peganum harmala* L. as a medicinal plant includes phyto-chemical molecules such as quinazoline alkaloids, betacarboline alkaloids and flavonoids presenting in different fractions of seed, root and stem extract. These components are responsible to provide antibacterial, antiviral, antioxidant, anti-parasite and antitumor properties. This study aims to extract and characterize the principal components of *P. harmala*'s seed as well as determining its antimicrobial potential against both positive and negative gram bacteria. Two methods (cold press vs. solvent extraction) were performed to isolate the active principle of *p. harmala* and the extracts were studied through Fourier transform infrared spectroscopy (FTIR). Antibacterial tests carried out by means of well-diffusion method, minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) tests against *Escherichia coli* and *Staphylococcus aureus*. The major alkaloids of *P. harmala*'s seed extract were harmine and harmaline. The functional group of both two components, C=C, was determined by FT-IR by which conjugated aromatic rings, aromatic rings, and Substitution of the aromatic rings could be determined at wave numbers between 3400 to 650  $\text{cm}^{-1}$ . The diameter inhibition zone for harmin and harmaline against *E. coli* and *S. aureus* was 13.7 and 18.5 mm, respectively. MIC values were determined 750 and 380  $\mu\text{g}\cdot\text{ml}^{-1}$ , respectively. Acid-base extraction of *P. harmala*'s seeds alkaloids (harmin and harmaline) demonstrated antimicrobial impact on both gram positive and negative bacteria confirming the traditional use of the plant assuming antibacterial agent properties.

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**PARTHENOLIDE FINGERPRINTING IN DIFFERENT  
*TANACETUM PARTHENIUM* L. TISSUES**

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*Tanacetum parthenium* (feverfew) belonging to the family of *Asteraceae* has a long history of use for the treatment of migraine headaches and rheumatoid arthritis. Sesquiterpen lactone, parthenolide (PTL) is the most important component isolated from feverfew bearing several antitumor properties including inhibition of proliferation, apoptosis and has influence on the sensitivity of cancer cells to drugs. PTL content is different in diverse tissues, 1.38% (w/w) in flower head, 0.95% in leaves, 0.08% in stalks and 0.01% in roots. The aim of this study was to compare the infrared spectrum of PTL extracted from flowers, leaves and stems of *Tanacetum parthenium* when analyzed by Fourier transform infrared spectrophotometer (FTIR). Acidic/base extraction of PTL from various tissue was performed. KBr discs were prepared from 1 mg sample mixed with 150 mg of dried KBr for FTIR analysis. The result of infrared spectroscopy showed that PTL extracted from the leaves was not significantly different from PTL extracted from flowers. FTIR spectroscopic analysis provides a great potential to fingerprint either the presence of PTL in different tissues or its spatial structure.

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**IMPROVEMENT OF CAFFEIC ACID DERIVATIVES PRODUCTION BY  
CHITOSAN IN HAIRY ROOT CULTURE OF *ECHINACEA PURPUREA***

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Caffeic acid derivatives from *Echinacea purpurea*, including cichoric acid, caftaric acid, chlorogenic acid and caffeic acid, have the remarkable activities to inhibit the replication of hyaluronidase and improve human immunity. The aim of this research was to study the effect of chitosan as biotic elicitor on caffeic acid derivatives in hairy root culture of *E. purpurea*. Hairy roots were induced from 8 weeks old leaf explants by 15834 strain of *Agrobacterium rhizogenes*. Hairy roots were cultured in modified liquid MS medium (15:25 mM ammonium to nitrate ratio) for three weeks in dark, 25 °C and 100 rpm shaker incubator. After three weeks, different concentrations of chitosan (0 (control), 100, 200 and 300 mg/l) were added to medium and the roots were allowed to grow for a week in described condition. In the end of fourth week, caffeic acid derivatives were extracted from dried hairy roots powder and analyzed with HPLC. Also, dry and fresh weight of produced hairy roots biomass was recorded. Results showed that chitosan improved caffeic acid derivatives production in hairy roots. Highest amount of cichoric acid, caftaric acid, chlorogenic acid, caffeic acid, dry and fresh weight were observed in modified liquid MS medium containing 200 mg/l chitosan (26.78, 7.21, 3.10, 0.13 mg/g dry weight, 1.20 and 5.8 g/10 ml, respectively, in comparison to control: 15.45, 4.53, 1.32, 0.08 mg/g dry weight, 0.98 and 4.9 g/10 ml, respectively). There was significant difference between control and chitosan treatments and also among chitosan levels at  $P \leq 0.05$ . Present results indicated the effectiveness of chitosan elicitation on caffeic acid derivatives production in hairy root culture of *E. purpurea*.

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**EFFECTS OF POMEGRANATE PEEL EXTRACT ON PERFORMANCE AND IMMUNE RESPONSE OF BROILERS UNDER HEAT STRESS**

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The aim of this study was to investigate the effect of pomegranate peel extract on the performance and immune response of broilers under heat stress. A total of 176 day-old male Ross 308 broilers were allocated into 4 treatments of 4 replicates and 11 chicks each. The experiment were done in a completely randomized design for 42 days. Dietary treatments were included 0, 250, 450 and 650 mg pomegranate peel extract (PPE). Birds were fed in 3 dietary periods of starter (0-10 days), grower (11-24 days), and finisher (25-42 days). The daily cyclic heat stress (HS) were done from 28 until 42. In this period, temperature were daily increased from 21 to 37<sup>o</sup>C days for 7 hours. Data related to performance included weight gain, feed consumption and were periodically collected and FCR were calculated. To evaluate the immune response 1 ml of 15% suspension of sheep red blood cells (SRBC) were injected to vein of 3 chicks per treatment at 21 and 35 days. The results show that extract of pomegranate peel increased the body weight gain ( $P \leq 0.05$ ) with no significant effects on feed intake as compared to control. The PPE significantly decreased FCR in HS birds ( $P \leq 0.05$ ). Antibody titer against SRBC in broilers under heat stress received 450 mg of pomegranate peel extract showed a significant increase as compared to control. The immunoglobulin G and M titer against SRBC showed no significant difference among treatments ( $P \leq 0.05$ ). It is concluded that using of PPE in heat stressed bird diets may improve the performance and immune system.





**EVALUATE THE PERFORMANCE AND IMMUNE RESPONSE OF BROILERS  
REARED UNDER HEAT STRESS FED POMEGRANATE PEEL  
TREATED WITH UREA**

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The aim of this study was to investigate the effect of pomegranate peel treated with urea on performance and immune response of broilers reared under High ambient temperature. One hundred seventy six day-old male Ross 308 broilers were allocated into 4 treatments of 4 replicates and 11 chicks each. The experiment were done in a completely randomized design for 42 days. The dietary treatments were involved control group, 1.5, 3 and 5 urea treated pomegranate peel which was used from the beginning to the end of the experiment. A schedule contains three periods of starter (0-10 days), grower (11-24 days), and finisher (25-42 days) were applied. The daily cyclic heat stress (HS) were done from 28 until 42. In this period, temperature were daily increased from 21 to 37<sup>o</sup>C days for 7 hours. Data related to performance included weight gain, feed consumption and were periodically collected and FCR were calculated. To evaluate the immune response 1 ml of 15% suspension of sheep red blood cells (SRBC) were injected to vein of 3 chicks per treatment at 21 and 35 days. The results were shown that the using of 1.5 % of processed pomegranate peel in broiler diets improved the body weight gain during heat stress. Dietary treatments did not significant effects on feed consumption. The least feed conversion ratio was observed in chicks fed 5% pomegranate peel processed ( $P \leq 0.05$ ). Antibody titer against SRBC showed a significant increase in heat stressed broilers receiving 5 percent of processed pomegranate. The dietary treatments did not significantly affect the titer of immunoglobulin G and M against SRBC. It is concluded that urea treated pomegranate peel could be used in broilers that reared under heat stress condition up to 5 percent.



**ALBIZIA JULIBRESSIN GEL AS AN HERBAL REMEDY IN TREATMENT OF  
SECOND AND THIRD DEGREE BURNS**

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Burn incidence is suffering large numbers of populations annually. The promising treatment of burn has not been identified yet. *Albizia julibressin* (*A. julibressin*) in *Fabaceae* family is popular for its antiseptic activity. This prospective study was designed to compare the wound healing effects of *A. julibressin* gel (AG) with silver sulfadiazine. This single blind clinical trial was performed on 40 patients with second and third degree burns. 20 patients treated with silver sulfadiazine (SSD) + placebo and 20 other patients received SSD + AG. The percentage of the wound healing was evaluated with pain, irritation, edema, itching, erythema, purulent discharges and skin discoloration symptoms. Also, the patients' satisfactory and adverse drug reaction was determined. The severity of pain (0.032), inflammation (P= 0.019) and purulent secretions (0.027) were significantly relieved in SSD + AG group. The healing time was significantly reduced in second degree burns (P=0.028) and third degree burns (P=0.039) with treating by AG. No significant adverse drug reaction was detected during consuming AG. It seems that AG improves the different therapeutic aspects in burn injuries and could be considered as a new herbal remedy in wound healings.

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MORPHOLOGICAL DIVERSITY OF FIG *FICUS CARICA* L. ACCESSIONS  
IN WEST OF IRAN

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Iran due to the large area and very diverse climatic conditions is one of the important centers for distribution of many plant species. The fig (*Ficus carica* L.  $2n = 2x = 26$ ) is one of the oldest traditional crops in Mediterranean countries such as Iran and belongs to the family Moraceae. Fig fruit is valuable and energetic and have a lot of material including sugars, nitrogen, fats, minerals, amino acids, different enzymes and carotene. Because of the many medicinal properties and the importance of this plant, understanding the fig genetic variation is necessary. The present study was done to investigate the genetic diversity of 147 fig samples in west of Iran (133 wildgenotypes and 14 samples from 9 cultivars) using morphological characters. Samples were evaluated from 25 regions of Kermanshah, Kordestan and Ilam provinces. The studied genotypes were evaluated for 58 traits related to the trees, leave and fruit characteristics based on national guideline for the conduct of test for distinctness, uniformity and stability in fig (2008). A large variation was observed among the evaluated samples of fig for most of the traits. Secondary branches drooping, number of bark tubers, shape of central lobe, length of central lobe/length of lamina, little lateral lobes, shape of leaf without lobed, fruit shape, fruit weight, fruit neck length, fruit skin over color and fruit pulp cavity had higher coefficient of variation (CV) than other characters, indicating a high level of variation among these traits. Cluster analysis divided the genotypes into five groups. The similarities and differences among the studied genotypes and cultivars of fig in the west of Iran indicated that this region is a rich source with high genetic diversity for fig germplasm to release new cultivars.

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**CHEMICAL COMPONENTS AND ANTIMICROBIAL ACTIVITIES OF  
ESSENTIAL OILS OF *URTICADIOICA* AND *CALENDULA OFFICINALIS*  
AGAINST PATHOGENIC BACTERIA ISOLATED FROM HUMAN**

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Essential oils are commonly used to treat minor health problems. In this study the chemical compositions of *Urticadioica* and *Calendula officinalis* were determined by gas chromatography and mass spectrometry. GC/MS analysis of *Urticadioica* resulted in phytol as the major oil component where as mentone exhibited as the most abundant constituent of *Calendula officinalis*. The antibacterial activities of these essential oils (Eos) against five gram negative bacteria, namely *Pseudomonas aeruginosa*, *Salmonella paratyphi (D)*, *Citrobacter*, *Enterobacter*, *Escherichia coli* and gram positive bacteria *Staphylococcus aureus coagulase* were investigated. Among the tested plants, *Urticadioica* showed higher activity against different bacteria, while *S. paratyphi* and *S. Aureus* were the most resistance bacteria. All the tested plant extracts possessed antimicrobial growth activities with MIC values ranging from 100 to 1509 L/mL. The results suggested that due to the potential antimicrobial activities of these essential oils they might be employed in food and pharmaceutical products.

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**EFFECTS OF *RUTA GRAVEOLENS* AQUEOUS EXTRACT ON HISTOCHEMICAL ALTERATIONS AND OVARY ULTRA-MICROSCOPIC CHANGES**

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*Ruta Graveolens* (RG) is traditionally used as contraceptive and occasionally for abortion induction in human being. More than 120 natural compounds mainly including acridone alkaloids, coumarines, essential oils, flavonoids, and furoquinolines have been found in the roots and aerial parts of this plant. There is relatively little known about its molecular and cellular mechanism of anti-fertility property. This study aimed to uncover some parts of its anti-fertility mechanism(s). Female healthy mice were divided into three groups of control (received nothing), control-sham (received only 0.2 ml saline normal) and RG -treated (received 300 mg/kg RG extract in 0.2 ml saline normal, orally). The animals were treated for 14 consecutive days. On days 17, 24 and 31 after start treatment, the ovaries were dissected out and oocytes were harvested. Histochemical and ultra microscopic studies were conducted on the ovary tissue. Histochemical staining including PAS, alkaline phosphatase and Sudan black to consider any metabolic disorder also were conducted. Histochemical examinations illustrated an accumulation of lipid and carbon hydrate in the cytoplasm of granulosa cells in the RG-treated animals. Alkaline phosphatase reaction was noticed in atretic follicles predominantly. The ultra microscopic studies revealed that RG-received animals showed apoptotic characters in entire ovarian tissue including granulosa cells. Generally, histochemical tests show that RG extract can cause metabolic disorders in follicles and ovarian tissue in mice. As well, ultra microscopic surveys indicate apoptotic changes and damage to the mitochondria and ovarian tissue that with passing time of extraction, structural and metabolic changes of follicles were reversible.

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**EFFECTS OF *RUTA GRAVEOLENS* AQUEOUS EXTRACT ON  
HISTOMORPHOMETRIC AND HISTOPATHOLOGIC ALTERATIONS  
ON MICE OVARY TISSUE**

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*Ruta Graveolens* (RG) has been used in various medical preparations for its anti-oxidant, anti-inflammatory, anti-tumour, anti-androgenic and anti-fertility properties. More than 120 natural compounds mainly including acridone alkaloids, coumarines, essential oils, flavonoids, and furoquinolines have been found in the roots and aerial parts of this plant. However, little is known about its anti-fertility property. This work aimed to study the anti-fertility properties of RG aqueous extract using histomorphometry method. Female healthy mice were divided into three groups of control (received nothing), control-sham (received only 0.2 ml saline normal) and RG -treated (received 300 mg/kg RG extract in 0.2 ml saline normal, orally). The animals were treated for 14 consecutive days. On days 17 (week 1), 24 (week 2) and 31 (week 3) after start treatment, the ovaries were dissected out and oocytes were harvested. Histomorphometric studies were conducted on the ovary tissue and the number of follicles was counted. Additionally, histopathologic examinations to evaluate the normal and atretic follicles were performed. We failed to find any remarkable differences in the number of primordial and primary follicles between the study groups, however, the secondary follicles were found to be increased in the RG-received animals, when compared to the control group. As well, present study showed that atretic follicles significantly increased in RG -treated groups. Our data suggest that aqueous extract of RG at 300 mg/kg dose level could exert a considerable negative impact on the structure of ovary. Moreover, corresponding animals showed abnormalities in the structure of ovary and follicles. The found negative impact returned approximately to normal condition in 14 days after administration.

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**SENSITIVITY OF CHLOROPHYLL FLUORESCENCE PARAMETERS TO WATER  
AND NUTRIENTS AVAILABILITY IN SAFFRON**

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Irrigation and nutrient supply are considered to be the two environmental inputs that contribute most to crop productivity. So far, the effects of fertilizer and irrigation management have been studied on saffron (*Crocus sativus* L.) growth and flowering, and it has been concluded that this crop responds positively to appropriate water and nutrients availability. However, the impacts of these factors on chlorophyll fluorescence parameters has not been investigated, previously. Therefore, in this study the effect of irrigation management (application of 3600 and 7200 m<sup>3</sup> ha<sup>-1</sup> water in intervals of 2 and 4 weeks, respectively) and fertilizer type (no-fertilizer, 30 ton ha<sup>-1</sup> cow manure and chemical fertilizer) was studied on the flower and stigma yield as well as minimum (F<sub>o</sub>), variable (F<sub>v</sub>) and maximum (F<sub>m</sub>) fluorescence and F<sub>v</sub>/F<sub>m</sub>, in saffron. In chemical fertilizer treatment used from 220, 150 and 100 kg.ha<sup>-1</sup> urea, super-phosphate and potassium sulfate, respectively. Results showed that F<sub>o</sub>, F<sub>m</sub>, F<sub>v</sub> and F<sub>v</sub>/F<sub>m</sub> in plants received 3600 m<sup>3</sup> ha<sup>-1</sup> water, were significantly higher than those received 7200 m<sup>3</sup> ha<sup>-1</sup>. In addition, both nutritional treatments reduced the value of F<sub>o</sub> and F<sub>m</sub>, but had no significant effect on F<sub>v</sub>/F<sub>m</sub>. The highest F<sub>m</sub> obtained at 4 weeks irrigation intervals and no-fertilizer application (460), while its lowest value obtained at 2 weeks irrigation intervals and cow manure treatment (284). Similar results were obtained for F<sub>o</sub>. In addition, in low-watered plants, application of manure (0.034) and chemical fertilizer (0.04) produced the more F<sub>v</sub>/F<sub>m</sub> than no-fertilizer treatment (0.027), but fertilizer application had no positive effect on this index in well-watered plants. These observations are in accordance with previous findings on winter wheat. Furthermore, the highest flower (24 g m<sup>-2</sup>) and pistil yield (0.56 g m<sup>-2</sup>) obtained in plants were treated with cow manure and received water in intervals of 4 weeks. Hence, lower water availability was not a limitation in the photosynthetic process of saffron, while its yield and photosynthetic characteristics exhibited positive responses to fertilizer supply. The appropriate saffron performance under lower water availability treatment is due to its special leaf and stomatal structure that leads to low water requirement especially during winter. Moreover, saffron fertilization particularly with organic manure, could increase soil fertility and structure, facilitate photosynthetic efficiency and consequently plant growth and yield.

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**THE EFFECT OF *POLYGONUM AVICULAR* HYDROALCOHOLIC EXTRACT  
ON LEARNING AND MEMORY IN A MODEL OF  
ALZHEIMER'S DISEASE IN THE RAT**

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Medicinal plants have gained more attention due to memory disorders such as Alzheimer's disease. With regard to the usage of *Polygonum avicular* in traditional medicine to enhance memory, this study aimed to assess the efficacy of this plant on learning and memory in male rats. The plants were collected from their natural habitats. After correct determination the voucher specimens were deposited in herbarium of medicinal plant institute with 7000-IMPH code number. The aerial parts of plant were dried in the shade and then finely powdered. In the next stage the methanolic extract was prepared using maceration method. 50 male Wistar rats were divided into 5 groups including control, streptozotocin (STZ) and three PA-treated groups with different doses of the extract of *Polygonum avicular* L. which received plant extract (200, 100, and 50 mg/kg, i.p.) for 3 weeks after induction of Alzheimer's disease by i.c.v. STZ. at a single dose of 3 mg/kg. Moreover, in order to evaluate learning and memory, initial (IL) and step-through latencies (STL) were determined at the end of study using passive avoidance test. According to results of this study, there was a significant improvement in STL at a dose of 200 mg/kg of the extract in STZ group as compared to untreated STZ one. Intraperitoneal injection of *Polygonum avicular* hydroalcoholic extract could enhance the capability of consolidation and recall in STZ model of Alzheimer's disease in the rat.

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**CORNELIAN CHERRY (CORNUS MAS) FRUIT DOES NOT AFFECT SERUM LIPOPROTEIN LIPASE, ADIPOSE TISSUE HORMONE SENSITIVE LIPASE AND HEPATIC PEROXISOME PROLIFERATOR-ACTIVATED RECEPTOR A LEVELS IN NORMAL RATS**

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Cornelian cherry fruit has been shown to be helpful in treating hyperlipidemia. Although its hypotriglyceridemic effect has been shown in humans with type2 diabetes [1], there is no study on possible effect of dietary consumption of this fruit on serum triglyceride (TG) levels as well as receptors and/or enzymes with regulatory role in TG metabolism. Lipoprotein lipase (LPL) has a pivotal role in lipid metabolism. It hydrolyzes TGs in lipoprotein particles and provides fatty acids for peripheral tissues. Serum level of preheparin LPL reflects LPL production mainly in adipocytes and correlates negatively with serum TG and positively with high-density lipoprotein-cholesterol (HDL-C). Peroxisome proliferator-activated receptor alpha (PPAR $\alpha$ ) is highly expressed in liver and its activation is associated with increased hepatic lipid uptake and oxidation. Hormone sensitive lipase (HSL) is an intracellular lipase enzyme which is highly expressed in adipose tissue and is capable of hydrolyzing triacylglycerols, diacylglycerols, monoacylglycerols, and cholesteryl esters, as well as other lipid and water soluble substrates. This motivated us to investigate the effect of dietary cornelian cherry fruit dried powder (CCDP) on serum TGs and VLDL-c as well as serum LPL, adipose tissue HSL and hepatic PPAR $\alpha$  levels in normal rats in a short term-repeated dose study. To this end 16 male adult Wistar rats were randomly allocated into two equal groups and treated as follows for 4 weeks: 1. control rats: normal rats, basic diet and 2. Rats that received 1g/100g BW of CCDP in diet. At the end of the experiment, no significant change was observed in serum TGs and VLDL-c concentration between two groups, moreover serum LPL, adipose tissue HSL and hepatic PPAR $\alpha$  levels were statistically the same between two groups. In conclusion short term consumption of CCDP is not associated with a significant change in serum TGs nor selected receptors or enzymes involved in its metabolism in normal rats.

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**ANTI-FUNGAL AND ANTI-ELASTASE ACTIVITY OF ZIZIPHORA  
ESSENTIAL OILS ON DERMATOPHYTE SPECIES**

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Treatment of dermatophytosis as a common superficial skin infection by essential oils instead of chemical antifungal agent is one of important issues in recent researches. In folk medicine, *Ziziphora* species have been used for treatment of infectious disease as antiseptic or disinfectant. The aim of our study was to evaluate the chemical composition of *Ziziphora clinopodioides* and *Z. tenuir* aerial parts essential oils by GC and GC-MS along with their antifungal effects against four strains of dermatophytes including *Trichophyton mentagrophytes*, *T. rubrum*, *Microsporum canis* and *M. gypseum*, by micro broth dilution assay and mycelium inhibition technique. The anti-elastase effects of essential oils were determined by porcine pancreatic elastase assays. 48 different compounds were identified in these essential oils which thymol, p-cymene, 1,8-cineole,  $\gamma$ -terpinene and (E)-caryophyllene were the major components. The anti-dermatophyte activities of essential oils were investigated. The mycelium inhibitory effects showed 150 ppm of essential oils inhibited 5-61% of dermatophytes mycelium growth, which *Z. clinopodioides* with inhibition percent of 28-61% showed better anti-dermatophyte activity than *Z. tenuir*. The MIC and MFC values were 0.01-0.25  $\mu$ l/ml and 0.01-0.5  $\mu$ l/ml, respectively. These essential oils also inhibited porcine pancreatic elastase dose dependently in the same manner up to 50% inhibitory in 0.5  $\mu$ l/ml of oil. Due to the anti-dermatophytes and anti-elastase effects of *Ziziphora* sp, it can be considered as natural antifungal agent for more clinical and pre-clinical trials.



**THE ANTI-DERMATOPHYTE AND ANTI- ELASTASE ACTIVITIES OF  
*THYMUS VULGARIS* ESSENTIAL OILS FROM THREE DIFFERENT  
GEOGRAPHICAL LOCATIONS**

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Dermatophytosis infections are common fungal infections of skin caused by *Microsporum*, *Trichophyton* and *Epidermophyton*. These infections have increased during the last decades in the different parts of the world. Emergence of drug resistant strains and adverse effects related to these drugs have interested the researcher to find the other new generation of drugs especially among the medicinal plants essential oils. The aim of our study was to evaluate the anti-dermatophyte and anti-elastase activities of *Thymus vulgaris* aerial parts essential oils from three different geographical regions of Iran (Kashan, Shahrood and Yazd). The essential oils were extracted by hydrodistillation method and the chemical composition of essential oils was determined by GC and GC-MS analysis. The antifungal activities were evaluated against *Trichophyton rubrum*, *T. mentagrophytes*, *T. schoenleinii*, *Microsporum gypseum*, and *M. canis* by micro broth dilution susceptibility test and mycelium inhibition technique. The anti-elastase activity of essential oils against elastase was assessed using porcine pancreatic elastase enzyme. Carvacrol (3.65-62.5%) and p-cymene (7.45-11.4%) were identified as the main components of *T. vulgaris* essential oils. The main constituents of *T. vulgaris* oil from Kashan were thymol (74.5%), carvacrol (3.65%) and p-cymene (7.45%). Carvacrol (62.5%, 11.5%), thymol (0.49%, 43.3%) and p-cymene (9.02, 11.4%) were the main ingredient *T. vulgaris* oil from Shahrood and Yazd, respectively. In mycelium inhibitory technique, the most sensitive dermatophytes to *T. vulgaris* essential oil-Shahrood was *T. rubrum* (56.6%), followed by *M. canis* (38.5%), *M. gypseum* (21.1%). *T. mentagrophytes* was resistant to *T. vulgaris* essential oil-Shahrood. *T. mentagrophytes* was inhibited by *T. vulgaris*-Kashan, *T. vulgaris*-Yazd about 44.6%, 43.6%, respectively. In micro-broth dilution assay, the MIC values for *T. vulgaris* essential oils (Kashan, Yazd, Shahrood) were 0.03-0.125, 0.03-0.06, 0.03-0.125  $\mu$ l/ml, respectively. The corresponding MFC were 0.03-0.125, 0.03-0.06, 0.03-0.125  $\mu$ l/ml, respectively. The elastase was inhibited about 71.7%, 70.58% and 68.2% by 1  $\mu$ l/ml *T. vulgaris* essential oils (Kashan, Shahrood, Yazd). Due to anti-dermatophyte and anti-elastase activities of *T. vulgaris* essential oils, they can be regarded as alternative natural products in controlling invasive mycoses.



**EVALUATION THE ANTIANXIETY AND ANTIDEPRESSANT PROPERTIES OF  
TOTAL EXTRACT OF *OCIMUMBASILICUM* USING PHARMACOLOGICAL  
MODELS IN MICE**

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Depression and anxiety are amongst most common problems in the world. In Iranian traditional medicine, treatment of depression is discussed very well. Considering the use of *Ocimumbasilicum* in traditional medicine as a tranquilizer and anxiolytic, the aim of the present study is to evaluate the anxiolytic and antidepressant effect of ethanolic, hexan, or chloroform extract of the plant using pharmacologic models in mice. Male NMRI mice (20- 25 g) obtained from Pasture Institute were used in this study. Animals were randomly put in groups: (i) control (vehicle-treated), (ii) treated with the standard drug (diazepam 2 mg/kg for anxiolytic properties or amitriptyline 15 mg/kg for antidepressant properties), and (iii) groups received ethanolic extract (100, 300 mg/kg), hexan extract (100 mg/kg), chloroform extract (100 mg/kg) of *Ocimumbasilicum*. Drugs or plant extract were suspended in vehicle (tween 80 0.5% in DW) and were administered p.o. 30 min before behavioral test. In elevated plus maze (EPM) test, the group received ethanolic extract of the plant (100 mg/kg) showed significant increase in the number of entrance into open arm compared with the control group. However, other anxiety indices in different groups did not show significant change compared with the control group. The locomotor activity evaluation (assessed by time spent in closed arm, distance moved, and velocity) showed no significant difference between groups. In open field test, mice received hexan extract (100 mg/kg) showed significant decrease in time spent in central zone compared with control group. No significant change was observed in other parameters between groups. In light-dark test, mice received ethanolic extract (100 or 300 mg/kg) of the plant extract showed significant increase in time spent in light chamber. Moreover, mice received hexan extract showed significant decrease in time spent in light chamber compared with the control group. For evaluation of antidepressant properties of plant extract the results of the forced swimming test and tail suspension test showed significant decrease in the time of immobility of mice compared with the control group. Our results suggest both anxiolytic and antidepressant properties of *Ocimumbasilicum* ethanolic extract in animal behavioral pharmacologic models. These effects might be due to the presence of many constituents with antioxidant properties, which have been already showed by previous studies.



## ETHNOBOTANICAL STUDY OF AMOL (MAZANDARAN)

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People have considered the use of medicinal plants from ancient times. Mazandaran province, with more than 1200000 ha meadows and more than 800000 ha natural forests, is the center of many medicinal plants due to the favorable weather condition. The increased tendency of people to natural and harmless therapies with available and non-expensive medicinal sources, caused a vast use of medicinal plants in traditional medicine of Iran. Old people in villages are the main source of valuable data on medicinal plants and gradually we may lose these traditional source of scientific data by their death so the conservation and reservation of these data are a necessity. The aim of present project is to study and identify the medicinal plants used in Amol County. In order to provide efficient data plants were gathered from nature and identified. Questionnaires were filled for each old and experienced person. Plants were gathered in spring and summer of 2015. The most used part of the plants were leaves and stems and the least used parts were roots and fruits. The Polygonaceae and Chenopodiaceae has the most use while Lamiaceae and Portulacaceae are less used. Most medicinal plants were used for digestive diseases, wound healing and to remove infections.

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**IN VITRO ANTIHYDATID EFFECT OF THE *ZATARIA MULTIFLORA*  
AROMATIC WATER**

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Hydatid disease is an important health problem all over the world. In inoperable cases of hydatidosis, chemotherapy is the only option. Albendazole, as the drug of choice for chemotherapy of hydatid disease has several side effects and 40% of patients do not respond to it satisfactorily. *Zataria multiflora* is not only a popular condimental plant but is also used in traditional folk remedies for its antiseptic, analgesic, carminative, anthelmintic and antidiarrheal properties. The present study was undertaken to evaluate the effect of *Z. multiflora* aromatic water (AW) on the germinal layer of hydatid cysts. Five laboratory mice were experimentally infected with 1,500 viable protoscolices. After development of hydatid cysts (6 months after infection), the infected mice were euthanized, necropsied and the hydatid cysts were carefully recovered and collected in petri dishes normal saline. The cysts with at least 5 mm diameter were selected for the experiments. After several washing in normal saline, the selected cysts were divided into test and control groups (12 in each). The cysts of test group were placed in a small glass dishes containing 15 ml of *Z. multiflora* aromatic water while the cysts of the control group were placed in a small glass dishes containing of 15 ml of normal saline. The dishes of the test and control groups were incubated at 22 °C (room temperature) for 48 h. Macroscopic examination of the cyst showed the lethal effect of *Z. multiflora* aromatic water on the germinal layer of hydatid cysts. While the cysts' structure and the germinal layer of the cysts incubated in normal saline were normal in appearance, the germinal layer of the cysts incubated in *Z. multiflora* aromatic water were completely detached from the laminated layer and had a crumpled appearance. With regard to the previously reported scolocidal activity of *Z. multiflora* AW and the results of this study, *Z. multiflora* AW either alone or along with albendazole, may be used as a therapeutic tool for treatment of hydatid disease in human being.

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**SAFFRON GROWTH, YIELD AND CHLOROPHYLL FLUORESCENCE  
PARAMETERS ARE AFFECTED BY MOTHER CORM WEIGHT**

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Saffron (*Crocus sativus* L.) is propagated by corms which are underground stems. Selection of suitable corms is an important factor in saffron cultivation because the flowering capacity of the plant depends heavily on the weight of planted corms. In Iran, gap yield of saffron is too much, mainly due to planting of small corms, which leads to low flowering capacity, particularly in the first flowering period. In this experiment the effects of mother corm weight on saffron growth, yield and chlorophyll fluorescence parameters [minimum ( $F_o$ ), variable ( $F_v$ ) and maximum ( $F_m$ ) fluorescence and  $F_v/F_m$ ] were investigated. Three corm categories (small: 0.1-4 g, medium: 4-8 g and large corms: 8-12 g) were compared at research station of Sarayan Faculty of Agriculture, University of Birjand. Flowering period lasted from 11 November up to 6 December, leaf and root growth was determined on 12 December and fluorescence chlorophyll parameters were measured on 12 February. Flower yield was 113 kg.ha<sup>-1</sup> when large mother corms were used, while the medium and small corms produced 34 and 0.11 kg.ha<sup>-1</sup>, fresh flower, respectively. The use of larger mother corms increased significantly the root weight, leaf weight and leaf number. Root weight for small, medium and large corms was 0.07, 0.12 and 0.20 g per plant and leaf weight was 0.45, 0.84 and 1.31 g per plant, respectively. Number of initiated replacement corms was 2.33 for large mother corms, while 1.15 for small mother corms. Based on the differences in mother corm weight between planting date and one week after flowering, it concluded that more than 80% of mother corms reserves were used for flowering, as well as leaf and root production. There was no-significant differences between treatments in terms of chlorophyll fluorescence parameters, however, with increase in corm size the amounts of  $F_o$  and  $F_m$  increased and  $F_v/F_m$  decreased. In similar study on saffron, total weight of replacement corms per colon (91%), number of flowers per square (84%), flower yield (66%) and stigma dry yield (154%) were higher for the large mother corm (9-10 g) than small mother corm (4-5 g). Saffron flowering can be limited when mother corms below 8 g are used, while the percentage of flowering and stigma yield increase significantly with enhancement of corm weight. Overall, based on our results and findings of other researchers. small corms usually do not flower in the first year and thus the planting of them is not affordable.

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**EFFECT OF PLOIDY LEVEL ON THE NUCLEAR GENOME CONTENT AND  
ESSENTIAL OIL COMPOSITION OF ANISE HYSOP  
(*AGASTACHE FOENICULUM* [PURSH.] KUNTZE)**

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Anise hyssop (*Agastache foeniculum*) is one of the important medicinal-ornamental plant species. In medicinal plants, polyploidy induction is usually associated with an increase in total nuclear genome content and a change in the quality and quantity of important medicinal compounds. In the present investigation, flow cytometry was used to compare the nuclear genome content of diploid and tetraploid plants of anise hyssop. The essential oils (EOs) of different ploidy levels, obtained by hydro-distillation method, were analyzed by GC and GC-MS instruments. The results showed the total nuclear genome of tetraploid and diploid plants was  $2.15 \pm 0.001$  pg and  $1.06 \pm 0.02$  pg, respectively. The change in ploidy level also significantly ( $P < 0.05$ ) affected the EO content and most of its components. The percent of EO in diploid and tetraploid plants was  $1.32 \pm 0.1$  and  $2.78 \pm 0.1$ , respectively. The proportion of Methyl cavicol, which is the major EO component of anise hyssop, significantly ( $P < 0.05$ ) increased in tetraploid plants (81.02 %) compared to the diploids (78.75 %). DNA content increases by chromosome doubling that occurs with polyploidy induction. Polyploidy can affect the physiological and biochemical behaviors such as net photosynthesis, transpiration, enzymes activity, photosynthetic electron transport and isozyme expression. All these changes might affect secondary metabolites biosynthesis and alter their accumulation in plants. Polyploidization significantly changed the concentrations of EO constituents. Polyploid induction may also change the secondary metabolites biosynthesis pathways and gene expression in the medicinal plants.

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**GENETIC DIVERSITY OF *MELISSA OFFICINALIS* BASED ON SRAP MARKER**

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*Melissa officinalis* L. (Lemon Balm) belongs to lamiaceae family is a medicinal plant native to East Mediterranean regions. Essential oil of the plant has Antioxidant, Anticancer properties and expectorant capacity (1, 2). Sequence related amplified polymorphism (SRAP) markers are new to amplify the sequence open reading frame (ORF) by PCR (1, 2). This technique uses a combination of primers, for amplifying ORF regions. In this study, SRAP marker with using 10 combine markers was used to evaluate genetic diversity of 20 different *Melissa officinalis* accessions. The results showed a total of 144 bands that 131 bands were polymorphism. The greatest number of bands was related to me3-em3 marker. Cluster analysis using the un-weighted pair-group method with arithmetic averages (UPGMA) produced three groups between these accessions. The genetic similarity was between 0.54 to 0.90 ranges. The average information polymorphism for these markers was 0.90, which indicated high level of genetic diversity. All of the SRAP markers have showed high polymorphism between these accessions.

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**ANTIMALARIAL ASSESSMENT OF *FUMARIA PARVIFLORA* L., *CICHORIUM INTYBUS* L. AND *VIOLA ODORATA* L. USED IN IRANIAN TRADITIONAL MEDICINE FOR THE TREATMENT OF FEVER BY HEME POLYMERIZATION INHIBITION METHOD**

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Malaria is a parasitic infectious disease caused by *Plasmodium* spp. Plasmodium is capable of hydrolyzing hemoglobin of the red blood cells to amino acids and free heme. Free heme is toxic for the parasite so it detoxifies the molecule to hemosoin by polymerization. The most important symptom of malaria is fever which was called “Hommi” in Iranian Traditional Medicine (ITM). The medicinal plants that have been used for the treatment of fever in ITM could be suitable candidates for evaluating antimalarial effects. In the present study, the antimalarial effects of the methanol extract of three medicinal plants including *Fumaria parviflora*, *Cichorium intybus* and *Viola odorata*, which have been used for the treatment of fever in ITM, has been evaluated by heme detoxification method. The methanol extract was prepared through maceration during three consecutive days, each day the mixture was filtered and fresh solvent was added to the plant residue. The heme detoxification method was carried out in 96-well plate with final concentration of 200 µg/mL of each sample. The absorbance was recorded at 405 nm with an ELISA reader and the heme detoxification inhibition was determined afterwards. The results demonstrated that *F. parviflora*, *C. intybus* and *V. odorata* inhibited heme detoxification up to 16, 31 and 90%, respectively with *Viola odorata* showing the most considerable result among the tested plants. The above mentioned results suggest *Viola odorata* as a proper candidate for further antimalarial studies.

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**EFFECT OF SAVORY AND THYME ETHANOL EXTRACTS AS AN  
ALTERNATIVE TO ANTIBIOTICS ON THE POPULATION OF INTESTINAL  
BACTERIA AND C-REACTION PROTEINS (CRP) OF BROILERS**

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In order to evaluate the effects of different levels of savory and thyme herbal medicines (0.05% of ethanloic extraction of savor, 0.05% ethanloic extraction of thyme, 0.025% of ethanloic extraction of savor and 0.025% of ethanloic extraction of thyme) on the population of intestinal bacteria and c-reaction proteins (CRP) of broilers in comparison with Flavomycin antibiotic growth promoter (0.045%), an experiment was conducted using 200 day-old Ross 308 chicks in completely randomized design manner having 5 treatments, 4 replicates and 10 chicks per replicate. Experimental treatments consisted of 1) control (basal diet based on corn and soybean meal without any additives), 2) basal diet with 0.045% Flavomycin antibiotic growth promoter, 3) basal diet with 0.05% of ethanloic extraction of savor, 4) 0.05% of ethanloic extraction of thyme, 5) basal diet with 0.025% of ethanloic extraction of thyme and 0.025% of ethanloic extraction of savor. Results showed that the number of bacteria salmonella, *E. coli* and Coliforms were not affected by the different treatments. Also, SRBC injection showed no significant changes on the intestinal bacterial load. The CRP content was affected by dietary treatments. The maximum content of CRP was seen in control group. The combined savory and thyme extract showed the lowest CRP which significantly differed from control, 0.05% of ethanloic extraction of thyme and 0.05% of ethanloic extraction of savor groups. Injection of SRBC showed no impact on CRP.



STUDY ON FUMIGANT TOXICITY OF TWO PLANT ESSENTIAL OILS ON  
ADULT INSECTS OF *SITOPHILUS ORYZAE*  
(COLEOPTERA: CURCULIONIDAE)

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Recently, there has been growing interest in research concerning the possible use of plant extracts as alternatives to synthetic insecticides. Essential oils are among the best-known substances tested against insects. These compounds may act as fumigants, contact insecticides, repellants, antifeedants and may affect growth and development of the insect. In an attempt to find a natural and inexpensive method for the control of stored-product pests. Fumigant toxicity of essential oils of *Nepeta cataria* L. and *N. pogonosperma* Jamzad & Assadi was investigated on adult insects of *Sitophilus oryzae* L. on laboratory condition (27±1°C, 75 ± 5% R.H., dark cycle: 12:12 h). The oils were extracted by using Clevenger apparatus. The results showed that the percentage of mortality was increased with increase in concentration and exposure of time. At the 357 µL/L air dose level, *N. pogonosperma* and *N. cataria* essential oil caused 94.67 and 100 % mortality of *S. oryzae* adults within 72 hours of exposure, respectively. The LC<sub>50</sub> after 72 h for *N. pogonosperma* and *N. cataria* were 150.49 and 152.630 µL/L air, respectively. The results suggested that essential oil the both of plants could be used as a potential bio-control agent for stored-product insects.

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## COMPARISON OF ESSENTIAL OIL COMPOSITION OF FIVE NEPETA SPECIES

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*Nepeta* genus belongs to Labiataefamily that has important medicinal and aromatic species. There are more than 250 species in the world and have been reported 67 annual and perennial species in Iran. In experiment, were studied essential oil composition of *Nepeta heliotropifolia* Lam., *N. cataria* L., *N. meyeri* Benth., *N. fissa* C.A. Mey. and *N. racemose* Lam. The flowering phase of these species were collected in spring and summer and dried in shade (at room temperature). The flowering phase of the species subjected to volatile fraction were isolated by hydro-distillation using a Clevenger-type apparatus for 3 or 4 hours. After decanting and drying of the oils over anhydrous sodium sulfate, they were stored in vial at low temperature (4°C) before analysis. The analysis of the oils was performed using GC-MS. The results showed that, the major constituents of *N. heliotropifolia* Lam. were Phytol (10.29%),  $\alpha$ -Copaene (9.46%), Spathulenol (8.14%) and Germacrene D (7.98%). The 4 $\alpha$ -  $\alpha$ ,7-  $\alpha$ ,7 $\alpha$ -beta-Nepetalactone (82.74%), 4 $\alpha$ - $\alpha$ ,7- $\beta$ ,7 $\alpha$ - $\alpha$ -Nepetalactone (83.92%), Phytol (20.01%) and 1,8-Cineole (70.89%) were the major constituents of *N. cataria* L., *N. meyeri* Benth., *N. fissa* C.A. Mey. and *N. racemose* Lam., respectively.

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**EVALUATION OF PHENOLIC COMPOUNDS UNDER DROUGHT AND SALINITY IN *SALVIA OFFICINALIS***

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Salvia contains various combinations with valuable medicinal properties in the medical. In this study the effect of three treatments consisted of salinity stress with NaCl (9.14DS.m<sup>-1</sup>), drought stress (50% FC), and well-watered (control) were studied on changes in the phenolic contents in different organs of *Salvia officinalis*. This research was conducted in a completely randomized design with three replications in the greenhouse and lab of Imam Khomeini International University. The measurement of phenolic compounds was determined by spectrophotometer. The results showed that both drought and salinity had a significant positive effect on leaf total phenols, stem total phenols, leaf total flavonoids, stem total flavonoids and leaf anthocyanins. The results of the mean comparisons showed that the phenolic compounds was increased more in drought stress compared to salt stress, so that the leaf total flavonoids and phenols were higher about 29 and 9%, respectively, at drought stress in compared to salinity. In general it was found that Salvia increases the production of secondary metabolites to become resistant to drought and salinity stresses.

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**EFFECT OF DILUTING METHOD ON TOXICITY OF *EUCALYPTUS*  
ESSENTIAL OIL**

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*Eucalyptus* essential oil is important due to its insecticidal activities but, there are some factors may influence the insecticidal activity (fumigant toxicity) of *Eucalyptus* essential oil and the dilution method which is one of them. The purpose of this study was to determine the effect of diluting the essential oil with various solvents on its insecticidal activity. *Eucalyptus globulus* pure essential oil was diluted ten times with ten different solvents such as DCM (Dichloromethane), Methanol, ethanol, acetone, propanol, N- propanol, diethyl ether, petroleum ether, hexane and tween80. These diluted essential oils were examined and their fumigant toxicity against *Sitophilus oryzae* was determined collectively. The current study found that all of the examined solvents except tween80, increased fumigant toxicity of essential oil from 20 to 50%. Tween 80 did not have any influence on the fumigant toxicity of *Eucalyptus* essential oil. Thus, diluting the oil with a suitable carrier (tween 80) is recommended.

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**REPELLENT ACTIVITY OF *EUCALYPTUS GLOBULUS* AND *EUCALYPTUS CAMALDULENSIS* ESSENTIAL OILS AGAINST *SITOPHILUS ORYZAE* L. AND *TRIBOLIUM CASTANEUM* HERBST**

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Chemical composition and Repellent activities of essential oils extracted from leaves of *Eucalyptus camaldulensis* and *Eucalyptus globulus* against storage pests *Sitophilus oryzae* L. and *Tribolium castaneum* (Herbst) were investigated. Gas chromatography (GC) and Gas chromatography–Mass spectrometry (GC-MS) analyses were performed for identification of essential oils chemical composition and treated kernels repellency test was designed for determining repellency effects of the essential oils against the stored insects. GC and GC-MS analyses of *E. camaldulensis* and *E. globulus* essential oils showed that 1, 8- cineole (74.90, 70.01%) and  $\alpha$ -pinene (3.90, 5.25%) were the major constituents of the *Eucalyptus* essential oils. The results of repellency test showed that the essential oils of *E. camaldulensis* highly repelled adults of *S. oryzae* and *T. castaneum* with values of 94% and 91% at 2.5  $\mu$ l/ml ( $\mu$ l essential oils/ml acetone/40 kernels) dose level, respectively. *Eucalyptus globulus* essential oil also repelled *S. oryzae* and *T. castaneum* adults with values of 94.11% and 96.5% at 2.5  $\mu$ l/ml dose level, respectively. The results of current study indicated that both of essential oils showed high repellent effects against adults of *S. oryzae* and *T. castaneum*. Thus, it was evident that *E. camaldulensis* and *E. globulus* essential oils have great potential for future development as safe fumigants and repellents.

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**ASSESSMENT OF BERBERINE BRIDGE ENZYME GENE EXPRESSION UNDER SALINITY AND DROUGHT DTRESS IN *PAPAVER SOMNIFERUM***

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This research was aimed to evaluate expression profile of berberine bridge enzyme gene expression under drought and salinity stresses. It was performed at the genomics laboratory of Imam Khomeini International University in a completely randomized environment with three replications. The treatments used in this study consisted of salinity stress with NaCl (100mM), drought stress (50% FC) and control (normal irrigation). Real Time PCR method was used for gene expression analysis. Based on the results, tissue type had a significant effect on the gene expression, so that the expression in the roots increased two fold more in comparison with leaves. According to the results, the treatments have significant effect on the *bbe1* gene expression. Mean comparison showed that there are significant differences among the treatment types in terms of gene expression and gene expression in salinity and drought stresses relative to the control were 2.5 and 1.5 times higher, respectively. Also evaluation of stress  $\times$  tissue interaction effects showed that the highest amount of *bbe1* gene expression was obtained under the salt stress in roots. In conclusion, gene expression was increased in both stresses; but its level was negligible in leaves compared with roots.

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**EVALUATION OF PROTECTIVE EFFECT OF EXOGENOUS GAMMA AMINO BUTYRIC ACID ON THE SOME GROWTH FACTORS AND PHYSIOLOGICAL PARAMETERS IN SQUASH TREATED WITH TRIFLURALIN HERBICIDE**

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This study was aimed to assess the effect of different concentrations of Trifluralin herbicide (0, 5, 15, and 25 ppm) in absence and combined with 1.5 mg.L<sup>-1</sup> gamma amino butyric acid (GABA) on the some growth factors and physiological parameters in squash (*Cucurbitapepo*) under greenhouse conditions. Seedlings were planted in 24 plastic pots containing a mixture of sterilized soil: sand (1:2) and then randomly allotted into 8 equal groups of 3 pots each (3 replicates). All pots were irrigated every other day with Hoagland's solution and distilled water. All experiment plants were allowed to grow trifoliolate stage and were exposed to Trifluralin treatments. Three days after Trifluralin application, plants were also sprinkled by 1.5 mg.L<sup>-1</sup> Gamma amino butyric acid (GABA). Compared to the control, Trifluralin enhanced damaging effects on the plants, so that fresh and dry weight, plant height, relative water content (RWC) and photosynthetic pigments (chlorophyll a, b and carotenoid) significantly decreased ( $P < 0.05$ ) by increasing herbicide concentrations, while total protein and carbohydrate contents, showed a significant increase ( $P < 0.05$ ). However, GABA treated plants, showed higher fresh and dry weight, plant height; photosynthesis pigments as well as total protein and carbohydrate contents. In conclusion, exogenous application of GABA can enhance the tolerance of squash plants to Trifluralin adverse effects.

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**EFFECT OF SAPONIN ON THE IMMUNOGENICITY OF AN INACTIVATED  
AVIAN INFLUENZA VACCINE (H9N2)**

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The aim of present study was to evaluate the humoral immune responses in chickens immunized with inactivated avian influenza vaccines (H9N2) containing different concentrations of saponin. Therefore, after subcutaneous inoculation of vaccines contain standard amount of Montanaid<sup>TM</sup> ISA-70 with 10, 20, 40, 80 and 100 µg/dose of saponin as co-adjuvant to 28-days-old chickens, serum antibody levels were measured by hemagglutination inhibition (HI) test at 14, 21 and 28 days post immunization. Our results indicated that immune response of all vaccinated chickens was increased by saponin compared to the control group. As well, in animals vaccinated with 40, 80, 100 µg/dose and 80 µg/dose of saponin, antibody response was significantly increased ( $P<0.05$ ) at 14 and 21 days post immunization, respectively, in compared with the control group. According to the study, the 80 µg/dose is as appropriate saponin concentration for use in under study inactivated vaccine. The use of saponin, as co-adjuvant, can be synergistic increase the antibody responses of oil-based adjuvant in chickens immunized with inactivated influenza vaccine.

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**EVALUATION OF SOME IRANIAN LANDRACES OF CORIANDER  
*CORIANDRUM SATIVUM* L.**

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Coriander (*Coriandrum sativum* L., Apiaceae) is an annual plant, which is one of the oldest medicinal plants. The essential oil of its fruits is widely used in various industries, including medicinal, food, and cosmetic industries. Furthermore, the fruit is an important medicinal export of Iran. This study assessed the yield and morphological quantitative and qualitative components such as plant height, 1000-seed weight, and seed yield in 13 Iranian accessions. The results have demonstrated that there is wide diversity in the case of morphological indices in Iranian coriander accessions tested. The highest seed yield and plant height were recorded in accession no. 13 (Nahavand), and the highest basal leaf length and number of basal leaves were observed in accession no. 9 (Ghaen), which were significantly higher than those of the others. Accordingly, accession no. 13 is a superior genotype in the case of fruit yield, and no. 9 regarding leaf production. Result of simple correlation analysis showed significant positive and negative correlation among many traits. PCA analysis placed 16 traits in four factors that covered 86.3 percent of variance. The first factor, covered 36.3 percent of variance included number of basal leaves (-0.513), basal leaf length (-0.498) and terminal leaflets length (-0.417). The second factor, covered 21.8 percent of variance included plant height (-0.452), fruit size (-0.522) and seed yield (-0.438). That in fact they are effective factors on distinguish between these accessions. Cluster analysis classified populations to 3 main groups and 2 independent populations.



EVALUATION OF ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES  
OF *DROSERA SPATULATA*

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The aim of the present study is to investigate and evaluate analgesic and anti-inflammatory potential of aqueous and methanolic extracts of *Drosera spatulata* using different models in rats. The aqueous and methanolic extracts of *D. spatulata* (at the doses of 3, 4, 5, 8 and 10 mg/Kg body weight) investigated for anti-inflammatory and analgesic activities using various experimental models. Analgesic activity was evaluated using formalin induced paw licking models in rats. Anti-inflammatory activity was evaluated using measurement of paw edema volume model in rats. Both extracts caused a significant ( $P < 0.05$ ) dose-dependent reduction of inflammation and pains induced by agent used. These results provide support for the use of aqueous and methanolic extracts of *Drosera spatulata* in relieving inflammatory, pain and insight into the development of new agents for treating inflammatory and pain diseases but further studies are needed to elucidate the mechanism (s) of action and phytochemical constituents of the plant.

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## EFFECT OF CHICORY EXTRACT BATH ON NEONATAL BILIRUBIN LEVELS

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Jaundice is a common problem in infants, particularly premature infants (60-80%). The most common treatment of neonatal jaundice is phototherapy; however, traditional and complementary medicine is preferred due to complications of phototherapy in newborns. This study evaluates the effect of Chicory extract bath on bilirubin levels of infants with jaundice hospitalized in educational hospitals in Isfahan in 2015. This study was a clinical trial in which participants included 64 mature infants with neonatal jaundice admitted to the selected hospitals of Isfahan. The infants were randomly assigned to two groups receiving phototherapy and phototherapy with chicory extract bath. The infants were bathed with chicory extract before phototherapy as well as 24 and 48 hours after phototherapy; then, the infants received phototherapy. During treatment, serum bilirubin was measured and recorded every 24 hours continuously. Control infants only received phototherapy; during treatment, serum bilirubin was measured and recorded every 24 hours. The results showed no significant difference in mean bilirubin levels between the two groups on admission ( $P \leq 0.37$ ), while mean bilirubin level of phototherapy infants was significantly higher than that of infants receiving phototherapy and chicory extract bath in 24 hours after intervention ( $P \leq 0.014$ ) and 48 hours after intervention ( $P \leq 0.011$ ). The results showed that chicory extract bath along with other treatments could be effective in reducing neonatal jaundice.

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**THE EVALUATION OF A FORMULATION CONTAINING SYRINGA VULGARIS EXTRACT AND OLIVE OIL (OLEANOLIC ACID) FOR REGULATING SEBUM PRODUCTION AND THE TREATMENT OF ACNE LESION**

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The use of antibiotics for the treatment of acne promotes the development of antibiotic-resistant bacteria, and it leads to serious problems in the treatment of acne disease. With regard to the fact that overactive sebaceous glands and sebum overproduction in skin is the main cause of inflammatory and non-inflammatory acne disease. Therefore, one way to treat this lesion is to suppress excessive sebum production in skin, and control acne disease by using herbal extracts without having any side effect. The aim of this study is to evaluate the efficacy of *syringa vulgaris* extract and oleanolic acid in formulation in order to reduce the amount of sebum produced by the sebaceous glands and control acne disease. In this research, the leaves of *s. vulgaris* were extracted by Maceration method. Next, the concentration of 0.4 % and 2 % *s. vulgaris* and oleanolic acid were used in anti-acne gel formulation, respectively. In this study, 40 patients at puberty age with inflammatory acne disease were selected, and divided into two groups. At the beginning of this study, the sebum of specified area was measured by the Sebometer® of Cutometer® dual MPA 580. Then, half of the patients were asked to use anti-acne gel; the others were asked to use placebo sample (without herbal extracts) twice a day for 2 months. After the end of study, the sebum of representative area was measured, and analyzed. The result shows that the amount of sebum has decreased in individuals who used anti-acne gel more than placebo sample. It illustrates that *s. vulgaris* extract in addition to having anti-bacterial effect, could alleviate sebum secretion by inhibiting 5-alpha reductase Enzyme. Therefore, this could be used as alternative drugs to control infectious caused by Propionibacterium acnes. It was also seen that there was a synergistic effect between oleanolic acid and *s. vulgaris* extract, and efficacy of formulation has increased without having side effect and using chemicals.



**EFFECTS OF DIFFERENT SEQUENCES IN CHEMICAL EXTRACTION STEPS  
ON PHYSIOCHEMICAL AND FUNCTIONAL PROPERTIES OF CHITOSAN**

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Chemical extraction of chitin and chitosan from the shells of crustaceans, are done with the elimination of mineral, protein and pigment compounds. The variation in the physicochemical and functional characteristics of chitin and chitosan were analyzed by displacing the sequence of extraction stages of these polymers from *Peneus semisulcatus* shrimp. The maximum amounts of chitin (25.2%), chitosan (18.21%) and fat bonding capacity of chitosan (466±21), by eliminating mineral and pigment before protein compounds was obtained. The maximum water bonding capacity of chitosan (689±13.5) was obtained by eliminating pigment compounds after the mineral and protein compounds. By eliminating protein and pigment before mineral compounds, a product with the lowest moisture (1.8%) and ash (0.23%) was formed. The elimination of mineral and protein before pigment compounds causes to formation of chitosan with the highest degree of deacetylation (82.05-84.46%) and crystallinity. The lowest molecular weight (36000 Da) of chitosan was obtained by eliminating protein and mineral before the pigment compounds. Antibacterial activities showed a direct and significant relationship with the reduction of chitosan molecular weight. Results of this study show that manipulation of the sequence of extraction stages of chitosan can influence some of the physicochemical and biological characteristics of this polymer. Therefore, by targeted manipulation in the extraction stages, a product with the desired qualities can be obtained.

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**STUDY OF SCOLICIDAL EFFECT OF THE AQUEOUS, ALCOHOL, AND ACETONE EXTRACTS OF YELLOW MAZOOJ (AN OAK GALL) ON PROTOSCOLECES OF HYDATID CYST**

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Hydatidosis caused by *Echinococcus* species is common in human and animals. This disease is spread in many countries. Treatment of hydatid cyst caused by this parasite is surgery as well medical therapy. To reduce the rate of recurrence of hydatid cyst, administration of scolicedal agents during surgery is necessary. This study was aimed to evaluate the scolicedal effects of various extracts of oak gall caused by *Andricus sternlichti* (a gall wasp) against protoscoleces in vitro. This kind gall called Yellow Mazooj in Persian. Protoscoleces of *E. granulosus* were collected in 60 livers infected with hydatid cyst from Khorramabad abattoir. To evaluate the scolicedal effects of Yellow Mazooj, 0.1, 0.05, and 0.01 mg/ml concentrations of aqueous, alcohol and acetone extracts of each were examined for 10, 20, 30, 60 min. Normal saline and hypertonic saline were used as negative and positive controls respectively. Inactivation of protoscoleces was confirmed by eosin staining. The data were analyzed by SPSS software. The results showed that concentrations of 0.1 mg/ml of acetone extract of Yellow Mazooj lead to the death of protoscoleces at 60 min. In this study, although, the dilution of 0.1 mg/ml is acceptable, the longtime of taking effect is undesirable.

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**A SURVEY ON SCOLICIDAL EFFECT OF THE VARIOUS EXTRACTS OF OAK GALL (GHALGHAF) ON HYDATID CYST PROTOSCOLECES *IN VITRO***

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Cystic echinococcosis is a parasitic disease that leads to the development of hydatid cysts in the body of human and animals. Treatment of hydatid cyst is mainly surgery. To reduce the recurrence rate, use of effective scolicidal agents during surgical operation of hydatid cyst is essential. The purpose of this study was to evaluate the effect of various extracts of oak gall (In Persian Ghalghaf) caused by *Andricus insana* (a wasp) against protoscoleces in a vitro model. Protoscoleces were aspirated from the livers of sheep having hydatid cyst obtained from Khorramabad slaughtered-house. Scolicidal effects of Ghalghaf were evaluated in three dilutions (0.1, 0.05, and 0.01) for 10, 20, 30, and 60 min. Normal saline was used as negative control and hypertonic saline was used as positive control. Protoscoleces with no activation were confirmed by 0.01% eosin. The data were analyzed by SPSS software. The most scolicidal effect was observed at 0.1 mg/ml concentration of alcohol extract at 20 min. In this study, using Ghalghaf with 0.01 mg/ml can kill 99/71% of protoscoleces successfully; then, it can consider as an effective agent in vitro.

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**IMPROVEMENT OF QUERCETIN PRODUCTIVITY IN SUSPENSION CULTURES  
OF *SCROPHULRIA STRIATA* BY CHITOSAN**

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Phytochemicals as dietary constituents are being explored for their cancer preventive properties. Quercetin is a major constituent of various dietary products and recently its anti-cancer potential has been extensively explored, revealing its anti-proliferative effect on different cancer cell lines, both *in vitro* and *in vivo*. Quercetin is known to have modulatory effects on cell apoptosis, migration and growth via various signaling pathways. Manipulation of cell culture media by elicitors is one of most important strategies of biotechnology to inducing secondary metabolism for the production of valuable metabolites. Natural elicitors such as chitosan are exogenous biotic compounds extracted from arthropods exoskeleton and fungal cell walls often act as specific elicitors in a number of plant cell cultures for efficient induction of valuable medicinally secondary metabolites. In this investigation, inducing effect of chitosan on physiological, biochemical and molecular parameters were investigated in cell suspension cultures of *Scrophularia striata* Boiss. Cells were treated with 10 mg/L chitosan and harvested for 3, 5 and 7 days after elicitation. Quercetin quantified by high-performance liquid chromatography (HPLC). Cell samples were used to elucidate the expression level of *phenylalanine ammonia-lyase (PAL)* and *p-coumarate 3-hydroxylase (C3H)* genes by semi-quantitative RT-PCR. Following treatments of chitosan, the results showed that the cell growth and viability of cells was decreased as compared to control. In addition, chitosan increased quercetin content. Cells elicited with chitosan for 5 days yielded the highest amount of quercetin (5.83-fold) compared to the control cells. The expression of *PAL* and *C3H* genes by chitosan was increased, reaching a peak at 5 days after treatment (2.2-fold and 2-fold higher than control cells, respectively). Chitosan up-regulates the production of quercetin, by effecting on gene expression of flavonoids biosynthesis pathway.

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**EVALUATION OF THE USE OF HERBAL EXTRACTS FOR REDUCING  
INFLAMMATION IN THE SKIN OF PATIENTS WITH PSORIASIS**

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Psoriasis is an autoimmune disease, macrophages and dendritic cells make T cells activated and differentiate them into T helper 1 and T helper 17. Then a number of cytokines release from these cells in this process the expression of IFN $\gamma$  increases that it leads to irregular proliferation of keratinocytes and As well as the expression of TNF $\alpha$  increases and causes inflammation. In this study, the combination of extracts of Calendula / green tea and Quercus was prepared that with decreasing expression of TNF $\alpha$  and IFN $\gamma$  reduces inflammation. In this study, the red pigment in certain areas of the skin 24 patients with psoriasis were measured by mexameter prob of cutometerdual MPA 580 and They were asked forusing from this combination two weeks. After two weeks re-measuring the amount of red pigment and color difference compared. The results confirmed reduction of inflammation by combination of three plant extracts.

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**THE COMPARISON OF ANTIBACTERIAL PROPERTIES OF CHITIN,  
CHITOSAN AND CHITOLIGOMERS EXTRACTED FROM SHELL  
OF *METAPENEUS AFFINIS***

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Chitin is one of the main components of crustaceans' exoskeleton. Chitosan obtained from chitin deacetylation. *Molecular weight* and degree of *deacetylation* play an important role in the biological activity of chitin and chitosan. So far a variety of derivatives with lower molecular weights have been obtained from these two polymers to increase their biological properties and functional areas. By investigating different levels of factors such as solvent concentration, temperature, time and the ratio of powder to solvent, the best state was determined for extracting chitin and chitosan from shell of *Metapenaeus affinis*. Shrimp samples were collected with trawl nets in 2015, summer, from Bandar Abbas waters. *N-acetyl chitooligosaccharides* and *chitooligosaccharides oligomers* were prepared through chemical hydrolysis of chitin and chitosan respectively. The antimicrobial properties of the four polymers on four bacterial strains were investigated and compared with an emphasis on molecular weight and percentage of deacetylation. The calculated amount of ash, moisture, protein and molecular weight of chitin was more than that of chitosan. But, chitosan percentage of deacetylation was much more than chitin. The highest and lowest antibacterial activity was related to *chitooligomers* and *chitin* respectively. Chitin and chitosan showed bacteriostatic properties against strains. But, the oligomers revealed bactericidal activity against most of the strains. The results of this study show that a product with higher purity can be obtained through manipulating the extraction method. Moreover, antibacterial activity is directly related to reduced molecular weight and increased percentage of deacetylation, and oligomers with lower molecular weight showed more antibacterial properties.

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**COMPARISON OF ANTIVIRAL EFFECTS OF *CHELIDONIUM MAJUS* HEXANE AND AQUEOUS EXTRACTS AGAINST HERPES SIMPLEX VIRUS TYPE 1BY QUANTITATIVE REAL-TIME PCR**

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Herpes simplex virus type I (HSV-1) has different clinical manifestation in human. The medicinal herbs is using for treatment of viruses due to drug resistance. One of these compounds is *Chelidonium majus* (*C.majus*) extracts. Different methods are used for evaluation of antiviral effects, one of these methods is based on molecular techniques. There are several ways to interrogate a cell for changes induced by artificial or natural agents during a biological process. Quantitative real-time PCR technology can be utilized to provide the required information. In this study, *C.majus* hexane and aqueous extracts was used to assess the antiviral effects against HSV-1 and measuring the amount of virus by quantitative Real-time PCR was performed. The toxicity of *C.majus* aqueous and hexane extracts on HeLa cells was determined by both two MTT and Trypan blue methods. Antiviral effects of these extracts was measured in different concentrations and also different times on virus replication. The viral titer was evaluated by quantitative Real-time PCR. The optimization of quantitative Real-time PCR was based on the amount of HSV-1 gD gene. The 3.5 mg/ml concentration of *C.majus* aqueous extract has no toxic effects and also has the highest effect on HSV-1 proliferation. This concentration of *C.majus* aqueous significantly reduced the virus titer after absorption time up to 12 hours. In comparison hexane extract does not have any antiviral effect on HSV-1. According to the results, *C.majus* aqueous extract has antiviral effect on HSV-1 compared to hexane extract and could be proper candidate for new anti-herpes treatments. Further study is required to identify effective element and bioactive compounds of this extract using more advanced techniques in order to be used in antiviral drugs.

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ANTIVIRAL EFFECTS OF METHANOL AND HEXANE EXTRACTS OF  
*CHELIDONIUM MAJUS* AGAINST HERPES SIMPLEX  
VIRUS TYPE 1 IN HELA CELL CULTURE

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Herpes simplex type I (HSV-1) belongs to herpesviridae family that may lead to oral herpes, encephalitis and keratoconjunctivitis. Antiviral drugs like acyclovir are used for treatment of herpes infections. Following the increasing of drug resistance, there has been an interest in the use of natural substance with antiviral ability with fewer side effects. In this study, we assessed the effect of hexane and methanol extracts of *Chelidonium majus* against HSV-1. The toxicity threshold of *Chelidonium majus* hexane and methanol extracts on HeLa cell was determined with trypan blue and MTT methods. Then their direct antiviral effect was evaluated against HSV-1. Different concentrations of extracts in different times of virus replication have been evaluated. The viral titers were tested by TCID<sub>50</sub> assay. The methanol extract at the concentration of 0.2 mg/ml and hexane extract at the concentration of 0.6 mg/ml were determined as non-toxic on HeLa cell line. These concentrations did not have significant virucidal effects on Herpes simplex virus. Concentration of 0.2 mg/ml of methanol extract had maximum antiviral effects on virus replication. The maximum antiviral effects of methanol extract was exhibited immediately after virus adsorption up to 8 hour after cells infection. Hexane extract does not have antiviral effect. According to the results, the antiviral effects of methanol extract of *chelidonim majus* is more remarkable than the antiviral effects of hexane extract and it could be used as a favorable candidate for new antiviral herbal preparation with fewer side effects. Further research is required to identify and extract specific bioactive compounds of this plant in order to be used in conformation of anti-herpes drugs.

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**EFFEECT OF SALICYLIC ACID AND SALINITY IN *TANACETUM PARTHENIUM*  
INVESTIGATION ON CHANGE IN ANTIOXIDANT ENZYME ACTIVITY  
AND BIOCHEMICAL PROPERTIES AND STABILIZATION**

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*Tanacetum parthenium* is a valuable medicinal plant from Asteraceae family with various pharmacological and therapeutic properties. Salinity is one the main environmental factors limiting crop production. Under salt stress, plants have to cope with water stress imposed by the low external water potential, and with ion toxicity due to accumulation inside the plant. Salt stress also produces oxidative damage which is even more severe when the production of reactive oxygen species. The accumulation of ROS damages lipids, proteins, nucleic acids and carbohydrates and even kills plant cells. To alleviate the impact of ROS, plants have evolved antioxidants, which include enzymatic and non-enzymatic types. Enzymatic antioxidants include activities such as CAT, APX and POD. Salicylic acid (SA) have been proposed as signal transducers in plant responses to biotic and abiotic stresses. Salicylic acid, considered to be a hormone-like substance, is a common plant produced phenolic compound that it acts as an endogenous signal molecule responsible for inducing abiotic stress tolerance in plants. To evaluate the effect of salicylic acid (SA) foliar application on physiological and antioxidant enzyme activity responses of feverfew (*Tanacetum parthenium*) medicinal plant under salinity stress, a factorial experiment based on completely randomized design with three replicates under greenhouse condition was conducted in Shiraz University. Feverfew seedlings were fed with Hoagland solution. Salinity induced by NaCl and CaCl<sub>2</sub>(2:1) at 30, 60, 90, 120, 150 and 180mM concentrations. SA was applied at 0, 200 and 300 μM concentrations as foliar spray during for 10 days. total protein, proline, catalase, peroxidase and ascorbic peroxidase were measured. Results showed that by increasing salinity starch and protein reduced, while increased sugar, proline, antioxidant enzyme activity (catalase, peroxidase and ascorbic peroxidase) but no significant effect on 150 and 180. SA increased the antioxidant enzymes activity and proline accumulation under both stress and non-stress conditions.

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**THE EFFECT OF SALICYLIC ACID AND SALINITY ON GROWTH  
ANDESSENTIAL OIL OF FEVERFEW**

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Feverfew (*Tanacetum parthenium*) is a perennial plant which is herbaceous in habit. This plant is native to Kazakhstan, Central Asia and Mediterranean region and has a wide distribution in Europe, Asia and America. It is distributed in various regions of north, west, east and central Iran and is found in the provinces of Golestan, Mazandaran, Gilan, East and West Azarbaijan. Tehran, Hamedan, Markazi and Yazd as a wild herb. Soil salinity has become a serious environmental problem which affects the growth and productivity of many crops. Approximately 20% of the world's cultivated land area and 50% of all irrigated lands are affected by salinity. High salt content in the soil affects the soil porosity and also decreases the soil water potential that results in a physiological drought. High salt content also affects the physiology of plants, both at the cellular as well as whole plant levels. The applications of plant growth regulators have been found to play an important role in plant responses to stress. Salicylic acid (SA) is one of the strong candidates for stress ameliorators that have recently been recognized as a plant hormone. It plays diverse physiological roles in plants, which include plant growth, thermogenesis, flower induction, nutrient uptake, ethylene biosynthesis, stomatal movements, photosynthesis and enzyme activities. Disease resistance and abiotic stress tolerance are the other roles assigned to SA. The present study investigates the role of salicylic acid (SA) in inducing plant tolerance to salinity. The application of 200 and 300  $\mu\text{M}$  SA to Feverfew plants via foliar spraying provided protection against 30, 60, 90, 120, 150 and 180 mM NaCl;CaCl<sub>2</sub>(2:1) stress. SA treated plants had greater shoot and root dry weights compared to untreated plants when exposed to salt stress. At each salinity level, SA application at 300  $\mu\text{M}$  significantly increased shoots dry weight. Application of SA increased Plant height, leaf number, shoot number, fresh weight, dry weight, dry mass percentage, essential oil content (w/w), sugar, in salt stressed plants. Transpiration rates were significantly lower in SA treated plants under saline stress conditions. SA application decreased electrolyte leakage compared to untreated plants. Beneficial effects of SA in saline conditions include sustaining the growth, and may have contributed to the reduction or total avoidance of necrosis. SA, when used in appropriate concentrations, alleviates salinity stress without compromising the plants ability for growth under a favorable environment.

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TWO PHENOLIC CONSTITUENTS ISOLATED FROM  
*TEUCRIUM STOCKSIANUM* BOISS.

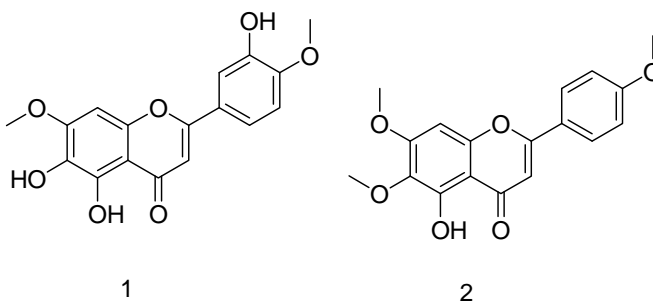
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One of the largest genera of the Lamiaceae family, genus *Teucrium*, belongs to the subfamily Lamioideae which comprises nearly of 340 herbaceous perennial, rarely annual species displaying remarkable variation. They are most common in Mediterranean climates and Middle East and Iran, particularly, is one of the centers of origin of the genus *Teucrium* with twelve species, described by the common Persian name of ‘Maryam-Nokhodi’ and about 25% of endemics. Most of the genera of this family have been reported to possess a variety of biologically active compounds. *Teucrium stocksianum* Boiss. is one of the native perennial species distributed just in south parts of Iran. This plant is an aromatic shrub, which has been used in traditional medicine system for the treatment of burning feet syndrome, colds, diabetes, feminine sterility, fever, malaria, pyrexia, renal colic, skin ailments and sore throat. On the basis of reported traditional uses of *T. stocksianum* Boiss. species, we carried out current experimental work to explore the plant on scientific grounds. In the present phytochemical study, two secondary metabolites (1, 2), were isolated and identified (Figure 1) by NMR spectroscopic studies from the aerial parts of *T. stocksianum* Boiss.



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6<sup>th</sup> National Congress on Medicinal Plants  
9-10<sup>th</sup> May 2017  
Tehran, Iran



221

**EVALUATION OF SOME MORPHOLOGICAL TRAITS IN FIVE IRANIAN  
ECOTYPES OF AJWAIN (*TRACHYSPERMUM AMMI* L.)**

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Ajwain (*Trachyspermum ammi*) is one of the most important medicinal plants, belong to Apiaceae family. The present study was conducted to evaluate some morphological traits in five Iranian ecotypes of ajwain in college of aburaihan, University of Tehran, during 2015-2016 growing season. Experimental design was Latin Squares. The ecotypes were selected from five different regions of Iran including Shiraz, Arak, Hamedan, Karaj and Shahedieh. Investigated morphological traits were include weight of 1000 seeds, plant height, and days to seeds ripening. Differences in plant height and seed ripening were observed among different ecotypes. The results showed significant differences for plant height between Karaj and other investigated traits Karaj ecotype with average plant height of 89.4 cm was the highest ecotype, this ecotype also had significant difference in seed ripening duration (143.2 days) compared with other ecotypes. There was no significant difference among five investigated ecotypes for weights of 1000 seeds.



**STUDY OF HYDROALCOHOLIC INTYBUS CICHORIUM EXTRACT ON MYOCARDIAL ISCHEMIA/REPERFUSION-INDUCED INJURIES IN MALE RATS**

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The cardiovascular protective effects of *Intybus cichorium* extract with phenolic and antioxidant compounds have been demonstrated in certain cardiovascular diseases. The aim of the current study was to investigate the effect of hydroalcoholic *C. intybus* extract on myocardial ischemia/reperfusion in male rats. To conduct this experimental study, 32 rats were divided into four groups of eight each: a control group and three treatment groups treated with 50, 100, and 200 mg/kg *C. intybus* extract. The treatment groups were gavaged for 14 days. Myocardial ischemia was induced by closing left anterior descending (LAD) for 30 min and cardiac function and arrhythmia investigated. Then, the rats underwent reperfusion five day. At completion of reperfusion, hemodynamic factors, infarct size, and antioxidant and biochemical enzymes of all groups were measured. This study demonstrated that treatment with hydroalcoholic *C. intybus* extract caused hypotensive effects and caused decrease in positive chronotropism, negative inotropism with decreased R height especially in 50 mg/kg *C. intybus*-treated group, prevention of increase in ST height, and decreased RR, QTC, and QRS intervals in myocardial ischemia/reperfusion. In addition, the treatments, especially in 50 and 100 mg/kg, caused prevention of T wave decrease and inversion. Treatment with 50 mg/kg *C. intybus* extract caused limitation of infarct size, decrease in arrhythmia prevalence, myocardial ischemia/reperfusion-induced injuries, and increase in antioxidant enzymes, which can be attributed to cardioprotective effects with ischemia-preconditioning due to treatment with *C. intybus* with antioxidant and phenolic compounds particularly quercetin.

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224

ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN GHAYENAT E.IRAN

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Medicinal plants were the first available material for human. Wide range of habitats and rich flora of Iran makes it a precise area for natural medicinal materials. Field studies are necessary to test the traditional beliefs of local inhabitants. Medicinal plants have a main role in the food and daily life of people in Ghayenat. The present paper deals with the medicinal plants used by the people of Gayent for curing different disease. Data gathering was based on interviews with 100 old locals, visiting daily market and studying the available literature. Samplings from different localities were done. In present study 87 species of medicinal plants were recognized in this region. The herbal medicines were prepared from various plant parts of single plant, or multiple plants. The majority of the preparation was made using water as the medium. Most abundant medicinal families are Apiaceae, Lamiaceae and Asteraceae but totally there are 32 families with traditional use in studied region. Plants as *Anethum*, *Thymus*, *Prunus* and *Mentha* are medicinal plants which are used in daily cuisine. *Crocus*, *Peganum* and *Solanum nigrum* are used temporarily to heal stomach pains too. Different use of medicinal plants their effects and conservation points of view are discussed.

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9-10<sup>th</sup> May 2017  
Tehran, Iran



225

**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN ZARAND COUNTY**

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Zarand (Kerman province) is a city with about 11521 Km<sup>2</sup> area. This city is located in the desertified parts of Iran with very low precipitation. Medicinal plants have a main role in the daily life of people in Zarand. The present paper deals with the medicinal plants used by the people of Zarand. As field studies are necessary to test the traditional beliefs of local inhabitants, in present project data were gathered by interviews with 100 old locals, visiting daily market and studying the available literature [1, 2]. Samplings from different localities were done. In present study 70 species of medicinal plants were recognized. The herbal medicines were prepared from single plant or mixed from multiple plants. Most abundant medicinal families are Apiaceae, Lamiaceae and Asteraceae but totally there are 39 edible medicinal plants used in daily life. Fabaceae and Malvaceae have many elements in this area too. Many plants are used in Zarand as distillates. *Origanum* is widely used to cure cold and fever. Different use of medicinal plants their effects and conservation points of view are discussed.

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**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS IN  
PADENAYE SOFLA SEMIROM**

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Semirom is located at southwest of Isfahan province. The average annual precipitation of the location is about 600 mm. Dena protected region is one of the biosphere reserve in Iran. The presence of 128 medicinal plants in Dena protected region showed the importance of this region. Medicinal plants have a main role in the daily life of people in Padenalye Sofla. The present paper deals with the medicinal plants used by the people of Padena. As field studies are necessary to test the traditional beliefs of local inhabitants, in present project data were gathered by interviews with 70 old (50-86 years old) locals, visiting daily market and studying the available literature. 40 female and 30 male were interviewed that most of them were uneducated or low educated people. Plant samples were gathered and identified. The herbal medicines were prepared from single plant or mixed from multiple plants. Most abundant medicinal families are Apiaceae and Lamiaceae. Often leaves and shoots are used in the studied area. Many plants are used in Padenaye Sofla as baked or brewed materials. *Mentha pulegiumis* widely used as carminative and to cure diarrhea. Different use of medicinal plants their effects and conservation points of view are discussed.

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**EVALUATION OF MORPHOLOGICAL CHARACTERS AND ESSENTIAL OIL  
CONTENT IN *SALVIA MULTICAULIS* VAHL. ECOTYPES OF  
HAMEDAN PROVINCE, IRAN**

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*Salvia multicaulis* Vahl. is one of the important unique medicinal plants belong to the Lamiaceae family which is extensively distributed in various districts of Hamedan province, Iran. This research was conducted to investigate diversity of some morpho-physiological properties and essential oil content among 11 ecotypes from this species in Hamedan province. The studied parameters were evaluated at the full flowering stage. Result showed that the most content of essential oil is related to Lashkardar and Gharb ecotypes (2%). The cluster analysis divided these ecotypes into two groups. The result of showed that the positive significant correlations between essential oil content with plant height and inflorescence branches dry matter. The analysis of the variability indicators in *S. multicaulis* ecotypes, originating from the Hamedan of Iran, showed a large variation in morphological traits and essential oil content. This information could be used in future study programs.





**ANTIOXIDANT ACTIVITY OF LEAF *MACLURA POMIFERA*  
WITH THE METHOD DPPH**

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Many free radicals cause disease in humans. Antioxidants neutralize free radical on the one hand reduces the risk of cardiovascular disease and stroke are And on the other hand can stop the progression of cancer. *M. pomifera* The fruit is bitter and inedible and because of its white sap Is very viscous. This tree is native to Texas and had very good growth in Iran. Fruits and leaves are a rich source of polyphenols. The aim of this study was to evaluate the antioxidant properties of the leaves of this tree that grows in Iran have been done. leaves *M. pomifera* on October 2016 the Botanical Garden of Kashan was collected and dried. Then by Soxhlet extraction with methanol was carried out for 4 hours and the extract was concentrated by rotary as much as possible and in a sealed glass jar was kept for further testing. The methanolic extract of the plant was tested for antioxidant activity using scavenging activity of DPPH (1,1-diphenyl-2-picryl-hydrazyl). Absorbance after 30 minutes at concentrations (8, 5, 25, 1, .05, .005, .0005) at 517 nm was read. All measurements were determined in triplicate. The methanol extract of the leaves of this tree is a potential source of natural antioxidants and can alternative to synthetic antioxidants. The methanol extract of the plant mentioned in all concentrations showed antioxidant activity. And also reduce the absorption and thereby increased the percent inhibition of oxidation inhibiting oxidation power to extract proved.

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**THE STUDY OF TOTAL FLAVONOIDES, TOTAL PHENOL AND  
ANTIOXIDANT ACTIVITY OF *MACLURA POMIFERA***

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Recent findings that many human chronic diseases are associated with oxidative stresses have instigated the search for dietary antioxidants. Many phytochemicals, particularly phenolic compounds, have been found to possess strong antioxidant activity and reduce the risks of those diseases. *M.pomifera* The fruit is bitter and inedible and because of its white sap Is very viscous. This tree is native to Texas and had very good growth in Iran. This study was carried out to investigate total flavonoids and phenolic contents and antioxidant activity for methanol extract of *M.pomifera* fruits from Iran, for the first time. The antioxidant activity was performed via DPPH free radical scav-enging method. Results showed the methanol extract of the *M.pomifera* is a potential source of natural antioxidants and can alternative to synthetic antioxidants. *M.pomifera* also contain large amounts of phenolic compounds and flavonoids.

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**RESPONSE OF BLACK CUMIN *NIGELLA SATIVA* L. AND FENUGREEK  
*TRIGONELLA FOENUM-GREACUM* L. TO ADDITIVE SERIES  
OF INTERCROPPING SYSTEM**

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Medicinal plants play pivotal role in human health. Intercropping system is one of the most important strategies for achieving sustainable agriculture goals. The purpose of this research was evaluation of quantitative and qualitative traits of *Nigella sativa* L. and *Trigonella foenum-greacum* L. as medicinal plants, in additive series of intercropping. Field experiment was conducted in research farm of Kurdistan University during spring 2016. Treatments consisted of 100% black cumin + 12/5% fenugreek, 100% black cumin + 25% fenugreek, 100% black cumin + 37/5% fenugreek, 100% black cumin + 50% fenugreek and their monocultures. Experimental design was randomized complete block design with three replications. In this study, different traits consisted of plant height, capsules number per plant, biological yield, grain yield and essential oil content of black cumin and plant height, pod number per plant, biological yield and grain yield of fenugreek and LER were evaluated. The results showed that intercropping treatments had significant effect on traits of both plants. The highest plant height, capsules number per plant, biological yield and grain yield of black cumin were belong to 100% black cumin+ 12/5% fenugreek and the lowest values of mentioned characteristics were belong to monoculture of black cumin. The highest essential oil content was obtained from 100% black cumin+ 50% fenugreek and the highest values of fenugreek traits were belong to it 's monoculture. Such findings were retrieved by other investigators on different medicinal plants in intercropping system. The highest land equivalent ratio was obtained of 100% black cumin+12/5% fenugreek. Therefore, it can be concluded that additive series design of 100% black cumin+12/5% fenugreek was the best treatment in comparison whit the other treatments.

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**USAGE OF MEDICINAL PLANTS IN TREATMENT OF CARDIVASCULAR  
DISEASES IN THE ZARMROOD DISTRICT OF NEKAAN  
ETHNOBOTANICAL PERSPECTIVE**

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Medicinal plants are important element of medical system. Neka County is a traditional and historical region situated in center of Mazandaran province in North of Iran. Zaramrood area is an important region located in this county and the traditional usage of plant species is commonly observed in the region. Nowadays Cardiovascular diseases are regarded as one of the most killer agents in the world. An Ethnobotanical study of plant used for the treatment of this diseases was carried out in the studied area. The study revealed 28 plant species that are used for the treatment of heart disease, high blood pressure, blood sugar, blood fat and blood purifier. These plants belong to 22 genera and 16 families. Rosaceae with 6 species, Lamiaceae with 4 species and Berberidaceae with 3 species are the most abundant and important families respectively. 41% of the plants were used for the management of blood sugar, 25% for high blood pressure, 18% for the treatment of hypercholesterolemia and 16% for the treatment of blood purifier. The most commonly utilized portions of plants for healing purposes include the leaves and fruits. Other part used are roots, stems and seed. The methods of preparation often employed are infusions and decoctions. According to our research the significance reduction of ethnobotanical information have been observed in the area studied. Therefore the comprehensive research surveys in the area are necessary to finding and documenting more useful species.

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**EVALUATION OF ANTIOXIDANT ACTIVITY, TOTAL PHENOLIC, FLAVONOID AND CAROTENOID CONTENTS OF *VERBASCUM* SPECIES FLOWERS COLLECTED FROM WEST AZERBAIJAN**

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*Verbascum*, commonly known as “mullein” is a member of Scrophulariaceae family with 42 species in Iran. Mullein flowers are highly valued herbal drugs used in the treatment of inflammation, asthma, spasmodic coughs and other respiratory tract diseases. *Verbascum* species are rich sources of flavonoids and saponins. Their phenolic compounds are responsible for the anti-inflammatory and antioxidant activity. This study was conducted to determine variations of phenolic, flavonoid and carotenoid contents and antioxidant activity of nine species of *Verbascum* flowers growing in various habitats in West Azerbaijan. The antioxidant activity of methanolic extracts was evaluated using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) and ferric reducing antioxidant power (FRAP) assays. The results showed that total phenolic (7.44 to 21.89 mg GAE/g DW), flavonoid (2.97 to 8.75 mg QE/g DW), carotenoid (1.56 to 5.43 mg/g DW),  $\beta$ -carotene (1.27 to 4.52  $\mu$ g/g DW) and antioxidant activity varied among nine species. Remarkable high antioxidant capacity as evaluated by DPPH (59.78 %) and FRAP (35.68  $\mu$ mol Fe<sup>++</sup>/g DW) assays and high total phenolic and flavonoid content were found in *Verbascum saccatum* flowers. The flowers of *Verbascum songaricum* showed the highest total carotene and  $\beta$ -carotene content. Nine species were classified into three groups based on cluster analysis. The results indicated that *Verbascum saccatum* have unique phytochemical traits that, this could provide valuable potential as natural antioxidant for usage in pharmaceutical and food industries.

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**EFFECT OF GROWTH STAGE ON ESSENTIAL OIL CONTENT AND COMPOSITION OF OREGANO (*ORIGANUM VULGARE* SSP. *VULGARE*)**

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The *Origanum* species, which are rich in essential oils, have been used as spices and in folk medicine of many countries as diuretic, stomachic, antineuralgic, antitussive, expectorant, sedative, stimulant, carminative and antirheumatic. Iranian flora comprises 3 subspecies of *Origanum vulgare* L. (ssp. *viride*, ssp. *vulgare* and ssp. *gracile*), that distributed in the north and northwest of country in various provinces such as Gilan, Mazandaran, Azerbaijan and Kurdistan. Like in any other essential oil bearing plants, one of the most important characteristics of oil accumulation in *Origanum* species is its dependence on the developmental (ontogenetic) stage. In this study the qualitative and quantitative variations in the essential oil of *Origanum vulgare* ssp. *vulgare* plants were evaluated in response to different phenological stages (pre, full and post-flowering). The essential oil of air dried leaves were isolated by hydrodistillation using a Clevenger-type apparatus and analysed by gas chromatography (GC) and gas chromatography–mass spectrometry (GC–MS). The highest (2.29%) and the lowest (1.39%) essential oil content were obtained in full-flowering and post-flowering stages, respectively. In total 22 components were identified and quantified in three phenological stages representing 97.69, 98.22 and 99.06% of the oil, respectively. Carvacrol (33.73%, 39.54% and 38.45%),  $\gamma$ -terpinene (30.83%, 23.22% and 10.27%),  $p$ -cymene (6.18%, 9.83% and 19.12%), methyl ether carvacrol (7.62%, 6.43% and 7.42%) and thymol (4.61%, 3.33% and 9.63%) were the main constituents of essential oils in pre, full and post-flowering stages, respectively. Overall the findings of this study showed to obtain high essential oil and carvacrol content, the plant materials should be harvested at full-flowering stage.

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**EFFECT OF SOIL APPLICATION OF NITROGEN ON SOME QUANTITY  
AND QUALITY CHARACTERISTICS OF PEPPER MINT  
(*MENTHA PIPERITA*)**

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Peppermint (*Mentha piperita* L.) is a herbaceous and perennial plant belonging to the Lamiaceae family. Peppermint's oil is used extensively in food, pharmaceutical and cosmetic industries. To study the effect of rate and source of nitrogen fertilizers on growth, yield and essential oil content of peppermint, a field experiment was conducted in randomized complete block design with 10 treatments and 3 replications. The fertilizer treatments were control (non-application of fertilizer) and three nitrogen fertilizer forms, including of urea, ammonium sulfate and ammonium nitrate were used in three rates (75, 150 and 300 kg/h). The results showed that nitrogen fertilizer have significant effect on growth parameters. Plant height, stem diameter, leaf number, fresh and dry weight of leaves and stems, fresh and dry herb yield were higher in the fertilizer treatments than control. Application of nitrogen fertilizer increased leaf nitrogen content. The highest and the lowest leaf nitrogen content were observed in 300 kg/h of ammonium sulfate and control, respectively. Also the results of this study showed that nitrogen fertilizer have no significant effect on essential oil content, but essential oil yield increased significantly by nitrogen fertilizer application. In total, application of urea in 150 and 300 kg/h, ammonium sulfate in 300 kg/h and ammonium nitrate in 150 kg/h rates were the best treatment for herb and essential oil production of peppermint.

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**THE EFFECT OF NANOPARTICLES OF SILICON DIOXIDE AND ALUMINUM OXIDE ON THE GROWTH CHARACTERISTICS AND PLANT PHENOLIC COMPOUNDS STEVIA**

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In this study the effect of different concentrations of nanoparticles of silicon dioxide and aluminum oxide on some growth characteristics and levels of flavanols, flavonoids and anthocyanins were studied. The explants were then micropropagation in MSFULL without hormone in media containing nanoparticles of silicon dioxide and aluminum oxide concentrations (0,5,10) were cultured and studied traits were measured after a month. The results showed that the highest stem length, many nodes, number of leaves, shoot fresh weight, shoot dry weight, root fresh weight, root dry weight in the control group (no elicitor) was observed. Flavonols and anthocyanins in medium containing the highest concentration of 5 mg/L SiO<sub>2</sub> with 10 mg/L Al<sub>2</sub>O<sub>3</sub> respectively. The results showed that the concentration of 5 mg/L SiO<sub>2</sub> with 5 mg/L Al<sub>2</sub>O<sub>3</sub> increased root length, medium containing a concentration of 10 mg/L SiO<sub>2</sub> with 10 mg/L Al<sub>2</sub>O<sub>3</sub> increase the number of lateral branches, medium containing a concentration of 5 mg/L SiO<sub>2</sub> flavonols and anthocyanins increases and the concentration of 5 mg/L SiO<sub>2</sub> to 10 mg/L Al<sub>2</sub>O<sub>3</sub> with increased flavonoid elicitor was no gender to the environment.



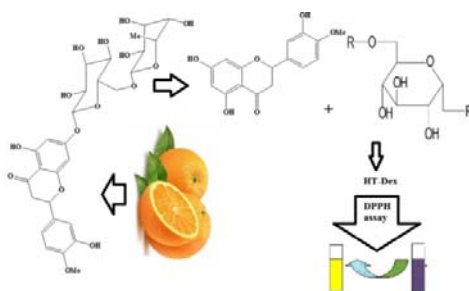


**SYNTHESIS OF DEXTRAN FUNCTIONALIZED WITH HESPERETIN  
A FLAVONOID PREPARATION FROM ORANGE PEEL, AS  
AN ANTIOXIDANT AGENT**

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During fruit consumption's, large quantities of wastes accumulate, however these materials may have some constituents of great significance generate substantial quantities of phenolics rich sub-products, which could be valuable natural sources of polyphenols. Hesperidin is a flavanone glycoside found abundantly in sweet orange peel. Its aglycone form is called hesperetin. hesperetin (HT) is a powerful radical scavenger and it is also a potential anti-inflammatory and anticancer agent. However, until now the low serum stability of hesperetin has limited its clinical application. Recently, among the family of polymer conjugates, flavonoid-polymer conjugates have been proposed for bio-medical applications with the aim to increase the stability of the antioxidant molecule prolonging its duration of action. Dextran (Dex) as polymer has wide range of application in biomedical and pharmaceutical field. In particular, it is readily available, inexpensive, and it can be easily chemically modified. In this work, hesperidin was isolated from orange peel and was converted to hesperetin. Then hesperetin-dextran (HT-Dex) derivative was prepared by free radical grafting reaction between hesperetin and dextran. The chemical characterization of hesperidin, hesperetin and HT-Dex were obtained by UV-Vis, <sup>1</sup>H-NMR and FT-IR analyses. The antioxidant activity of the hesperetin-dextran conjugate was tested by 2, 2-diphenyl-1-picrylhydrazyl (DPPH<sup>•</sup>) radical method. The interaction of the HT-Dex with DPPH<sup>•</sup> resulted in fast decoloration of the DPPH<sup>•</sup> solution. Dextran offers a versatile scaffold to develop highly efficient antioxidant hybrid material, by covalent grafting of hesperetin antioxidant molecule.



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**FUNCTIONALIZATION OF TiO<sub>2</sub> NANOPARTICLES WITH *DIOSPYROS LOTUS*  
L. EXTRACT AND ITS ANTIOXIDANT ACTIVITIES**

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The use of nanomaterials in consumer and industrial products has increased due to their distinctive physicochemical properties, including lower melting temperature, high reactivity and greater solar radiation absorption. In particular, titanium dioxide nanoparticles (TiO<sub>2</sub>NPs) have been used in crop production, food industry, medicine, toothpastes, sunscreens, cosmetics, and waste water treatment. This wide spread use of TiO<sub>2</sub>NPs has inevitably led to harmful biological responses in humans, and animals, particularly in the reproductive system [1]. Modification of metal oxide nanoparticles surfaces by a functionalizing-to antioxidant technique is found to reduce cytotoxicity of them. Medicinal plants play an important role in the lives of people. Many plant extracts show antioxidant/free radical scavenging properties. Date-plum (*Diospyros lotus*L.) is an important medicinal species of ebenaceae family and grows exclusively in the north of Iran. This plant has a long history of folk uses in treating bronchitis, various forms of disease of the bowels, chronic dysentery, and uterine hemorrhag [2]. Herein, TiO<sub>2</sub>NPs were synthesized by a modified sol-gel method. The extract of *Diospyros lotus* fruit was obtained by ultrasonic method and it was grafted on TiO<sub>2</sub>NPs. The structure, morphology and the particle size of the nanoparticles were investigated by Scanning Electron Microscopy (SEM) and X-ray Diffraction. The antioxidant capacities of free TiO<sub>2</sub>NPs and Functionalized TiO<sub>2</sub>NPs (TiO<sub>2</sub>NPs-DL) were determined by reduction of 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical. TiO<sub>2</sub>NPs-DL exhibited higher antioxidant activity compared to free TiO<sub>2</sub> NPs. The results demonstrate the in-vitro properties of TiO<sub>2</sub> NPs-DL in selected tests which enhances its applicability in biomedical and pharmaceutical fields.

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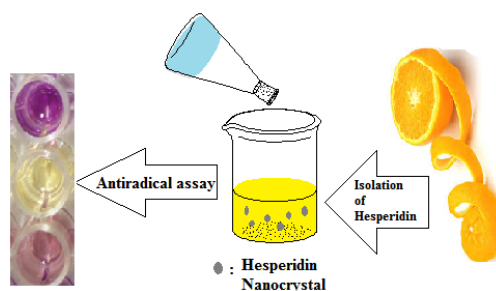


## PREPARATION OF NANO HESPERIDIN: CHARACTERIZATION AND ANTIRADICAL STUDY

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Hesperidin, an abundant and inexpensive bioflavonoid in citrus peel, has been reported to possess a wide range of pharmacological properties such as antioxidant, anti-inflammatory, hypolipidemic, anticarcinogenic and vasoprotective and cholesterol lowering actions. An essential physicochemical feature of hesperidin is its low solubility, especially in aqueous systems. Solubility of a given metabolite is a requirement to enter the systemic circulation and exert a physiological effect. Nano and micronization can be used to enhance flavanone solubility and therefore increase its absorption and the levels detected in plasma [1]. evaporative precipitation of nanosuspension (EPN) is utilized to prepare micro-and-nano sized particles. The advantage of this precipitation method is its simplicity and low setup cost. In this method, the drug is dissolved in a good solvent and precipitated as nanocrystals by rapid addition of the drug solution to the anti-solvent. Nanocrystals can increase the saturation solubility and the dissolution rate of drug particles due to the size and the high surface area to volume ratio [2]. In the present study, hesperidin was isolation and purification from orange peel. Then hesperidin nanocrystal was prepared by the evaporative precipitation of nanosuspension method. The characterization of hesperidin and its nanocrystal were obtained by <sup>1</sup>H-NMR, <sup>13</sup>C-NMR, FT-IR and SEM analyses. The antiradical activity of the hesperidin and its nanocrystal were tested by 2, 2-diphenyl-1-picrylhydrazyl (DPPH<sup>•</sup>) radical method. The result show that DPPH<sup>•</sup> was scavenged when exposed to the hesperidin and its nanocrystal. Also hesperidin nanocrystal more effective than original hesperidin in antioxidant properties.



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ANTIOXIDANT ACTIVITY OF DIFFERENT EXTRACTS FROM THREE  
ORGANS OF *MOMORDICA CHARANTIA*

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Antioxidants are combinations that protect the body against cell membranes injury or cell genetic material damage from free radical activity. Free radicals are the source of many diseases such as cancer and skin aging [1]. *Momordica charantia* Linn. (karela) is an herbal climber grown in tropical and subtropical regions, belonging to the Cucurbitaceae family [2]. It is used in traditional medicine for its antidiabetic, anticancer and antiviral properties [3]. The objective of this research was to study the effects of different solvents (methanol 70%, acetone, ethyl acetate, hexane and chloroform) on antioxidant activities from various extracts of three organs (leaf, root and fruit) of *M. charantia* using three methods of antioxidant assays, which were 2,2-diphenyl-1-picrylhydrazyl (DPPH), Ferric Reducing Antioxidant Power (FRAP) and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). The total antioxidant activity results indicated that, the inhibition percent of methanolic fruit extract was significantly higher than other extract which was 96/24% in DPPH and 26% in H<sub>2</sub>O<sub>2</sub> methods. FRAP capacity of methanolic extract of fruit extracts of *M. charantia* was 3/5 mmol Fe(II)/g dry. The results showed that solvent with different polarity had significant effect on antioxidant activity. *M. charantia*, particularly the fruit, can be a useful source of natural antioxidants.

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**EFFECT OF DROUGHT STRESS ON QUANTITY YIELD AND SOME MORPHOLOGICAL CHARACTERISTICS AND ESSENTIAL OIL OF THYME FOUR ECOTYPES OF THE SPECIES *THYMUS TRANSCAUCASICUS***

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In order to effect of drought stress on quantity yield and some morphological characteristics and essential oil of thyme four ecotypes of the species *Thymus transcaucasicus*, was conducted a greenhouse experiment in badiie engineering research station located in the city of Qom Jafarih during cropping year 2014-2015. The experiment was a factorial experiment in a completely randomized design (CRD) in 6 replications. Experiment treatments were of drought stress in three levels: I1-watering in 100% of field capacity I2-watering in 70% of field capacity I3-watering in 40% of field capacity as first factor and thyme ecotypes in four levels include: E1: (Roodbar Gylan), E2: Tarom Zanzan E3. Quchan Khorasan) E4: Nodoushan Yazd), as second factor were respectively. Traits measured in this study were consisted of shoot height, shoot fresh weight, root dry weight, root dry weight ratio to shoot dry weight, dry matter yield, oil percentage and essential oil yield. Results showed that interaction effect of water stress and ecotypes; except for shoot height was significant on all traits. Mean Comparison of essential oil percentage and dry matter yield showed that the highest dry matter yield in water stress in 70% of field capacity and ecotypes Roodbar was achieved with mean 84.4 kg/ha but highest of essential oil percentage in water stress 40% of field capacity and ecotype Nodoushan Yazd was observed. Based on results it can be conclusion that for achieve to performance maximum and essential, irrigation at 70% field capacity and the use of two ecotypes of Nodoushan Yazd and Rodbar Gylan, is recommended.

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**THE EFFECT OF DROUGHT STRESS ON THE AMOUNT OF PROLINE AND  
ACTIVITIES OF ANTIOXIDANT ENZYMES OF AJOWAN  
(*CARUMCOPTICUM* L.) ECOTYPES IN SEEDLING STAGE**

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Drought is one of the most important factors in limitation of growth and functionality of plants [1]. Ajowan with its various usages in medicine, is one of the most important plants in the Apiaceae family. In order to analyse the effects of drought stress on some physiological traits of endemic ajowan ecotypes, an experiment on 25 ecotypes of ajowan in four treatment of drought stress, including 45%, 55%, 65% and control 100% field capacity in the factorial form in the format of complete random blocks with three replications in the control environment has been conducted. The results of this experiment showed that with the increase in drought stress, the amount of proline in every ecotype has increased. Also activities of peroxidase and catalase enzymes was affected by severe drought stress. With comparison of all ecotypes respecting physiologic traits, it was shown that Ghaen, Boshrevieh, and Sarbisheh 2 ecotypes have the most resistance and Falaverjan, Rafsanjan 2, and Ardebil 4 ecotypes have the least resistance in their seedling stage.

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**EVALUATION OF QUANTITATIVE AND ECONOMIC PERFORMANCE OF  
MEDICINAL HERBS FOR USING CROPPING PATTERN IN SISTAN REGION**

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In order to evaluation of economic and yield of some medicinal plants in cropping pattern of farmers Sistan region, some medicinal plants compatible with climatic conditions include: *Plantago pycnanthum*, *Trachyspermum Copticum*, *Nigella sativa*, *Cuminum cyminum*, *Foeniculum vulgare*, and *Matricaria chamomilla* along crops (Bread wheat, durum wheat and safflower,) were planted in growing season 2015-2016 year in village Keykha located in Hamoon county in plots with space 100 m<sup>2</sup>. According to results yield of medicinal plants, dry flower chamomilla (1000 kg), grain fennel (574 kg), grain fleawort (1321 kg), grain copticum (764 kg), grain black cummin (628 kg) and grain cummin (698 kg) per hectare was identified also grain yield obtained for crops as wheat, durum wheat and safflower yield was 4664, 5104 and 2404 kg/ha. Results of economical evaluation by using Cost-Benefit ratio of index showed that this index were in chamomile (3.8), fennel (3.84), Fleawort (5.3), copticum (4.7), Black cummin (4.7) and cummin (4.6) wheat bread (3.56), durum wheat (4.13) and safflower (3.34), that's mean with every an rial investment in any of the above mentioned medicinal plants caused higher profit for farmers than crops plant. So it can be concluded that the planting of medicinal plants along crops cultivation in Sistan region will be caused production sustainability and increase farmers' income.

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INVESTIGATION OF IN VITRO EFFECTS OF *ERYNGIUM CAUCASICUM* AND  
*ALLIUM PARADOXUM* EXTRACTS ON ANTIGENIC DETERMINANTS  
OF *HELICOBACTER PYLORI*

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*Helicobacter pylori* is a hypothetical causative agent of gastrointestinal ulcer and cancer. Antibiotic therapy has been used for the treatment of *H. pylori* infections. However, antibiotic resistance has been developed in *H. pylori* clinical strains in recent years. In this study the anti-helicobacter effect of the hydroalcoholic extracts of two medicinal plants, *Eryngium caucasicum* and *Allium paradoxum* has been studied by agar dilution method. MIC values were calculated the concentration of the extracts at which no colonies of *H. pylori* was counted on the agar plates. Extraction was done by three times maceration of 50 g of powdered plant materials. Dried extracts were subjected to *H. pylori*, isolated from clinical subjects. The extracts were tested at various concentrations and minimum inhibitory concentrations (MICs) were calculated by a modification of the standard agar diffusion method. The data of urease inhibition assay was analyzed with linear regression analysis. Both *E. caucasicum* and *A. paradoxum* extracts were effective against *H. pylori* isolates (by MIC values of 200 µg/ml and 300 µg/ml, respectively). The plant extracts inhibited urease activity in a concentration-dependent fashion, too. The results indicated that the extracts of two medicinal plants used in this study may contain bioactive components that can efficiently inhibit antigenic determinants of *H. pylori*. The clinical importance of this study should be confirmed in *in vivo* models.

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**LIPID FRACTION OF PERSIAN GULF *SARGASSUM* SPECIES AS  
ANTI-DIABETIC AGENT**

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the therapeutic effects of *Sargassum* sp. may be explained partially by key in vivo and in vitro pharmacological activities of *Sargassum* sp such as anti-cancer, anti-inflammatory, anti-bacterial, anti-viral and anti-diabetic activities [1]. We surveyed lipid fraction of brown algae that showed anti-diabetic activity in vivo study. Persian Gulf brown algae was washed and dried shade for 3 days. 100 g of fine powder was extracted in methanol (1;10W/V), chloroform-methanol (1;1V/V) and chloroform (1;10W/V) respectively. Then combined three extracts and was dried with anhydrous sodium sulfate. Solvents was evaporated under vacuum at 30 °C and lipids fraction was extracted. Organic extract from *Sargassum* sp. Was tested in vivo on glucose level and lipid profile in diabetic rats. Lipid fraction of brown algae have various biological activities, including antiviral and anti-diabetic activities. Weight measurements of each animals was done in normal conditions and treated with organic solvent extract of *Sargassum* sp. of Persian Gulf. The lipid fraction of the brown algae *Sargassum* sp., which is widely distributed in Persian Gulf coasts, was extracted and monitored for their anti-diabetic activities by blood glucose levels[2]. In summary, Persian Gulf lipid fraction purified from *Sargassum* sp. Possesses anti-diabetic effect that can be a possible candidate for the development of new drugs to treat various inflammatory diseases.

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**ESSENTIAL OILS: AN ALTERNATIVE APPROACH TO MANAGEMENT  
OF DAMPING OFF AND WILTING DISEASES IN PLANTS**

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Damping off and Fusarium wilt of melon, caused by *Phytophthora melonis* and *Fusarium oxysporum* f. sp. *melonis* respectively, are important disease affecting melon production in many countries throughout the world. Both pathogens are the soil-borne fungus and survives in the soils as oospores and chlamydospore for several years [1]. Damping off and Fusarium wilt of melonis are an economically important disease in Iran. *Fusarium oxysporum* f. sp. *melonis* invades plant vascular tissues and induces severe wilting of the foliage by blocking xylem transport and impeding the movement of water. But, *Phytophthora melonis* can cause crown, and root rot, and stem and leaf blight disease in melon. In this study, we survey the antifungal activity essential oil of *Bunium persicum* and *Allium sativum* against *Fusarium oxysporum* f. sp. *melonis* and *P. melonis* respectively *in vitro* and greenhouse conditions in different concentration. The *in vitro* test consisted of evaluating the development of colonies of pathogens on Potato Dextrose Agare medium supplemented with the plant essential oils at various concentrations. Also, *in vitro* the median effective concentration (EC<sub>50</sub>) values of plant essential oils was calculated. In greenhouse conditions, pasteurized soil infested with pathogen and the essential oils added to soil surrounding the roots of melon plants. Also, control treatments were carried out. The chemical composition of the essential oils was determined by gas chromatography-mass spectrometry (GC-MS). Also, Data were analyzed using SPSS software. The results showed that *Bunium persicum* essential oil were very effective on *Fusarium oxysporum* f. sp. *melonis*. Maximum and minimum EC<sub>50</sub> values of oil on this pathogen was 341.3 and 217.71. The mean EC<sub>50</sub> values for *Allium sativum* on *P. melonis* was 45.38. Both essential oils were able to inhibit mycelial growth of pathogens. Results of greenhouse indicated that plant essential oils were able to reduce disease severity in melone. The profile of the oil components of *Bunium persicum* showed that  $\gamma$ -Terpinene (24.02%), Cuminaldehyde (20.1%) Para-Cymene (13.09%) were the main compounds. Also, The profile of the oil components of *Allium sativum* showed that Allyl disulfide (26.78%) and Diallyl tetra sulfide (31.32%). Results this research show that application of essential oils of *Bunium persicum* and *Allium sativum* provides significant protection against the soil-borne pathogen consists of *Fusarium oxysporum* f. sp. *melonis* and *P. Melonis* in melon under *in vitro* and greenhouse conditions. These essential oils may be used as alternative for synthetic chemical for integrated management of plant disease.

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**TOTAL PHENOLIC AND FLAVONOID CONTENT AND THEIR ANTIOXIDANT  
POTENTIAL IN DIFFERENT ARIAL PARTS OF  
*GALANTHUS TRANSCAUCASICUS***

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Phenolic and flavonoid compounds are a large group of secondary metabolites commonly found in plants. The phenolic acids commonly derived from shikimic acid, mostly occur in the bound form and their analgesic, antipyretic, cholagogic, sedative and anti-biotic properties are well documented [1]. There are many plants with antioxidant components that act in metabolic response to the endogenous production of free radicals [2]. A local herb, *Galanthus transcaucasicus* (Amaryllidaceae) is known for its alkaloids compounds and treatment of Alzheimer's disease; however, its phytochemical contents have not been fully documented. This study was performed to evaluate the total phenolics and flavonoids as well as their antioxidant properties in different aerial parts (bulb, flower and shoot) of *G. transcaucasicus*. The overall results demonstrated that shoot part contained higher phenolics and flavonoids compared to the bulb and flower with respective values of 4.45mg gallic acid equivalents/g DW and 2.67mg rutin equivalents/g DW. Besides that, the obtained results of the anti-oxidant (using DPPH and FRAP assay) revealed that shoot extracts of *G. transcaucasicus* exhibited higher antioxidant activities compare to bulb and flower. However, these values were lower than the tested anti-oxidant standards. The present research revealed that *G. transcaucasicus* extracts contained high amount of phenolics and flavonoids content and it could be utilized as a natural antioxidant source.

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INVIVO ANALGESIC ACTIVITY OF *CITRUS AURANTIFOLIA* PEEL  
ESSENTIAL OIL.

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*Citrus aurantifolia* popularly named lime, is a native plant in Iran and is distributed in some part of the world. The *C. aurantifolia* essential oil (EO) has been reported to have antioxidant (1,3), antimicrobial (2), antifungal activities (2) and treatment of drug-induced obesity (3). Since Amorim et al., has reported significant analgesic activity of the peel EO of *C. aurantifolia* cultivated in Brazil (4), we were prompted to investigate the analgesic property of the peel EO of *C. aurantifolia* collected from Iran. The EO from peels of *C. aurantifolia* were obtained by hydro distillation using a Clevenger apparatus. The examined EO was analyzed by gas chromatography/mass spectrometry (GC/MS) to determine the possible active components. The anti-nociceptive activity of EO was evaluated using chemical (acetic acid-induced writhing and formalin-induced nociception) and thermal (Eddy's hot plate) models of nociception in male mice. IP administration of EO (5 mg/kg) significantly reduced the writhing number evoked by acetic acid injection as compared to the vehicle group ( $p < 0.001$ ). The dose of 10 mg/kg, i.p., showed a significant increase in reaction time in the hot plate method as compared to the vehicle group ( $p < 0.01$ ). The dose of 5 mg/kg, i.p., resulted in significant inhibition of first phase ( $p < 0.01$ ), while the dose of 10 mg/kg, i.p., inhibited the second phase of formalin-induced licking as compared to the vehicle group ( $p < 0.01$ ). The major components of the oil were characterized as limonene (40.4 %) and  $\beta$ -pinene (16.4 %). These results clearly showed the analgesic effect of *C. aurantifolia* EO. Further studies are suggested to clarify the mechanism of tested EO for the observed pharmacological effects.

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**ELECTROCHEMICAL OXIDATION OF AQUEOUS- METHANOLIC LEAF  
EXTRACT OF *HELIANTHUS ANNUUS* (SUN FLOWER)  
ANTIOXIDANT ACTIVITY IN THE BIOLOGICAL PH**

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Electrochemical measurements have advantages for the determination of antioxidant activity such as their use as a rapid proof of the antioxidant capacity of a lot of organics. The oxidation potentials measured by cyclic voltammetry (CV) have been used to compare the antioxidant strength of compounds such as phenolic acids, flavonoids, cinnamic acids, *etc.* [1,2], being the glassy carbon electrode (GCE) the more frequently used electrode. *Helianthus annuus* (Asteraceae) is an annual plant native to America. [3]. It possesses a large inflorescence. The leaf which is simple, heart-shaped, lobated, and alternate along the stem has been of interest to researchers because of its uses in the treatment of various disease conditions in Nigerian traditional medicine. Its leaf is used by the herbalist for the treatment of diabetes mellitus in Enugu State, Nigeria [4]. In the present work the electrochemical oxidation of aqueous-methanolic leaf extract of *Helianthus annuus* has been investigated by cyclic and differential pulse voltammetry (DPV) techniques. The results show that this extract has strong scavenging capabilities and oxidized at low potentials in comparison of quercetin as a standard antioxidant. Also the effect of extract concentration and scan rates has been studied in the biological pH.

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**VOLTAMMETRIC DETERMINATION OF ANTIOXIDANT CHARACTER IN  
LEAVES AND FLOWERS OF *ALCEA KURDICA* ALEF.  
EXTRACT IN BIOLOGICAL PH**

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Antioxidants help organisms deal with oxidative stress, caused by free radical damage [1]. Such electrochemical determination is fast and cheap and allows making measurements under a variety of experimental conditions. The accuracy of the electrochemical measurements is the same for all the compounds, irrespective of their scavenging activity, the opposite of what occurs in the DPPH<sup>•</sup> test [1]. In the present study the voltammetric response of the Leaves and flowers of *Alcea setosa*(Boiss.) Alef. extract has been investigated in the aqueous solution and various concentrations and scan rates at biological pH. On the other hand the cyclic voltammogram 2,2-diphenyl-1-picrylhydrazyl | 2,2-diphenyl-1-picrylhydrazin (DPPH<sup>•</sup> | DPPH) redox couple has been recorded in the absence and presence of various concentration of extract for evaluation of its antioxidant activity. The results show the good antioxidant activity of the extract and the electrochemical behavior of the constituents in it at glassy carbon electrode.

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**ELECTROCHEMICAL BEHAVIOR AND CYCLIC VOLTAMMETRY FOR  
ASSESSMENT OF ANTIOXIDANT ACTIVITY OF *MALVA SYLVESTRIS L.*  
FLOWERS EXTRACT**

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The antioxidant properties of biological samples, foods, extracts, and pure substances are measured by using different methods involving free radicals, but none provide quantitative information on the relative ease of oxidation, an important factor in antioxidant properties. Compounds which are antioxidants by virtue of their ability to act as reductants in solution tend to be easily oxidized at inert electrodes [1,2]. In the present study, aqueous extract of *Malva sylvestris L.* flower was investigated by cyclic and differential pulse voltammetry techniques in the biological pH at the surface of glassy carbon electrode at various concentrations and scan rates. The results revealed that the extract had an irreversible redox reaction. Oxidation peak currents are linearly dependent on the square root of the scan rate, which is typical of a diffusion controlled electrochemical process. Antioxidant activities of this extract was evaluated using the 2,2-diphenyl-2-picrylhydrazyl (DPPH) radical-scavenging method and it is directly related to its redox potential value. The results show the good antioxidant activity of the *Malva sylvestris L.* flower extract and the electrochemical behavior of the constituents in it, at glassy carbon electrode.

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**THE ROLE OF SALICYLIC ACID ON CHANGES IN PEROXIDASE ACTIVITY IN  
*THYMUS VULGARIS* UNDER DROUGHT STRESS**

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Environmental stress increasing the activation of adaptation and defense responses in plants. It has been proved that the role of salicylic acid (SA) is reasonably important in this mechanism [1]. Salicylic acid as a plant growth regulator plays a significant role in alleviating oxidative stress caused by drought stress in plant cells [2]. The experiment was conducted to determine the effect of SA and drought stress on the peroxidase (POD) activity in *Thymus vulgaris*. At first seed priming with 2mM SA were applied and then two groups of plants (one with SA treatment and other without it) were grown and irrigated normally for one month. After wards, the pots were exposed under 50% field capacity irrigation regime. The experiments were done in randomized complete design. The activity of peroxidase was measured in aerial parts of plants [3]. Although, the peroxidase activity significantly decreased in treatments with SA and combination of drought and SA compared to control, it raised in drought stress. Our results suggested that SA can relieve oxidative tension caused by drought stress in *Thymus vulgaris*.

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**ANATOMICAL STUDIES OF STEM, LEAF, PETIOLE AND ROOT OF  
*ANTHEMIS TINCTORIA* L.**

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The genus *Anthemis* L. (tribe Anthemideae Cass.), the second largest in the Asteraceae family, outnumbered only by *Artemisia* L., consists of more than 210 species. Anatomical features of leaf, petiole, root and stem of *Anthemis tinctoria* were investigated. This study showed the epidermis is serrated shape. Cuticular thickness was 27.5  $\mu\text{m}$ . Trichomes were observed on the adaxial and abaxial surfaces of the epidermis. Trichomes types was glandular and eglandular. Eglandular types had uniseriate base with one to five cells in head. Glandular type was two groups. First type was globular shape, had uniseriate base and a head with one to five secretory cells and second type was straight with stalk having one to three cells and uniseriate base. The mesophyll was unifacial. Stoma was anomocytic type. Stamata length and weight were 12.5 and 15  $\mu\text{m}$ , respectively. Underneath of the epidermis, were located 5 layers of parenchyma cells with 167.5  $\mu\text{m}$  in thickness. The numbers of fiber, phloem and xylem were 3, 4 and (1-4) layers. The thickness of fiber, phloem and xylem was 37.5, 10 and 45  $\mu\text{m}$ , respectively. Petiole had oval shape and single layer epidermis with one to multicellular trichomes. Collenchymas tissue was 4 layers beneath the epidermis. Cortical parenchyma was 5 layers underneath the epidermis. The thickness of parenchyma was 190  $\mu\text{m}$ . The diameter of largest vascular bundle was 200  $\mu\text{m}$ . 1-2 layers of rays existed between vascular bundles. The thickness of pith was 700  $\mu\text{m}$ . In the stem, epidermal cells had rectangular shape with 17.5  $\mu\text{m}$  in thickness. 6 layers of parenchyma cells were located under the epidermal layer, having 85  $\mu\text{m}$  thickness. The diameter of largest vascular bundle was 400  $\mu\text{m}$ . Eglandular and glandular trichome types had one to three cells in stalk and unicellular base. The number of xylem, phloem and fiber were 5, 3 and 7 layers, respectively. 1-3 layers of ray exist between the vascular bundles. The thickness of pith was 1150  $\mu\text{m}$ . This species exhibited bundle sheath extensions with 20  $\mu\text{m}$  thickness. In root, cork was in the external layer of root with 50  $\mu\text{m}$  thickness. Six layers of cortical parenchyma existed under the cork with 150  $\mu\text{m}$  thickness. The diameter of largest vascular bundle was 122  $\mu\text{m}$ . 1-5 layers of ray located between the vascular bundles.

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**ESSENTIAL OIL CONTENT AND COMPOSITION OF *ACHILLEA WILHELMSII* (ASTERACEAE) FROM IRAN DURING DIFFERENT PHENOLOGICAL STAGES**

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*Achillea wilhelmsii*, is the plant belonging to the family Asteraceae in Europe, Turkey, Iran and Central Asia to be found. In this study, in order to survey of the effect of plant growth stages on the color, oil content and composition of essential oil of *Achillea wilhelmsii* C. Koch flowers in May to July 2015 collected inflorescence of this species in the region of Qushchi Col. Essential oil extraction, analysis and identifying the compounds using gas chromatography connected to mass spectrometer (GC/MS) and gas chromatography device (GC) was performed. The results showed that the color of essential oil in May, June and July were yellow, colorless and light green, respectively. Some of the essential oil was allocated to a specific phenological stage and others were found in the essential oil every three months. Also, according to the results of this study, the highest amount of *A. wilhelmsii* flower essential oil composition belongs to monoterpenes including camphor, camphene, Eucalyptol, borneol, bicyclic heptan, thujone,  $\alpha$ -Linalool and 3,7-Octadien-2-ol, 2,6-dimethyl. The highest amount of essential oil belongs to the early flowering stage (1.48 percent).

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**EFFECT OF COPPER ON GERMINATION AND ANATOMICAL STRUCTURE  
OF LEAF AND ROOT IN *HELIANTHUS ANNUS***

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Indiscriminate in human activities such industrial products and using synthetic materials lead to drastically increase in concentration of different heavy metals in the environment. Heavy metal toxicity is one of the major abiotic stresses leading to hazardous effects in plants. Copper (Cu) is widely prevalent and was considered as an essential element for all living organisms including plants but is toxic when present in excess. Cu occurs in the environment as hydrated ionic species, forming complex compounds with inorganic and organic legends. Heavy metal toxic effect on the plants may cause alteration in their metabolic pathways, such as photosynthesis, respiration, growth and modifying plant anatomy. The aim of this work was to study the different toxicity levels of Cu on germination and anatomical structure of *Helianthus annus*. The results indicated that Cu caused reduced germination rate and percentage, plumule and radicle length, plumule and radicle fresh weight, plumule and radicle dry weight. The results showed that Cu lead to a significant increase in mesophyll thickness of leaf, xylem, phloem and paranchyma thickness of root and disturbance in root xylem arrangement.

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**THE STUDY OF SEED PRIMING ON GERMINATION STAGE IN *ANETHUM GRAVEOLENS* UNDER DROUGHT STRESS**

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In order to study the effect of priming and osmotic potential in *Anethum graveolens*, this experiment was conducted at the laboratory of medicinal plants, University of Tabriz, using a completely randomized factorial design with three replications. The factors were including drought stress (0, -1.5, -3 bar), hydropriming and osmopriming (0, -1.5, -2.5 bar prepared by PEG 6000). The results showed that drought stress had significant effect ( $p < 0.05$ ) on percent and rate of emergence, radicle and plumule length. Increasing drought stress to -3 bar led to decrease in all germination parameters. Plumule length reduced significantly with increasing drought stress, but radicle length increased by increasing drought. Mean germination time increased under drought stress mainly in non-primed seeds. The highest percent and rate of emergence was observed in osmopriming (-2.5 bar) without any drought. In primed seeds (-2.5 bar) when it was exposed to high drought stress, radicle length and rate of emergence showed a decrease as compared to the control. According to the results hydro and osmo-priming can improve germination parameters under mild drought stress conditions.

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**USING PLANT ESSENTIAL OILS AGAINST STRAWBERRY  
ANTHRACNOSE DISEASE**

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Strawberry anthracnose disease, caused by *Colletotricum acutatum* is important disease affecting strawberry production in many countries. It is an economically important disease in Iran. The fungi caused rot of strawberry fruit and is characterized by large, sunken lesions that render the fruit unmarketable. Also, lesions can occur on all parts of the plant, including the stolon, petiole, leaf, flower, crown and root [1]. Excessive application of chemical fungicide can negatively impact human health and the environment and may lead to an increased risk of developing pathogen-resistant population [2]. In this study, we survey the antifungal activity essential oil of *Achillea millefolium*, *Salvia officinalis* and *Mentha longifolia* against *C. acutatum* *in vitro* in different concentration. The *in vitro* test consisted of evaluating the development of colonies of pathogens on Potato Dextrose Agar medium supplemented with the plant essential oils at various concentrations [3]. Data were analyzed using SPSS software. Three essential oils significantly reduced the mycelial growth of pathogen in culture media. The results showed that *M. longifolia* and *A. millefolium* proved to be the first and second most effective in inhibiting mycelial radial growth of the pathogen respectively, followed by plant essential oil of *S. officinalis*. Essential oil of *M. longifolia*, *A. millefolium* and *S. officinalis* in concentration 600, 1000 and 1300 ppm showed potent inhibitory effect on the radial growth of *C. acutatum* 91.3%, 55.55% and 60.85% respectively. In addition, plant essential oils were effective in inhibiting fungal viability and spore germination, so morphological changes of fungal hyphae were observed under light microscope. Also, the results showed that all essential oils have fungistatic effect on *C. acutatum* and cause inhibition of fungal growth. In conclusion, our results indicated that application of these essential oils provides significant protection against the strawberry anthracnose disease. This research is first report of effect these plant essential oils on this disease. Hence, further studies are needed to develop strategies for practical application in greenhouse and fields in order to control the strawberry anthracnose.

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## THE USE OF NATURAL GUM IN FORMULATION OF SOLID DOSAGE FORM OF FERROUS SULFATE AND ITS PHYSICOCHEMICAL CHARACTERIZATION

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Iron deficiency is the most common nutritional deficiency worldwide. The main method for treatment of iron deficiency anemia (IDA) is the use of iron containing medicines. Ferrous sulfate is the oldest form of iron preparations which has been used for IDA but causes upset stomach, allergic reaction and constipation. In new preparation, it has been tried to formulate in sustained release formulation for reducing the GI disturbance. The gums are from plant secondary metabolites which contain hydrophil-lipophil function groups can make hydrogels in suitable conditions and so prepare a matrix for loading drug molecules and sustained release formulations. Zedu gum is a non-starch polysaccharide and water-soluble hydrocolloid exudate gum which naturally secretes from the plants of Rosaceae family. The purposes of this research is the use of Zedu gum as a natural source for introducing a new preparation containing ferrous sulfate as a sustained release formulation and study its physicochemical characteristics. At the first, hydrogel was prepared from Zedu gum, ferrous sulfate and ascorbic acid was added, homogenized and lyophilized to give a powder. The powder was granulated by wet granulation method and was pressed. Release studies were done as described in USP pharmacopoeia. Physicochemical characteristics of Zedu gum, fungal and microbial contamination of pressed tablet and their stability was studied. Zedu gum showed suitable loading of ferrous sulfate and a good releasing control and be a good matrices for sustained release formulation. On the basis of obtained results, formulation containing 51.16% Zedu gum was selected as the best formulation.



**CHEMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY OF ESSENTIAL OIL  
OF *ARTEMISIA ANNUA* L. FROM NORTH OF IRAN IN CORN OIL**

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*Artemisia* genus is an important medicinal plant in Iran. Recent investigations have shown that the antioxidant properties of plants could be correlated with oxidative stress defense and different human diseases [1]. *Artemisia annua* L. is an annual plant belongs to *Asteraceae* family that has been used by Chinese herbalists for more than two thousand years in the treatment of many illnesses, such as skin diseases and malaria. *A. annua* L. is an essential oil bearing medicinal plant that its essence has these medical effects. For production purposes, plants with high quality essence content are required [2]. Essential oil of spices, herbs, and other plant materials rich in polyphenolics are increasingly of interest to the food industry because they have the capacity to retard oxidative degradation of lipids and thereby improve the quality and nutritional value of food [3]. The present study investigated the chemical composition of the essential oil (E.O) extract with cleverger device from aerial parts (flowering stage & leaves) of *Artemisia annua* L. by gas chromatography-mass spectroscopy (GC-MS). In total, many compounds were recognized, accounting for 98.27% of the E.O. The major constituents of the E.O were  $\alpha$ -pinene (11.1%), 1,8-Cineole (16.21%), Artemisia ketone (7.02%), Camphore (19%), Germacrene D (4.6%), Camphen (2.1%), Pinocarvone (8.75%), Artemisia alcohol (6.90%),  $\beta$ -Selinene (6.88%) and  $\beta$ -Caryophyllene (4.96%). In addition, the antioxidant activity of the E.O was tested. Antioxidant activity was measured by the ability of the E.O to scavenge 1,1-diphenyl-2-picrylhydrazyl (DPPH) radicals. The antioxidative activity has been assessed by methods: free radical scavenging assay with DPPH, inhibition of the lipid peroxidation with the TBA and Proxide test on Corn oil. TBHQ was taken as positive control. Due to this results the E.O of *Artemisia annua* L. could be a valuable raw material for natural antioxidant additives.

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**CHEMICAL COMPOSITION AND ANTIOXIDANT ACTIVITY OF ESSENTIAL OIL  
OF *ACHILLEA SANTOLINA* L. FROM NORTH OF IRAN IN SESAME OIL**

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*Achillea* (Yarrow) is one of the most important genera of the Asteraceae family. Nineteen species of this genus are found in Iran, among which seven are endemic. Bumadaran is a popular name for several species of *Achillea* in Persian language. They have been used as anti-inflammatory, anti-spasmodic, diaphoretic, diuretic, emmenagogic agents and for treatment of hemorrhage, pneumonia, rheumatic pain and wounds since antiquity [2]. *Achillea santolina* L. is a plant species in the genus *Achillea* of the sunflower family (Asteraceae). *Achillea santolina* perennial medicinal herb belonging to the Asteraceae family has a relatively wide distribution in different parts of Iran [3]. Essential oil of spices, herbs, and other plant materials rich in polyphenolics are increasingly of interest to the food industry because they have the capacity to retard oxidative degradation of lipids and thereby improve the quality and nutritional value of food [4]. The present study investigated the chemical composition of the essential oil (EO) extract with Clevenger device from aerial parts (flowering stage and leaves) of *Achillea santolina* by gas chromatography-mass spectroscopy (GC-MS). In addition, the antioxidant activity of the EO was tested. Antioxidant activity was measured by the ability of the EO to scavenge 1,1-diphenyl-2-picrylhydrazyl (DPPH) radicals. In total, many compounds were recognized, accounting for 97.62 % of the EO. The major constituents of the EO were Camphor (19.35 %), 1-8 Cineole (13.18 %), Fragranol (10.26 %), Fragranol acetate (18 %), Caryophyllene oxide (7.34 %), p-Cymene (3.11 %),  $\alpha$ -Pinene (2.62 %), Terpinen 4-ol (5.81 %). The antioxidative activity has been assessed by methods: free radical scavenging assay with DPPH, inhibition of the lipid peroxidation with the TBA and Proxide test on Sesame oil. TBHQ was taken as positive control. Due to these results the EO of *Achillea santolina* could be a valuable raw material for natural antioxidant additives.

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**EXTRACTION OF NICOTINE AND ANTIOXIDANT FATTY ACIDS FROM IRAN  
TOBACCO WASTE**

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Alkaloids and fatty acids are components found in tobacco. Nicotine is the major alkaloid and widely used due to its pharmacological properties in medical applications. Several groups of fatty acids are considered to inhibit oxidative stress. In this study, alkaloids and antioxidant fatty acids were extracted from Tobacco dust/waste received from the SURAK factory (IRAN) using an alkaline solvent. Next n-hexane was added and nicotine and fatty acids separated by liquid-liquid extraction. Extracted compounds were identified by using GC / MS. The results indicate the high purity nicotine extraction is 99% and antioxidant fatty acids from tobacco waste. Extracted Fatty acids compounds via hexane showed antioxidant compounds similar to Linoleic acid, Linolenic, n-Hexadecanoic acid, ascorbic acid and palmitic acid. These compounds are used as antioxidants in cancer prevention and health industry Beauty.

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**STUDY OF CHEMICAL COMPOSITION OF DIFFERENT POPULATIONS OF  
*SALVIA VERTICILLATA* L. IN IRAN**

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*Salvia verticillata* L. is a medicinal plant of Lamiaceae family that has been distributed in different regions of Iran. The aim of the present study was to compare the chemical composition of essential oils isolated from three main regions at full flowering stage in Iran (Tehran-Lavasan, Chalus-Sira village and Firouzkouh-Tangehvashei) by hydro-distillation method. Analysis of the isolated oils by GC and GC-MS revealed the presence of 19 different components represented mainly by E-caryophyllene, (E,E)- $\alpha$ -farnesene,  $\alpha$ -humulene, spathulenol, germacrene D, bicycogermacrene and  $\alpha$ -eudesmol. The results of analysis of variance based on CRD design showed that there are significant differences between locations and their individual characteristic for all the measured essential oils ( $P < 0.01$  and  $0.05$ ). The highest number of compounds were found at Firozkoh region in full flowering stage with 19 compounds. The highest yield of E-caryophyllene oil were found at Chalus region in full flowering stage with 41.0%. The highest compound amount of (E,E)- $\alpha$ -farnesene was found at Tehran region in full flowering stage with 29.1%.



**RURAL DEVELOPMENT BY HERBAL PLANT: A STRATEGY FOR POVERTY ALLEVIATION IN YAZD VILLAGES**

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Rural Development in Iran is one of the most important factors for the growth of the rural population growth. Unfortunately, most of village especially in central area of Iran are encountering with water deficiency, which this cause to immigrate to cities. The commercial value of medicinal plant products in the global market is very high provided the quality is maintained at a high level with consistency from harvest-to-harvest and lot-to-lot. The quality control measures can be achieved by educating rural folk with a team of experts on methods of cultivation, harvesting techniques and warehousing techniques. Farmers in rural areas can produce or collect high quality plant components provided they receive appropriate direction, receive attention and gain knowledge from the experts in various fields. In order to increase the growth of agriculture, the Government has planned several programs pertaining to Rural Development. The basic objectives of our research was to alleviate poverty and unemployment through creation of basic and economic infrastructure, provision of training to rural unemployed youth and providing employment to marginal Farmers/Labourers to discourage seasonal and permanent migration to urban areas. During 2015-2016, local communities were arranged in various chain of herbal plant in 4 cities includes: Bafgh, Meybod, Abarkouh and Ardakan. Constitute of herbal plant pilots in order to Educational and cultural purposes and also establishment of home-jobs by local communities were the results of our study.



**EFFECTIVE AND USEFUL DIETS OF SOYA ON TRIGLYCERIDE AND  
CREATININE LEVELS IN FEMALE MICE**

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Medicinal plants due to their easier access, fewer side effects, cost effectiveness and less toxic effects are considered as an ideal alternative for chemical agents. The large number of deaths occurs due to –cardiovascular diseases that could be because of animal fat consumption. Soybean is a widely used vegetable seed. 110 immature female Balb/c mice three weeks of age were randomized, into eleven groups of 10 animals each based on following diets: 1) low protein, 2) full protein without soybean, 3) full protein with 20% soybean, and 4) full protein with 40% soybean, for three months. The animals received their diet orally on a daily basis for three and six months. At the end of the study period, the blood samples were collected and glucose and TOP levels were measured. The data were analyzed with SPSS software using one-way ANOVA and Tukey’s test. In the groups that received 20% and 40% soybean diet, creatinine level showed meaningful decrease ( $p < 0.01$ ). However, the mean value of triglyceride did not show significant change among experimental groups ( $p < 0.01$ ). Results of the present study indicated that soybean as a cost effective protein could be suitable replacement for animal protein and soybean may have beneficial effects on health like reduction of creatinine levels. Due to presence of low amounts of the methionine in soybean protein, it can reduce the serum creatinine levels.

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**THE EFFECT OF DIFFERENT TREATMENT HYDROPRIMING AND OSMOPRIMING ON SEED GERMINATION AND SEEDLING GROWTH OF *SATUREJA HORTENSIS* L. AT DIFFERENT TEMPERATURES**

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Savory plant with the scientific name (*Satureja hortensis* L.) belongs to the family Lamiaceae and is native to southern Europe, where the wild in Asia, including Iran also seen in abundance. Drought in Iran is one of the adverse environmental factors, which affect the germination and growth stage shows. Savory seed seedling growth experiment based on randomized complete block design with three factors (stress, priming and temperature), with polyethylene glycol 6000 was conducted. Tensions rise, attributes such as rate and percentage of germination, seedling dry weight, seedling length and vigor index decreased, but the number of sub-rooted tensions increased and then decreased 3 times. The interaction of water stress and osmotic potential of priming on germination, seedling dry weight, number of secondary roots and vigor index were significant. Priming at a temperature of 15 ° C, the most positive impact on traits in non-stress and tension was 3 times. Osmo-primed treatments significantly increased seedling length and number of lateral roots and longest roots in the treatment of 5 bar and a temperature of 25 ° C, respectively. The results show that the studied traits in seeds that were primed at a lower temperature was better.

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**EFFECTIVE AND USEFUL DIETS OF SOYA ON LIVER ENZYMES LEVELS  
IN FEMALE MICE**

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Nowadays, advances in the medical field has controlled many diseases and has ended up rise of life expectancy. Since a large number of plants are used in herbal medicine, the study of the effects of plants could be very beneficial in the treatment of diseases. 110 immature female Balb/c mice three weeks of age were randomized, into eleven groups of 10 animals each based on following diets: 1) low protein, 2) full protein without soybean, 3) full protein with 20% soybean, and 4) full protein with 40% soybean,. The animals received their diet orally on a daily basis for three and six months. At the end of the study period, the blood samples were collected liver enzymes and some Ions were measured. The data were analyzed with SPSS software using one-way ANOVA and Tukey's test. Results: In the groups that received 20% and 40% soybean diet, the mean values of ALT, AST, and ALP did not show significant change among experimental groups ( $p < 0.01$ ). Results of the present study about the level of these enzymes indicating that soy protein cannot cause liver damage and soy protein did not influence hepatic enzymes.

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**STUDING OF PHYSIOLOGY AND BIOCHEMICAL PARAMETERS IN  
*FERULA GUMMOSA* L.**

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Galbanum (*Ferula gummosa* L.) is a perennial monocarpic plant that bears only rosette leaves in the first year but produces stems, flowers and fruit in the last year of its life, following which the roots rot and the plant dies. Root nodes are rich in a gum resin called galbanum or yellow gum that, in addition to its use for curing digestive problems (intestinal gas, poor appetite), has numerous pharmaceutical and industrial properties including its antispasmodic, analgesic, disinfectant, laxative, anti rash, anti-influenza, and antioxidant feature, and its applications in industry include production of adhesives for gluing precious gemstones such as diamonds and production of hygienic and cosmetic products and stabilizers for perfume and cologne. This research intended to assess contents of proteins, antioxidant enzymes, and malondialdehyde (MAD) in galbanum plants of various ages that were collected in Semnan Province by using a spectrophotometric method. Results indicated that the content of proteins reached its maximum in the leaves of eight-year-old plants when they entered the reproductive phase and the minimum in two-year-old plants. Moreover, the largest contents of the antioxidant superoxide dismutases (SOD) were found in the roots of four-year old plants and the smallest in the leaves of eight-year old plants. Furthermore, peroxidase (POX) reached its maximum content in the leaves of two-year old plants and its minimum in the other vegetative periods (declining to zero in the gum). Catalase (CAT) shifted towards negative potential values in the roots of two- and eight-year-old leaves, in the leaves of four-year-old plants, and when the plants entered the reproductive phase, but it had positive potential values in the other growing periods. Finally, the plants exhibited the highest MAD concentrations in the gum and leaves of eight-year old plants.

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**CHANGES IN TRIGONELLINE CONTENT OF TOW POPULATIONS OF FENUGREEK (*TRIGONELLA FOENUM- GRAECUM* L.) UNDER DROUGHT STRESS APPLIED BY POLYETHYLENE GLYCOL 6000**

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Fenugreek (*Trigonella foenum-graecum* L.) is an annual medicinal plant belongs to the legume family and has anti-diabetic, anti-fertility, anticancer, anti-microbial, anti-parasitic and hypocholesterolaemic effects. To study of the effect of drought stress on trigonelline content in tow populations of fenugreek. The fenugreek seeds obtained from Agricultural Research Center of Isfahan, then sterilized by Sodium hypochlorite 7% for 10 minute , planted in the media consist of perlite under controlled condition (temperature 30±5 , relative humidity 60±10% and the light flux 1400-1200 lux). The uniform plants transfer to hydroponic culture consist of Hoagland solution for 7 days then moved into Hoagland solution contain different concentration of polyethylene glycol (PEG) 6000 as drought treatment with water potentials of 0, -3, -5 and -7 Bar in such away to have a random block design with 3 replicates. For measurement of trigonelline in the fenugreek samples, the Zheng and Ashihara method was modified. The samples were ground with 80% methanol and magnesium oxide (MgO) in a mortar and pestle. After incubation at 60°C for 30 min, the homogenates were centrifuged and the supernatant was collected. After complete evaporation of methanol, the methanol-soluble extracts were dissolved in distilled water. The samples were filtered using a disposable syringe filter unit and the aliquots were used for determination of trigonelline (TG) by HPLC. The result of our analysis demonstrated increasing drought stress increased concentration of trigonelline in both hendi and isfahani populations of fenugreek so that the most concentration of trigonelline found in -7 Bar level of drought stress and the least of that found in control samples. Metabolic changes in response to drought conditions highlighted pools of metabolites that play a role in the adjustment of metabolism and physiology of the fenugreek populations to meet drought effects. Trigonelline as secondary metabolites is produced from Nicotinamide Adenine Dinucleotide (NAD). Accumulation of trigonelline correlated with the decline in leaf water, osmotic and turgor potentials. Scholars have reported many physiologic roles in plant for this metabolite such as resistance to biotic and abiotic stresses and the maintain operating of turgor pressure. In this study trigonelline increased as the factor for resistance to drought stress.

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**APOPTOSIS INDUCTION IN ACUTE MYELOID LEUKEMIA CELL LINE BY  
A LECTIN DERIVED FROM URTICA DIOICA**

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Lectins are carbohydrate-binding proteins, found in many organisms and can affect many cellular functions through carbohydrates [1]. *Urtica dioica* agglutinin (UDA) is a lectin derived from Stinging nettle. Herein, the effect of UDA on HL-60, an acute myeloid leukemia cell line, was evaluated. HL-60 cell line (*Human promyelocytic leukemia cells*) was used to study effect of UDA isolated from rhizomes and roots of *Urtica dioica* by affinity chromatography on chitin. The cells were treated with different concentration of UDA in 72 hours. Apoptosis was determined using annexin V/PI staining by flow cytometry. The results showed UDA was potent in inducing dose-dependent apoptosis in HL-60 cells after 72 hours. Here for the first time, the data demonstrated that UDA plays a role in apoptosis induction in AML cell line HL-60. The data could address for further investigation on UDA as a new medications on AML.

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**CHANGES OF ANTI-OXIDATIVE CAPACITY AND PHENOL CONTENT AMONG 9 BLACKBERRY AT MATURATION STAGE**

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*Rubus* species in Iran often are probably of relatively young origin and confined to special small areas(1,2). In Iran, the latest report showed 8 species include *R. saxatilis* L., *R. caesius* L. and *R. sanctus* Schreber (belonging to hyrcanian or Caspian), *R. hirtus*, *R. hyrcanus*, *R. dolichocarpus*, *R. discolor* and *R. persicus*(3). *Rubus sanctus* is a blackberry species which is widely distributed in Iran from the wet climate in the north (Caspian Sea) to the cold climate in the west and even to some semi-arid climates in the southwest of the country(4). The present work aimed to compare the fruit antioxidant activity and nutritional value of 9 genotypes of this species growing in 2 sites located in different climatic conditions, of Iran. Plant samples were collected from blackberry collection in Shiraz-Bajghah. The genotypes of these collection were collected in 2011 from 4 different species and cultured in research field at Department of Horticultural Science, School of Agriculture, Shiraz University, Shiraz, Iran. Fruits are harvested in ripe stage (black color). Blackberry species studied, included 9 genotypes of *R. sanctus*. The chemical traits of the juice were also measured, precisely the amount of total phenol, total flavonoid, total flavanone. Results showed variability between fruits collected in the two parts of the country. highest phenol was found in the southern region. total flavonoid did not present significant differences between the two regions. The highest amount of anthocyanin and flavanone were also related to samples of the southern region but the highest amount of antioxidant activity was related to samples of the northern area. was detected for Sanandaj and NamakAbrood, both produced in black and red stage. Different cultivars grown in the same region/season consistently showed differences in antioxidant capacity. There was effect of harvest season on phenolic levels. We conclude that levels of total flavonoid, flavanone, antioxidant capacity, and polyphenols mainly depended on the genotype and the climate or the season.

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**TOTAL PHENOL AND FLAVANONE COMPOUNDS IN 3 DIFFERENT SPECIES  
OF BLACKBERRIES FRUIT AT DIFFERENT RIPE STAGE**

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Plants are sustainable sources of bioactive compounds which can be used for different applications, for instance as food additives, functional food ingredients and as nutraceuticals [1]. During recent years, interest in identifying new possible sources of natural antioxidants and other health promoting compounds has increased. blackberry is a temperate soft fruit crop particularly rich in different antioxidants with health promoting properties (2). The compounds mainly contributing to the antioxidant capacity of blackberry are ascorbic acid and phenolic compounds such as flavonoids and phenolic acids (3). there is no previous information about the content of phenolic compounds in relation to the ontogenetic development and time during the growing season. Hence the objective of the present study was to assess the composition and quantitative level of phenolic compounds in blackberry fruit collected from the different stage maturation (green, red, black) at during a growing season from 3 species. A range of blackberry cultivar from *sanctus*, *persicus* and *hirtus* harvested in different seasons and stage were collected to determine their antioxidant capacity using DPPH assays. Total flavonoid and flavanone, total phenols, and total anthocyanin, as well as the correlation between all these parameters, were determined for all treatments. The total flavonoid varied from *persicus* (593.663mg/100g dry weight) in green fruit to *sanctuse* (321.268mg/100g dry weight) in black stage. *hirtus* and *persicus* (88.502-86.425) did not exhibit any significant differences in flavanone at green stage harvest (highest values) and relatively lowest flavanone levels were recorded for *sanctus* (49.1806) at black treatments. Sanctus at green stage (326.526) the highest values for phenol content. Antioxidant capacity values was detected for *hirtus* then *persicus* and *sanctus*, in black and red stage. Different cultivars grown in the same region/season consistently showed differences in antioxidant capacity. There was effect of harvest season on phenolic levels. We conclude that levels of total flavonoid, flavanone, antioxidant capacity, and polyphenols mainly depended on the genotype and the climate or the season.

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**CHANGES OF ANTI-OXIDATIVE CAPACITY AND PHENOL CONTENT AMONG  
4 *R.SANCTUS* GENOTYPES AT DIFFERENT RIPE STAGE**

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Free radicals contribute to more than one hundred disorders in humans including atherosclerosis, arthritis, ischemia and reperfusion injury of many tissues, central nervous system injury, gastritis, cancer and AIDS (1,2). Free radicals due to environmental pollutants, radiation, chemicals, toxins, deep fried and spicy foods as well as physical stress, cause depletion of immune system antioxidants, change in gene expression and induce abnormal proteins. Oxidation process is one of the most important routes for producing free radicals in food, drugs and even living systems. Berry crops, specifically blackberry fruits, are significant sources of polyphenolic compounds in the human diet (3). *Rubus*, commonly known as blackberry, is one of the most diverse genera in the plant kingdom with approximately 740 species. Fruits of the *Rubus* species are a rich source of anthocyanin and other polyphenolic antioxidants (4). Plant samples were collected from blackberry collection in Shiraz-Bajghah. Fruits are harvested in different ripe stage (green, red, black color) of *R.sanctus*. A range of blackberry fruits genotypes harvested in different seasons and stage were collected to determine their antioxidant capacity using DPPH assays. Total flavonoid and flavanone, total phenols, and total anthocyanin, as well as the correlation between all these parameters, were determined for all treatments. The total phenol varied from 320.7 to 234.15 mg 100g<sup>-1</sup> in the extracts. Flavonoid contents were between 594.835 in green stage and 48.59 mg 100g<sup>-1</sup> in black stage. The total flavanone varied from 74.1 to 289.5 ± 5 mg 100g<sup>-1</sup>. Total phenol in green stage of Sanandaj to 234.152 in black stage from Babolsar. Oroumeh and NamakAbrood, Baolsar genotype did not exhibit any significant differences in phenol at black stage harvest. The highest concentration of flavonoid was recorded for NamakAbrood at green stage and relatively lowest flavonoid levels were recorded for Babolsar at black treatments. Oroumeh at green stage the highest values for flavanone and anthocyanin content. antioxidant capacity values in the extracts 1,1-diphenyl-2-picryl hydroxyl (DPPH) radical scavenging effect was determined Spectrophotometrically. it was detected for Sanandaj and NamakAbrood, both produced in black and red stage. Different cultivars grown in the same region/season consistently showed differences in antioxidant capacity. There was effect of harvest season on phenolic levels. We conclude that levels of total flavonoid, flavanone, antioxidant capacity, and polyphenols mainly depended on the genotype and the climate or the season.

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**CHANGES OF ANTI-OXIDATIVE CAPACITY AND PHENOL CONTENT AMONG  
9 BLACKBERRY AT MATURATION STAGE**

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*Rubus* species in Iran often are probably of relatively young origin and confined to special small areas (1,2). In Iran, the latest report showed 8 species include *R.saxatilis* L., *R.caesius* L. and *R.sanctus* Schreber (belonging to hyrcanian or Caspian), *R.hirtus*, *R.hyrcanus*, *R.dolichocarpus*, *R. discolor* and *R.persicus* (3). *Rubus sanctus* is a blackberry species which is widely distributed in Iran from the wet climate in the north (Caspian Sea) to the cold climate in the west and even to some semi-arid climates in the southwest of the country. The present work aimed to compare the fruit antioxidant activity and nutritional value of 9 genotypes of this species growing in 2 sites located in different climatic conditions, of Iran. Plant samples were collected from blackberry collection in Shiraz-Bajghah. The genotypes of these collection were collected in 2011 from 4 different species and cultured in research field at Department of Horticultural Science, School of Agriculture, Shiraz University, Shiraz, Iran. Fruits are harvested in ripe stage (black color). Blackberry species studied, included 9 genotypes of *R.sanctus*. The chemical traits of the juice were also measured, precisely the amount of total phenol, total flavonoid, total flavanone. Results showed variability between fruits collected in the two parts of the country. highest phenol was found in the southern region. total flavonoid did not present significant differences between the two regions. The highest amount of anthocyanin and flavanone were also related to samples of the southern region but the highest amount of antioxidant activity was related to samples of the northern area. was detected for Sanandaj and NamakAbrood, both produced in black and red stage. Different cultivars grown in the same region/season consistently showed differences in antioxidant capacity. There was effect of harvest season on phenolic levels. We conclude that levels of total flavonoid, flavanone, antioxidant capacity, and polyphenols mainly depended on the genotype and the climate or the season.

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**EFFECT OF GROWTH SEASON AND HEAT STRESS ON ANTIOXIDANT ENZYMES AND ANTIOXIDANT ACTIVITY IN BLACKBERRY (*RUBUS SANCTUS*) PLANT**

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current climate models indicative a gradual increase in temperature, and it is predicted global warming, an average of 1.4–4.3 °C during the next century. in the near future the high temperatures in addition to the heat stress will be causes other abiotic stress, such as salinity and droughts, that could threaten plant growth and development and limit plant production (1). As a result, 82% of area of Iran is arid and semi-arid which includes most of southern and central parts of Iran with high temperature that sometimes range up to +50°C. High temperature is limited the growth of blackberry such as oxidative stress and physiological damage. Reactive oxygen species can cause lipid peroxidation and in turn damage cell membranes and the photosynthetic apparatus, leading to degradation of chlorophyll. blackberry is one of the most important sources of antioxidants, such as carotenoids, phenols, flavonoids, vitamins, and dietary glutathione. These antioxidants are capable of acting as free radical scavengers, peroxide decomposers, singlet and triplet oxygen quenchers, enzyme inhibitors and synergists. The purpose of this study was to determine the changes in the activities of antioxidant enzymes and antioxidant capacity in blackberries at different growth stage and temperature in leaf and stems of Sanctus cultivar. This genotype was collected in 2011 and cultured in research field at Department of Horticultural Science, School of Agriculture, Shiraz University, Shiraz, Iran. The date of the collecting the samples were at the June, Aguste, October when the average temperature was 30,38 and 26°C. This research was conducted during 2015 to 2016. The results showed that heat stress decreased carotenoid in steams, but increased the amount of flavone and flavonoids and other antioxidant compounds in both of leaf and steams. The results also showed that the antioxidant enzymes were significantly influenced antioxidant capacity increase. also, we reported the anti-oxidative results of different stage, in activities of POD, SOD, CAT and antioxidant capacity as follows: in Aguste, whose activities of anti-oxidative enzymes (POD, SOD, CAT) were higher and antioxidant capacity was highest and in October anti-oxidative enzymes (POD, SOD, CAT) and antioxidant capacity were lowest. So, it can be concluded that the antioxidant enzyme could be an effective regulator of stress which increases the amount of antioxidant capacity and compounds such as phenols and flavonoids and flavone in plants.

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**ANTIOXIDANT CAPACITY OF STEAM EXTRACTS OF *RUBUS SANCTUS* IN  
DIFFERENT CLIMATIC REGIONS**

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Blackberry, *Rubus* L. Focke belonging to Rosaceae family and Rosoideae subfamily (1). *Rubus sanctus* is a blackberry species which is widely distributed in Iran from the wet climate in the north (Caspian Sea) to the cold climate in the west and even to some semi-arid climates in the southwest of the country. The present work aimed to compare the quantitative attributes and antioxidants activity of this species growing in Shiraz-Bajghah. A blackberry genotype harvested in different seasons in cultured in research field at Department of Horticultural Science, School of Agriculture, Shiraz University, Shiraz, Iran. was collected to determine their antioxidant capacity using DPPH assays. Total flavonoid, flavanones, total phenols, and total anthocyanin, as well as the correlation between all these parameters, were determined for all treatments. Total phenol ranged from 254.66mg/100g dry weight in Aguste, to 193.33mg/100g dry weight in June. Total flavonoid and flavanone and anthocyanin ranged from 73.72, 37.218, 57.9962 mg/100g dry weight in Aguste, to 25.655, 18.65, 53.002 mg/100g dry weight in June. Sanctus exhibit significant differences in phenol, flavonoid, flavanone or antioxidants activity as a consequence of the harvest season. The highest concentration of antioxidants activity was recorded for Aguste and relatively low antioxidants activity levels were recorded for June treatments. blackberry from Sanctus exhibited the highest values for total phenolic and anthocyanin content. We conclude that levels of total flavanone, flavonoid, antioxidant capacity, and polyphenols mainly depended on the climate or the season. antioxidants activity was correlated with total phenols and anthocyanin content.

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**IMPROVEMENT OF QUALITY AND SHELF-LIFE OF STRAWBERRIES "PARUS"  
FRUIT WITH NANO-EMULSION COATING CONTAINING CHITOSAN**

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Fresh fruits of strawberries are very perishable and susceptible to postharvest diseases which limit the storage period and marketing life of them. Moreover, postharvest decay results in substantial economic losses around the world. As is known, synthetic fungicide treatment has long been the main method for controlling postharvest diseases [1]. However, there is increasing international concern over the indiscriminate use of synthetic fungicides on crops because of the possible harmful effects on human health and the emergence of pathogen resistance to fungicides. Therefore, new alternatives for controlling postharvest diseases which have good efficacy, low residues, and little or no toxicity to non-target organisms are in urgent demand. Chitin, together with its derivative chitosan, has been reported as a promising alternative to control postharvest diseases. Chitin is the second most abundant biopolymer renewable source in nature after cellulose, which has a versatile application potential in the agriculture-food industry. Therefore, developing safe methods to control perishability and maintain quality of strawberries during storage is crucial. Considering the successful application of chitosan in edible coating formulae and its proven antifungal properties due to its Nano-particles prompted us to initiate this study aiming at assessing the efficiency of an edible coating based on chitosan Nano-emulsion in delaying perishability, maintaining quality and increasing the shelf life of strawberries. In this study, after picking, strawberries were coated with Nano-emulsion with particle sizes of 50-100±10 nanometers and containing 0.5% chitosan as an antimicrobial substance and stored, along with control samples, at a temperature of 4±1°C and a relative humidity of 70%. At 4-day intervals qualitative indicators, including acidity, soluble solids, texture firmness, weight loss, respiration rate, ascorbic acid and percentage of damage, were determined in three replicates (confidence interval = 95%). Results showed that, coating strawberries with a Nano-emulsion containing 0.5% chitosan had, in addition to delaying the fruit damage, positive effects on their quality parameters. As compared to uncoated samples, the treated samples were firmer and their weight loss, respiration rate and percent damage were lower. Also, ascorbic acid was better preserved in the coated strawberries than in the control uncoated sample. Changes in acidity and soluble solids were not considerable. So, coating strawberries with a Nano-emulsion containing chitosan can be introduced as a safe and effective method to increase their shelf life from 8 days to 20 days (2.5 times as long) and better preserve their quality.

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**EFFECT OF CHITOSAN COATINGS COMBINED WITH CALCIUM GLUCONATE ON STRAWBERRY (*FRAGARIA ANANASSA* CV. *PARUS*) QUALITY ATTRIBUTES DURING REFRIGERATED STORAGE.**

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Strawberry (*Fragaria X Ananassa* Duch) belongs to Rosaceae family (1). According to FAO (2004), world strawberry production reached about 3.1 million tons and the total planted area was 214.200 ha (2). The use of synthetic chemical fungicides has been the main method for reducing postharvest disease. However, consumer concern over pesticide residues on foods, along with pathogen resistance to many currently used pesticides, has increased the need to find alternative methods for decay control. Recently, biologically active natural products have started to become an effective alternative to synthetic fungicides. Chitosan (poly b-(1,4) N-acetylD-glucosamine) polymer is industrially produced by chemical deacetylation of the chitin found in arthropod exoskeletons. This biopolymer can also be obtained directly from the cell wall of some plant-pathogenic fungi. Chitosan and its derivatives have been shown to inhibit the growth of a wide range of fungi and trigger defensive mechanisms in plants and fruits against infections caused by several pathogens. Chitosan possesses excellent film-forming properties and can be applied as an edible surface coating to fruits and vegetables. Chitosan coatings have been reported to limit fungal decay and delay the ripening of several commodities, including strawberry. Pre-harvest chitosan sprays have been noted to be effective in controlling postharvest fungal infection in strawberries. In order to investigate the effect of different concentrations of chitosan on qualitative and quantitative characteristics of 'Parus' strawberries in storage, an experiment was performed in factorial based on a completely randomized design (CRD), So that in this experiment, the effect of three levels of coating include, 0.5, 1 and 1.5 mM chitosan on qualitative and quantitative characteristics of this cultivar in 3 replications and in three stages (4, 8 and 12 days of storage) were studied. Results of the study showed the coating type, storage time and interaction between them were significant at 1% on 'Parus' strawberries fruits characteristics including fruit weight loss, total soluble solid (TSS), TSS/TA ratio and vitamin C and they were not significant on pH and treatable acid (TA). Generally, in this study, among all used treatments, 1 mM putrescine application and keeping instoragefor 12 days could be introduced as the most effective treatment to maintain quality of 'Parus' strawberries and it can be used due to beneficial effects to improve postharvest life of this fruit.

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**EFFECT OF NANO-EMULSION COATING CONTAINING CHITOSAN ON  
STORABILITY AND QUALITATIVE CHARACTERISTICS OF  
STRAWBERRIES"KORDESTAN"**

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Strawberries (*Fragaria ananassa* Duchesne) are especially perishable fruit, being susceptible to mechanical injury, desiccation, decay and physiological disorders during storage(1,2). Chitosan, a high molecular weight b-(1,4)-glucosamine polymer, is an important structural component of the cell wall of some plant-pathogenic fungi. It is also produced from the chitin components of arthropod exoskeletons; by deacetylation. Chitosan has been shown to have anti-fungal activity against a wide range of fungi. Chitosan coating of harvested strawberries protected them from infection and improved their quality. Considering the successful application of chitosan in edible coating formulae and its proven antifungal properties due to its Nano-particles prompted us to initiate this study aiming at assessing the efficiency of an edible coating based on chitosan Nano-emulsion in delaying perish ability, maintaining quality and increasing the shelf life of strawberries. After picking, strawberries were coated with Nano-emulsion with particle sizes of 50-100±10 nanometers and containing 0.5% chitosan as an antimicrobial substance and stored, along with control samples, at a temperature of 4±1°C and a relative humidity of 70%. At 4-day intervals qualitative indicators, including acidity, soluble solids, texture firmness, weight loss, respiration rate, ascorbic acid and percentage of damage, were determined in three replicates (confidence interval = 95%). The result show that Coating strawberries with a Nano-emulsion containing 0.5% chitosan had, in addition to delaying the fruit damage, positive effects on their quality parameters. As compared to uncoated samples, respiration rate and percent damage were lower but no effect on the treated samples were firmer and their weight loss. Also, ascorbic acid was better preserved in the coated strawberries than in the control uncoated sample. Changes in acidity and soluble solids were not considerable. so, we can conclusion, Coating strawberries with a Nano-emulsion containing chitosan can be introduced as a safe and effective method to increase their shelf life from 4 days to 8 days and better preserve their quality.

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**ESSENTIAL OIL COMPOSITION AND ANTIOXIDANT, ANTIMICROBIAL  
AND CYTOTOXICITY ACTIVITIES OF NASTURTIUM OFFICINALE**

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Nasturtium officinale (Watercress) belonging to Brassicacea family is one of the most important medicinal herb that grows on the wet and around water habitats and has been used by the rural healers as nutritive, anti-inflammatory and antioxidant agent. This plant is a vegetable, consumed raw or cooked in salads, soups and also used to cure abdominal pain in traditional medicine [1] and for treatment of diseases such as diabetes and bronchitis [2]. There are several reports on essential oil composition of antioxidant activity of *N. Officinale* [3,4]. The constituents of the volatile oil from aerial parts (50 g) obtained by hydrodistillation were analyzed by gas chromatography-mass spectroscopy (GC-MS). The major constituents of the essential oil were  $\gamma$ -cadinene (6.27%),  $\beta$ -ionone (5.67%), *p*-cymene (5.55%) and carvacrol (5.33%). The essential oil of *N. Officinale* was also assayed for measurement of antioxidant, antimicrobial and cytotoxicity activities with standard methods. Results revealed that *N. Officinale* oil inhibited DPPH radicals ( $IC_{50} = 0.74$  mg/ml) and various Gram-positive and Gram-negative bacteria. On the other hand, the oil was shown to have cytotoxic activity against A549 ( $IC_{50} = 7.25$   $\mu$ g/ml), MRC-5 ( $IC_{50} = 4.71$   $\mu$ g/ml), MDA ( $IC_{50} = 1.43$   $\mu$ g/ml) and HT29 ( $IC_{50} = 1.38$   $\mu$ g/ml) cell lines.

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## IMPROVEMENT OF ACTIVE CHITOSAN FILM PROPERTIES WITH ROSEMARY ESSENTIAL OIL

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Rosemary essential oil ( REO) used in chitosan film. The effect of REO concentration (0.5,1.0 and 1.5% v/v) on physical, mechanical and optical properties of REO-chitosan film were studied. microstructure and the interaction of the chitosan-based films were studied by Scanning electron microscopy and Fourier transform infrared (FTIR) spectroscopy. It was observed that REO improved transparency of the films from 4.97 in neat chitosan up to 7.61; moreover, it reduced the films' light transmission in UV light more than 25%. Films containing REO showed more antibacterial activity and total phenol content. The films containing REO showed potential to be used as active film in food preservation [1,2].

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**EFFECTS OF FOLIAR APPLICATION OF IBA ON GROWTH AND SOME  
SECONDARY METABOLITES OF *OCIMUM BASILICUM* PLANTS  
GROWN UNDER SALT STRESS**

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Basil (*Ocimum basilicum* L.) is an important medicinal plant of the Lamiaceae family which has an essential oil and also anti-bacterial and antioxidant properties. The aim of this study was evaluation of effects of different salinity treatments along with Indole butyric acid (IBA) hormone on growth and some secondary metabolites of basil plants. This study was carried out in a factorial design based on randomized complete blocks with 5 replications. Factor 1 was salinity which contained three levels of (0, 50, 100 mM) and factor 2 was IBA concentrations were concluded 0, 200 mg/L. The measured parameters contain leaves number, leaves length, stem height, lateral branches number, wet and dry weight of aerial organs, total phenol, total flavonoid and essential oil percentage. The results showed that salinity stress caused significant reduction in basil plants growth and yield evidenced by decrease of leaves number, leaf area, and branches number, plant fresh and dry weights. The negative effects of salinity on plant growth were exaggerated with increasing salinity levels in root medium. IBA mitigated harmful effect of salinity on some of growth traits of basil plants including number of branches, plant height, fresh and dry weight of shoot. The interaction at salinity treatments and IBA application was not significant on total flavonoid content and essential oil percentage. However, IBA application induced significant increase in total phenol content and essential oil percentage and decrease in total flavonoid content [1, 2].

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**EXTRACTION AND DETERMINATION OF NANO FOLIC ACID FROM WATERMELON SEED USING SUPERCRITICAL FLUID EXTRACTION AND LC-MS ANALYSIS**

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Growing attempts are being made to rationally utilize natural food-grade extracts which are enriched of valuable active materials for human health improvement and disease prevention as food supplement or formulation agent. Folic acid (FA) “another form of folate” which is one of the B vitamins, is an essential ingredient for making the genetic material of cells (DNA), and also is vital for growth and development. Folic acid is particularly important for maintaining a healthy nervous system and in the formation of red blood cells, which carry oxygen around the body. Healthy body can normally get enough folate naturally in its diet otherwise folic acid supplements are needed. In this work FA extracted from Watermelon seed as natural and not harmful matrix then in order to enhance bioaccessibility and uniformly blending with excipients which is necessary in formulation process, the extracted material has been processed via scCO<sub>2</sub> supercritical fluid media to be changed in to smaller particles. In order to obtain submicron or nano size particles of the extracts of Watermelon seed which is enrich of Folic Acid, a three-step supercritical fluid based process was employed<sup>2</sup>. The first step of process was done with aim of clean up from oils using scCO<sub>2</sub>, followed by second step which was extraction of active substance with adding Dimethyl sulfoxide (DMSO) as modifier carrying out supercritical CO<sub>2</sub>, the final step which was a rapid expansion of the extract in to secondary chamber equipped with particle collective surface. All of the parameters of three steps were optimized for decrease in oils content that are interfering stuff in nano material producing in first step, increase in Folic Acid content in the second and obtaining smaller particle for the third step. Identification of Folic Acid and investigation of extract profile was done with LC-MS. Chromatographic result showed the content of Folic Acid was decreased in remaining substance after extraction while the Scanning Electron microscopy(SEM) and Atomic force Microscopy(AFM) results showed the collected particles are mainly within 40-100nm in diameter.

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**EXTRACTION AND DETERMINATION OF NANO FOLIC ACID FROM WATERMELON SEED USING SUPERCRITICAL FLUID EXTRACTION AND LC-MS ANALYSIS**

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Growing attempts are being made to rationally utilize natural food-grade extracts which are enriched of valuable active materials for human health improvement and disease prevention as food supplement or formulation agent. Folic acid (FA) “another form of folate” which is one of the B vitamins, is an essential ingredient for making the genetic material of cells (DNA), and also is vital for growth and development. Folic acid is particularly important for maintaining a healthy nervous system and in the formation of red blood cells, which carry oxygen around the body. Healthy body can normally get enough folate naturally in its diet otherwise folic acid supplements are needed. In this work FA extracted from Watermelon seed as natural and not harmful matrix then in order to enhance bioaccessibility and uniformly blending with excipients which is necessary in formulation process, the extracted material has been processed via scCO<sub>2</sub> supercritical fluid media to be changed in to smaller particles. In order to obtain submicron or nano size particles of the extracts of Watermelon seed which is enrich of Folic Acid, a three-step supercritical fluid based process was employed<sup>2</sup>. The first step of process was done with aim of clean up from oils using scCO<sub>2</sub>, followed by second step which was extraction of active substance with adding Dimethyl sulfoxide (DMSO) as modifier carrying out supercritical CO<sub>2</sub>, the final step which was a rapid expansion of the extract in to secondary chamber equipped with particle collective surface. All of the parameters of three steps were optimized for decrease in oils content that are interfering stuff in nano material producing in first step, increase in Folic Acid content in the second and obtaining smaller particle for the third step. Identification of Folic Acid and investigation of extract profile was done with LC-MS. Chromatographic result showed the content of Folic Acid was decreased in remaining substance after extraction while the Scanning Electron microscopy (SEM) and Atomic force Microscopy (AFM) results showed the collected particles are mainly within 40-100nm in diameter.

**References**

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**EXTRACTION AND PARTIAL CHARACTERIZATION OF SCLEROGLUCAN  
ORIGINATED FROM *SCLEROTINIA SCLEROTIURUM***

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Preparation of additives from herbal plants for use in drugs formulation is one of the most important usage of these plants in pharmaceutical industry. Sugars are one of the additives frequently used in industry and  $\beta$ -glucan can be one of this valuable sugars. This polysaccharide is composed of glucose monomers linked together through a linear chain with (1 $\rightarrow$ 3) glycosidic linkages [1]. A special kind of  $\beta$ -glucan namely scleroglucan that is an exopolysaccharide exhibits a backbone of (1 $\rightarrow$ 3) linked  $\beta$ -D-glucose units with side chains linked  $\beta$ -(1  $\rightarrow$  6) to every third residue in the main chain, already has been reported [2]. Scleroglucan extracts from fungal genus *sclerotinia* that causes a disease called white mold in herbal and grass plants [3]. In this research, the extraction and identification of scleroglucan, fungal  $\beta$ -glucan, from a pathogenic fungus, *Sclerotinia sclerotiorum*, and characterization of its structural were studied. Sclerotia was isolated from infected herbal plant *Helianthus annuus* L. and has been inoculated in PDA medium, and then transferred in modified Czapek dox agar medium without agar to produce scleroglucan. Isolation and extraction of produced scleroglucan carried out with ethanol as a solvent, keeping or eliminating oxalic acid which normally produces during the production of scleroglucan. The extracted scleroglucan was identified by FTIR analysis. Survey of extracted  $\beta$ -glucan spectrum including oxalic acid showed crystalline structure, however and  $\beta$ -glucan spectrum excluding oxalic acid showed more similar structure with high purity  $\beta$ -glucan when analyzed by Fourier transform infrared spectroscopy (FTIR). Based on results, oxalic acid seems to have an important role in purification of this sugar.

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**COMPARISON OF SUPERCRITICAL FLUID EXTRACTION AND  
ULTRASOUND-ASSISTED EXTRACTION OF FATTY ACIDS  
FROM KIWI SEEDS**

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Nowadays one of the most considerable issues in phytochemical field is to achieve valuable active materials which are vital for human health improvement and disease prevention, from natural sources not chemical ones. Many researchers are working for this aim all over the world for many justifiable reasons. One of them is that natural active materials are more effective and reliable than the chemical ones. Meanwhile they have no dangerous side effects. In this research kiwi seed which is likely to have several valuable nutrients was chosen for extraction. The kiwi seed extract is important especially in cosmetic industry because of its anti-wrinkle and anti-under eye darkness properties. In recent years, the application of supercritical fluid extraction using CO<sub>2</sub> (scCO<sub>2</sub>) has been widely studied for extracting oil from plant materials. In comparison to solvent extraction techniques, SFE has several advantages such as environmental safety, selectivity and capability to extract thermally labile compounds under mild conditions. SFE also requires less organic solvent and has a short extraction time. Therefore, it has been widely accepted by many investigators that SFE provides a rapid and quantitative method for extracting essential oils from seeds and plants. The experimental parameters of SFE such as pressure, temperature, modifier volume, static and dynamic extraction time were optimized using a Central Composite Design (CCD). The results of chemometrics analysis showed the highest yield for SFE (3.46%), which was obtained at a pressure of 351 bar, temperature of 35 °C, modifier (Ethanol) volume of 150 μL, and static and dynamic extraction times of 30 and 60 min, respectively. The optimum conditions in UAE were as follows: solvent (n-hexane) volume, 21 mL; extraction time, 70 min; and extraction temperature, 30 °C. This resulted in a maximum oil recovery of 29.7%. The extracts were analyzed using GC-MS which showed that 9,12-octadecadienoic acid [z,z], 9,12,15-octadecatrienoic acid, hexadecanoic acid and 9,12,15-octadecatrien-1-ol, were the major components.

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**COMPARISON OF *SALIX AEGYPTIACA* EXTRACT AND FLUOXETINE IN  
REDUCING DEPRESSION IN ANIMAL MODEL**

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The aim of this study was to compare the effect of *Salix aegyptiaca* extract and Fluoxetine in reducing depression [1]. In this experimental study used 60 laboratory mice weighting approximately 25 to 30 grams. Mice were divided in to the six groups: control, depression, Fluoxetine and three groups received different doses of 50, 100 and 200 mg/kg intraperitoneal injection of hydro alcoholic *Salix aegyptiaca* extract. After intraperitoneal injection, Forced swimming test and the tail suspension test was used to determine the level of depression [2]. Mobility and immobility time of mice in each test indicates animal level of depression. The results were analyzed using Humanities statistical software. The results showed that *Salix aegyptiaca* extract at a dose of 200 mg/kg was significantly effective in increasing mobility time in both tests compared with control and fluoxetine groups, indicating depression improvement. Moreover, mobility significantly increased at a dose of 200 mg/kg *Salix aegyptiaca* compared with the control and fluoxetine groups. According to the results it can be said that *Salix aegyptiaca* hydro alcoholic extract with a dose of 200 mg/kg can be a good alternative to fluoxetine and can be utilized in reducing depression symptoms.

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**COMPARISON OF THE CHAMOMILE HYDROALCOHOLIC EXTRACT AND  
IMIPRAMINE IN REDUCING DEPRESSIVE SYMPTOMS IN MICE**

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The aim of this study was to compare the effect of chamomile extract to imipramine in reducing depression. This experiential study used 60 laboratory mice weighing approximately 25 to 30 grams mice were divided in to the six groups: control, depression, imipramine and three groups received different doses of 50,100 and 200 mg/kg intraperitoneal injection of hydro alcoholic chamomile extract [1]. Depression was induced by tetrabenazine and depression was assessed by forced swimming test and the tail suspension test. Mobility and immobility time of mice in each test indicates animal degree of depression. The results were analyzed using humanities statistical software. The results showed that doses of 50 and 100 mg/kg of chamomile extract was not effective in reducing depressive symptoms. But chamomile at a dose of 200 mg/kg showed significant increase in mice mobility time which indicates a decreased level of depression compared with the control and imipramine groups [2]. According to the results it can be said that chamomile extract in a dose-dependent manner can be a good alternative to imipramine and can be utilized in reducing depression symptoms.

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**COMPARATIVE EFFECT OF GINGER EXTRACT AND IMIPRAMINE ON  
DEPRESSIVE SYMPTOMS IN ANIMAL MODEL**

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This study aimed at investigating the effects of ginger extract comparing to Imipramine in reducing the effects of depression. In this experimental study, 60 adult mice weighing approximately 25 to 30 grams, were divided into six intraperitoneally groups of control, Imipramine, depression, and three experimental groups receiving doses of 50, 100, and 200 mg/kg hydro alcoholic extract of ginger. After receiving the last dose from all of the groups, suspension test and forced swim test was conducted. And mobility time, as an indicator of depression, was measured comparing to immobility time, then the results were analysed using humanities' statistical software. Hydro alcoholic extract of ginger at a dose of 100 mg/kg significantly caused an increase in the duration of mobility of mice in the suspension test and the forced swim test, as an indicator of reduction in depression [1,2], comparing to the control and Imipramine groups. Therefore, the findings of this study showed that 100 mg/kg hydro-alcoholic extract of ginger can be a good alternative to Imipramine in reducing symptoms of depression. Whereas, the dose of 50 mg/kg and 200 mg/kg of ginger extracts lacked such power. Therefore, it can be concluded that using ginger in a dose dependent state is probably effective in reducing the symptoms of depression in animal model.

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**COMPARASION EFFECT OF BUPRENORPHINE AND AJWAIN EXTRACT ON  
THE REDUCTION OF BEHAVIORAL SYMPTOMS OF ADDICTION'S  
WITHDRAWAL IN MICE**

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The present study was aimed to investigate the comparable impact of buprenorphine and plant extract of Ajwain on the reduction of behavioral symptoms of addiction's withdrawal in mice. The research method was experimental with posttest in the control group. The sample consisted of 60 adult female mice weighing 25 to 30 g that were randomly divided into six groups of 10 mice other than in the control group. Five groups within 21 days orally received the morphine and (after injection of naloxone) their addiction was confirmed. After creating dependence and withdrawal of morphine, into three groups, the dose of 50, 100 and 200 mg/kg of ajwain (*C. Copticum*) and a group of buprenorphine (4.1 mg/kg) were injected. Information on the face symptoms (jump, climb and stand on two legs and diarrhea) and relative symptoms (tremor, trembling legs, teeth chattering, dragging the body) were recorded and the data obtained from the research were analyzed by the Chi-square, analysis of variance and Tukey post hoc test [1,2]. The results showed that 50 mg of *C. Copticum* did not have a significant effect in reducing the symptoms. The dose of 100 mg/kg in Group with *C. Copticum* reduced the diarrhea and snarl in the addicted group that buprenorphine is significantly different from the group. Finally, a dose of 200 mg/kg of *C. Copticum* significantly reduced the symptoms of jumping, climbing, tremor and snarl in the addicted and were not significantly different with buprenorphine groups; it means that the 200 mg/kg of *C. Copticum* and buprenorphine had the same therapeutic effect.

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**STUDING THE EFFECT OF PIPER NIGRUM HYDROALCOHOLIC EXTRACT  
ON INJURIES RESULTING FROM ISCHEMIA-REPERFUSION OF  
MALE RATS ISOLATED HEART**

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The fruit of *Piper nigrum* is an important part of the family of edible spices and its main component is piperine. Today piperine is used for various medicinal and experimental purposes. This study focuses on the effect of *Piper nigrum* hydroalcoholic extract on injuries resulting from ischemia-reperfusion of an unconscious rat's heart. Hydroalcoholic extract was produced from soaking, and densities of 25, 50, and 75 (mg/kg) were obtained. Wistar male rats were divided accidentally into 4 groups of 8. The control group was given normal saline orally for a week, and the extract-treated groups were given *Piper nigrum* hydroalcoholic extract orally for one week and then after complete anaesthesia, the animal's heart was cut out of rib cage and connected to the Langendorff heart set up. Bicarbonate Krebs-Heseleit buffer at 37 degree centigrade was used as perfusion solution and ischemia was induced as a result of closing LAD, and at the end of reperfusion, hemodynamic left ventricle parameters as an index of heart performance and ECG parameters for determining arrhythmia and CK-MB and LDH enzymes were measured. The results show that *Piper nigrum* hydroalcoholic extract with 25 mg/kg dosage can prevent the falling of hemodynamic heart factors such as reduction in heartbeat, LVDP, and dp/dt and reduction of arrhythmia severity, Total VTs time, and total number of PVCs in the ischemia phase, and also the reduction of heart enzyme CK<sub>MB</sub> in the reperfusion phase shows acceptable protective effects and promising results for future treatments.



**CYTOTOXIC TERPENOIDS FROM *SALVIA LACHNOCALYX* INDUCE  
APOPTOSIS IN CANCER CELLS**

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A large number of chemotherapeutic agents in current use are directly or indirectly derived from natural products [1]. Investigation of plant-derived compounds with cytotoxic potential in order to understand their mechanism of action helps us find new sources of anti-cancer drugs with higher efficacy and lower side effects. In this project, the effects of potent terpenoids including geranyl farnesol, sahandinone and 4-dehydrosalvilimbinol isolated from *Salvia lachnocalyx* were investigated on cell cycle and reactive oxygen species (ROS) generation in MOLT-4 human leukemia cells to achieve better understanding of the mechanism of action of these compounds. Cell cycle analysis showed that sub-G1 fraction significantly increased dose-dependently in cancer cells treated with all terpenoids, demonstrating that these compounds induced apoptosis in cells. Intracellular ROS generation results indicated that these terpenoids did not increase ROS production. Theoretical target prediction was also performed for these compounds, which showed that topoisomerase I inhibition can be considered as a mechanism of their cytotoxic activity. A good correlation was found between topoisomerase I docking scores and cytotoxic activities. The findings of this study provide evidence that some terpenoids present in *Salvia lachnocalyx* may exert anticancer action by induction of apoptosis in cancer cells.

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## PROTECTIVE EFFECTS OF THYMOL ON THE ACID-ACETIC INDUCED ULCERATIVE COLITIS IN WISTAR RATS

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Thymol (2-isopropyl-5-methylphenol), is a natural monoterpene phenol derivative of cymene found in the essential oils of *Thymus*, *Origanum*, and *Lippia* species, and certain antitussive medicines [1,2]. Anti-inflammatory benefits of Thymol have been determined in some previous studies [3]. This survey was designed to evaluate the potential effects of Thymol for the treatment and controlling inflammation in animal models of ulcerative colitis. Ulcerative colitis was induced in the male Wistar rats by luminal instillation of acetic acid. Rats in the treatment groups received Thymol (100 mg/kg PO) or Prednisolone (10 mg/kg PO) daily for 10 consecutive days. At the end, the rats were sacrificed and the disease activity index (macroscopic changes), the levels of myeloperoxidase and nitric oxide were assessed in the colonic homogenized tissues specimens. Moreover, in cross section of colitis tissue the histopathological changes were observed. The results showed that both therapies with Thymol and Prednisolone could regress the clinical scores, mortality rate and histopathological changes of ulcerative colitis. However, the disease activity index showed a more prominent significant decrease in colitis rats received Thymol compared to colitis rats received Prednisolone. In this regards, the levels of myeloperoxidase and nitric oxide were down-regulated in the guts of Thymol treated rats more than Prednisolone groups. Collectively, these data suggest that the Thymol may be used as a natural source to alleviate the signs of rat model of ulcerative colitis.

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PHENYLALANINE AMMONIALYSE GENE EXPRESSION UNDER EXCESS  
Zn(NO<sub>3</sub>)<sub>2</sub> IN SEEDLINGS OF CAPSICUM ANNUUM L

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*Capsicum annuum* L. belong to family solanaceace (2n=24) and they are variously used as a pungent flavour in food, naturel plant color, pharmaceutical ingredient and as sprays for riot control and self-defense. Capsaicin content of peppers is one of the major parameters that determine Capsicum's commercial quality. It is also a rich source of vitamins C (ascorbic acid), A and E. It has also been reported to show anticancer effect and to be active against neurogenic inflammation, protective effects against high cholesterol levels and obesity, anti-mutagenicity effect and a high antioxidant activity. Heavy metal toxicity includes the binding of heavy metals more strongly to functional sites that are normally occupied by essential functional groups of biologically important molecules such as enzymes, changing the conformation of the biological molecules, proteins and nucleic acids thus disrupting the integrity of entire cells and their membranes, making them inactive, decomposing essential metabolites. Phenylalanine ammonia-lyase (PAL) has a crucial role in secondary phenylpropanoid metabolism and is one of the most extensively studied enzymes with respect to plant responses to biotic and abiotic stress. In this study, the influence of different concentrations (0, 2.5, 5, 7.5, 10 and 15 mM) of Zn(NO<sub>3</sub>)<sub>2</sub> on PAL gene expression were investigated at seedlings in *Capsicum annuum* L. The relative transcript level of PAL mRNA were established by semi-quantitative reverse transcription PCR (RT-PCR) of RNA isolated from leaves in control and in presence of increasing concentrations of Zn<sup>2+</sup>. PAL mRNA amount was normalized to that of a housekeeping gene (18s rRNA) mRNA. The PAL mRNA level was higher in seedlings growing in the elevated presence Zn than in the control. The highest amount of mRNA coding for PAL was observed in the present of 15 mM Zn<sup>2+</sup>. In conclusion, excess Zn has influenced on increasing PAL gene expression in *Capsicum annuum* L.

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**DETERMINATION OF ANTIMICROBIAL OF METHANOLIC EXTRACT  
OF *FERULA LATISECTA***

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*Ferula latisecta* is a species of *ferula* genus from Apiaceae family [1]. *Ferula Assa-foetida*, with Persian name of “Anghoze”, is the famous species of the genus with different medicinal uses such as anticancer [2], antiviral [3], and antimicrobial [4]. *F. latisecta* has been known to have several uses in traditional medicine in north of Khorasan- Iran. The leaves of the plant are used by people to cure flatulence and indigestion. In this study we focused on evaluation of antibacterial activity of the methanolic extracts from the plant leaves using disc diffusion method. For this purpose the leaves of *F. latisecta* were collected from Hezar-Masjed Mountain (Kalat-e-Naderi) at April 2016. First of all the leaves were dried and ground. Then the leaves were macerated in methanol for 72 h. Finally the crude extract was concentrated under low pressure. To analysis of antibacterial activity of the extract, a disc (6mm), which was impregnated by 30µL of the extract with concentration of 20 µg/mL, was placed on an inoculated agar with different microorganisms. The diameter of inhibition zone was reported as antibacterial activity of the plant extract. According to the results the plant extract prevent the growth of *Klebsiella pneumonia* (-) with 12 mm inhibition zone, whereas the extract was unable to inhibit the growth strain of *Escherichia coli*(-), *Pseudomonas aeruginosa*(-) and *Styphylococcus aureus*(+).

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**PHYTOCHEMICAL CONTENTS OF *FERULA LATISECTA***

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*Ferula latisecta* belongs to Apiaceae family [1]. The plants of *Ferula* genus grow up in China, Central Asia, Afghanistan, Iran, and Turkey [2]. Leaves of *F. latisecta* are used to cure stomach ache in Khorasan- Iran. Since there is no report on phytochemical contents of the plant, in this evaluate the presence of differaent study we secondary metbolites such as phenolic, flavonoids, alkaloids, and anthraquinones compounds. The collected plant leaves were dried and extracted using methanol for 72 h at room temperature, then the extracts were fractionated by four solvents which were different in their polarity including n-hexane, chloroform and ethyl acetate, water. Different reagents were prepared and sprayed on TLC profile of the fractions to identify the presence of the mentioned compounds. The reagents were: aqueous FeCl<sub>3</sub> 5% for phenolic compounds (change to blue or green color); methanolic AlCl<sub>3</sub> 5% for flavonoid compounds (change to yellow color); ethanolic KOH 5% for anthraquinone compounds (change to orange or red color); Wagner reagent for alkaloids compounds (formed brown precipitate). The results are tabulated in the following Table.

Fraction Name	Phenolic compounds	Flavonoids compounds	Alkaloids compounds	Anthraquinones compounds
N-Hexane	+	-	-	+
Chloroform	+	-	+	-
Ethyl Acetate	+	+	-	+
Water	+	+	-	+

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**EFFECT OF SALICYLIC ACID AND HUMIC ACID IN PERIWINKLE PLANTS  
(CATHARANTUS ROSEUS L.) ON SOME GROWTH INDICES.**

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Periwinkle plant *Chatarantus roseus* L. from Apocynaceae family is one of the valuable ornamental-medicinal subshrubs [1]. Salicylic acid and humic acid play an important role in plant growth [2,3]. To evaluate the effects of salicylic acid and humic acid on growth indices in periwinkle plant, an experiment was conducted in completely randomized design with seven treatments and three replications at Horticultural department, college of agriculture university of Zanjan in 2016. The experimental factors consist of four salicylic acid levels (0, 0.5, 1, 2 mg.L<sup>-1</sup>) as factor a and four levels of humic acid (0, 0.5, 1 and 1.5 mg.L<sup>-1</sup>) as factor b. Evaluated traits such as plant height, number of flowers, flower diameter, stem diameter, node number, root length, chlorophyll and carotenoid content were recorded. The results showed that compared to control, number of flowers, stem diameter, node number, root length and carotenoid content were significant ( $p < 0.01$ ) and plant height, chlorophyll content were significant ( $p < 0.05$ ). Using of salicylic acid 0.5 mg.L<sup>-1</sup> had maximum yield on flower diameter, stem diameter and root length. Also chlorophyll content was obtained significant comparison with control and other treatments in 0.5 mg.L<sup>-1</sup> humic acid. Thus application of salicylic acid and humic acid by improvement in the morphological characteristics could enhance yield of this ornamental-medicinal plant.

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**COMPARISON OF ANTIOXIDANT ACTIVITY AND TOTAL PHENOL CONTENTS OF PARSLEY (*PETROSELINUM CRISPUM*) ESSENTIAL OIL AND ETHANOLIC EXTRACT**

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The search for potential natural antioxidants has gained increasing interest among researchers. Various compounds from different phytochemical categories have been identified in Parsley. Also, different pharmacological activities have been attributed to this plant. Thus far, very little is known about the difference between antioxidant activity and phenol contents of the ethanol extracts and essential oil of parsley [1]. Therefore, this study compared the antioxidant effects of two different plant extracted products. After preparation ethanolic extracts and essential oil by maceration and hydro distillation method, total phenolic contents were measured spectrophotometrically with folin ciocalteu method. The antioxidant capacity of the extract was assessed by DPPH (2, 2- diphenyl-1- picrylhydrazyl) radical-scavenging activity and compared to synthetic antioxidant BHT. In addition, antioxidant capacity of extracts was also analyzed with ABTS (acid sulphonic-6-ethyl benzthiazoline-3-azinobis, 2, 2, cation radical method [2]. Data were analyzed using Duncan's multiple test by SPSS software. Result showed that total phenolic content of extract and EO was  $118.85 \pm 10.77$  and  $31.99 \pm 1.53$  mg Gallic acid / g, respectively. In testing percent of inhibition of free radicals (DPPH, ABTS and reducing power), the plant extracts showed a significant inhibitory effect but ethanolic extract showed significantly higher antioxidant effect than EO ( $p < 0.05$ ). Our findings showed that both extracted compounds has relatively good antioxidant activity in compare to BHT (standard antioxidant), But in order to apply as a potential source of natural antioxidants in food and pharmaceutical industries, extract is preferable.

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**EFFECT OF SALICYLIC ACID AND METHYLE JASMONATE ON  
*ECHINACEAE PURPUREA* L. VEGETATIVE AND  
GENERATIVE INDICES.**

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*Echinaceae Purpurea* L. from Asteraceae family is a Perennial and herbaceous Plant that has been recognized as a valuable ornamental – medicinal Plant in most valid pharmacopoeia [1]. Salicylic acid and methyle jasmonate regulate a wide range of plant development response [2]. For studying the affect of salicylic acid and methyle jasmonate on *Echinaceae purpurea* L. vegetative and generative indexes, a factorial experiment based of completely randomized design was conducted with 9 treatments replicated three times. Factor A was salicylic acid in 3 levels (0, 1 and 2 mg.L<sup>-1</sup>) and factor B was methyle jasmonate in 3 levels (0, 0.5 and 1 mg.L<sup>-1</sup>). This Study was carried out at Horticultural sciences department, college of Agriculture, university of Zanjan in 2016. Analysis of variance showed that the interaction of treatments was significant (p<0.05) on side branches number, flower fresh weight, root fresh and dry weight. Simple salicylic acid effects was very significant (p<0.01) on side branches, number of flowers, flower fresh weight, root fresh and cartenoid content. Plant height and total chlorophyll content was affected significantly (p<0.05) by salicylic acid treatments. The highest number of the flowers in comparison with control and other treatments was recorded in 1 mg.L<sup>-1</sup> of methyle jasmonate considering obtained results, the highest flower number, flower fresh weight, root dry weight and side branches number ended with flowers blonged to 1 mg.L<sup>-1</sup> methyle jasmonate and highest fresh root weight showed on 1 mg.L<sup>-1</sup> salicylic acid. Thus the growth of *Echinaceae purpurea* L. was improved by combination vegetative and generative of 1 mg.L<sup>-1</sup> salicylic acid and 1 mg.L<sup>-1</sup> methyle jasmonate.

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**INVESTIGATION OF THE EXTRACTION PROCESS OF THE PHENOLIC COMPOUNDS: COMPARISON BETWEEN CUMIN AND AJWAIN**

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Ajwain (*Trachyspermum ammi*) and Cumin (*Cuminum cyminum*) are annual herbs in the family Apiaceae. Ajwain is used as medicinal plant in traditional ayurvedic medicine primarily for stomach disorders such as indigestion and flatulence. Ajwain is rich in vitamins, minerals and health promoting phytonutrients such as carotenoids, flavonoids and polyphenols to provide powerful antioxidant protection [1]. Cumin also has many uses as a traditional medicinal plant and has various useful chemical compounds [2]. Antioxidants are substances that protect cells from the cellular damage caused by unstable molecules known as free radicals induced oxidative stress. Antioxidants neutralize free radicals as a natural by-product of normal cell processes. Phenolic compounds, which are widely distributed in many fruits and vegetables, are believed to account mainly for the antioxidant capacity of many plants [3]. In the present study ethanolic and aqueous extracts of ajwain and cumin were studied for the quantification of the total phenolic compounds. Also the effects of the type of solvent and kinds of extraction techniques have been investigated for the extraction of phenolic compounds from ajwain and cumin. The extraction yield was measured as the ratio of gallic acid mass in milligram to dry plant mass in gram (mg/g). The results showed that the best solvent for extraction of phenolic compounds was ethanol 75% (ethanol to water) for both plants. The phenolic content of the cumin was higher than ajwain, so that the phenolic content was obtained as 1.72 mg/g for cumin and 1.41 mg/g for ajwain. Therefore, it can be concluded that the antioxidant properties of cumin is greater than ajwain.

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**CALLUS INDUCTION AND REGENERATION FROM VARIOUS EXPLANTS  
IN *STEVIA REBAUDIANA***

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*Stevia rebaudiana*, belonging to the Asteraceae family, is a perennial shrub which grows up to 1m. The leaves of *Stevia* are the source of the diterpene glycosides, stevioside, and rebaudioside, which are estimated to be 100–300 times sweeter than sucrose. The plant is indigenous to the northern regions of South America and nowadays it is being cultivated in continental China, Taiwan, Thailand, Korea, Brazil, and Malaysia. A procedure has been outlined for callus induction and plant regeneration of *Stevia Rebaudiana*, through in vitro culture of Various Explants. The present study aims at developing a simple, rapid, economical, and high frequency regeneration protocol from various explants of *S. rebaudiana* so as to give rise to true-to-type clones for potential application in large-scale propagation. The explants leaf, node, and internode derived from the young plants cultured in solid Murashige and Skoog (MS) medium (pH 5.6) were exposed in 0, 0.5, 1, 1.5 mg/L IBA and 0, 0.5, and 1 mg/L BA treatments to callus induction. In order to plant regeneration, the calli were cultured in MS medium supplemented with 0, 0.5, 1, 1.5 mg/L NAA and 0, 1, 1.5, 2 mg/L BA. The results showed that the leaf is the best explant for callus induction with percentage of  $98 \pm 1.8$  in MS medium complemented with 1 BA and 0.5 IBA. In case of indirect regeneration the highest percentage ( $56 \pm 4.7$ ) of plant regeneration was obtained from the MS medium supplemented with 1.5 mg/L BA and 0.5 mg/L NAA.

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## THE POLYPHENOLS CONTENT AND ANTIOXIDANT ACTIVITY OF ROSEMARY AND LAVANDULA

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The rosemary (*Rosmarinus officinalis* L.) is a household plant grown in many parts of the world and has many compounds with antioxidants activity, mostly polyphenols. The most important antioxidants constituents of this plant species are carnosic acid, caffeic acid and its derivatives such as rosmarinic acid. Rosemary leaf extracts were proposed as important human dietary factors, and investigated as therapeutic potential agents against several diseases [1]. Another important species of the family lamiaceae, is the lavandula (lavender). Lavandula plants contain phenolic compounds known for their general antioxidant abilities. In medicine, Lavandula is used for the spasmolytic, carminative, stomachic or diuretic properties, and nowadays is applied as a mild sedative and cholagogue in various phytopharmaceuticals [2]. In this study, the process of polyphenols extraction from rosemary and lavandula was investigated. The effect of some parameters including solvent, time of extraction, and the extraction method were examined on the extraction of polyphenols. The results showed that the best solvent for extraction of polyphenols is ethanol 50% (ethanol to water) for rosemary and is ethanol 75% for lavandula. This is indicated that the plant matrix is affected the extraction process. Also the total polyphenol content of the best extract obtained by the dynamic extraction method was obtained as 1.12 mg/g for rosemary and was obtained as 1.02 mg/g for lavandula (mg of gallic acid per g of dry sample). Also the ultrasonic extraction method was used and the noticeable amount of polyphenol compounds was extracted in a shorter time (i.e. 1.27 mg/g for rosemary and 0.96 mg/g for lavandula during less than 30 minutes). Finally, the antioxidant activity of the rosemary and lavandula was compared. The rosemary indicated higher antioxidant activity.

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**STUDYING MICROBIAL TRANSFORMATION OF ATROPINE TO ITS  
DERIVATIVES WITH *E. COLI K12***

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Biotransformation involve organic reaction that utilize Biological catalysts. In this field bacteria has been gave more attention, because of capability to transform plant secondary metabolites. Atropine is a tropane alkaloid, which was found in plants of the *Solanaceae* Family. It a wide range of pharmacological activities, however little data is available on the *in vitro* metabolism and metabolites of atropine. The microbial transformation study of atropine would play important role in development of new drugs and its clinical application. In this work, biotransformation by *E. coli K12* on atropine was assessed. Biotransformation by *E. coli K12* on atropine was done by incubation condition for 14 days. In order to analyzing sampling period was set at every 24 hours. The progress of formation of metabolites was monitored by Thin Layer Chromatography (TLC), after extraction by ethyl acetate. Obtained result shown the metabolism was well done; moreover, the best values for the concentration and the required time are calculated.

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**INVESTIGATING THE CORRELATION BETWEEN AGRONOMIC AND PHYTOCHEMICAL TRAITS OF DIFFERENT POPULATIONS OF FENNEL**

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Fennel (*Foeniculum vulgare*) has many culinary and prevalent medicine uses. For example, the bulbs, shoots, leaves, flowering stems, mature inflorescences, and fully ripened and dried seeds are commonly used for homemade remedies and are said to be useful in the treatment of several complaints, specifically those of the digestive system [1, 2 and 3]. In this study, the correlation between four important secondary metabolites detected by GC-MS including Trans-Anethole, Estragole, Limonene and Fenchone with agronomic traits and essential oil percentage were studied. Trans-Anethole content had a significant positive correlation with grain yield, harvest index, number of umbrellas and essential oil content in 100 grams of dried seeds and had a significant negative correlation with length of the longest internode. Stepwise multiple regression analysis showed that the number of umbrellas had the most positive impact on Trans-Anethole content. Final internode length had the highest indirect effect on Trans-Anethole via number of umbrellas.

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**PHYLOGENY AND TAXONOMY OF *TANACETUM PINNATUM*  
BASED ON MOLECULAR DATA**

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*Tanacetum* is, after *Artemisia* and *Anthemis*, the third specious genus in Asteraceae. Its ca. 160 species, are distributed in the circum-Mediterranean region, southwestern, central and eastern Asia, and parts of northern America and entered Iran from Africa and Anatolia likely during Mid-Miocene [2]. *Tanacetum* species containing a variety of secondary metabolites are of aromatic plants and have numerous medicinal and herbicide attributes. This genus with many enigmatic species is also one of the most problematic in tribe Anthemideae. One of these species is the Irano-Turanian *Tanacetum pinnatum* Boiss., whose inconsistent taxonomic treatment and unclear delimitations of its taxa in different Floras cause confusion [1,4]. This encouraged us to do a phylogenetic analysis of nrDNA ITS and cpDNA rpl32-trn<sub>LUAG</sub> sequences derived from accessions of geographically separated populations of this species in Iran, plus taxa who have a common historical taxonomic and nomenclature treatment with it, to test their current taxonomic treatment and to identify them through phylogenetic approaches, regarding their morphological diagnostic characters in above mentioned Floras and ploidy levels acquired in other studies [3]. We have also investigated polymorphic sites in the sequences of these taxa.

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**FORMULATION, ANALYSIS AND STABILITY DETERMINATION OF “DAVA-E LOBAN”, A DRUG INSPIRED FROM IRANIAN TRADITIONAL MEDICINE**

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Dava-e loban (DL) is one of the compounds which have been prescribed in Iranian traditional medicine (ITM) for treatment of dementia and Alzheimer's disease (AD). AD is a neuro degenerative disorder and is considered as the most common form of dementia in the elderly people, especially those older than 65 years. According to ITM, the cause of AD is coldness and dryness of the brain. DL is an herbal medicine which contains *Boswellia carterii*, *Zingiber officinale*, *Cyperus rotundus L.*, *Acorus calamus L.*, *Piper nigrum L.* and honey (1). Previously, some studies have demonstrated the effectiveness of this compound on AD (2) but there is no study on the formulation, analysis, and stability of this compound. The aim of this study was to reformulate DL in the form of capsule instead of their original dosage form i.e. Ma'joun under the principles of ITM to cover the bitter taste of the drug, and to determine the stability of the drug. All herbal materials were powdered, sieved (mesh size 30), and mixed thoroughly to reach a uniform powder. Then, the powder was granulated with honey. Then, the size 0 capsules were filled with the granules to make 400 mg capsules. Keto- $\beta$ -boswellic acid, one of the components of *Boswellia carterii*, was measured via HPLC as a marker. Physicochemical properties as well as microbial count of the product were determined in the month 0, 1, 3, and 6. The results of accelerated stability test showed that Physicochemical characteristics of the product acceptable. Keto- $\beta$ -boswellic acid was 0.06 mg in each capsule at the beginning and was 0.059 mg/capsul at the end. Microbial count was in acceptable range (total bacteria <100 cfu/ml, total fungi and yeast <10 cfu/ml, no *Salmonella sp.*, *E. coli*, *S. aureus*, and *P. aeruginosa*). at all testing times. Based on the results, DL is stable and can be produced in the form of capsule in pharmaceutical industries.

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**STUDY OF SECONDARY METABOLITES IN CALLUS OF  
FENNEL POPULATIONS**

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Fennel (*Foeniculum vulgare* Mill.) is an open pollinated species belonging to the *Apiaceae* family and originating in the Mediterranean region where it is possible to observe a high genetic variability [1-2]. Traditionally, in Europe and Mediterranean areas, fennel is used as antispasmodic, diuretic, anti-inflammatory, analgesic, secretomotor, secretolytic, galactagogue, eye lotion, and antioxidant remedy [3]. In this research, 16 populations of fennel from Iran as well as two populations from Germany and two populations from Turkey were evaluated. Five types of explants (leaf, hypocotyl, epicotyl, cotyledon, and root segments) were cultured in MS medium supplemented with 2, 4-D and kinetin (2, 4-D + Kin) (1:1 and 0.5: 1 mg/l) and NAA and BA (NAA+BA) (1: 1 and 0.5: 1 mg/l). Among five explants used in this study, only hypocotyl explant had appropriate response to the callogenesis. According to the GC-MS analyses, the highest trans-Anethole content (67.23%) was produced in the callus of Turkey (Gaziantep) population under NAA + BA (1: 1 mg/l) treatment. Turkey (Izmir) population callus extracts contained considerable amounts of Limonene (67.70%) under 2, 4-D+Kin (0.5: 1 mg/l) treatment.

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**EFFECTS OF INOCULATION WITH ARBUSCULAR MYCORRHIZAE ON SOME MORPHOLOGICAL CHARACTERISTICS OF *NEPETA BINALUDENSIS* JAMZAD**

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*Nepeta binaludensis* Jamzad is a medicinal plant and a rare species of Lamiaceae family that grows in a limited area of 'Binalood' mountains in the province of 'Khorasan'. The aerial parts of this plant are used medicinally [1,2]. The aims of this study was to evaluate the effect of Arbuscular mycorrhizal inoculation on some morphological indices of *Nepeta binaludensis*. So three species of Arbuscular mycorrhizal including *Glomus intraradices*, *Glomus etunicatum* and *Glomus mossea* and control (no inoculation) treatments were evaluated in a completely randomized design with three replications. The results showed that although the treat with all kinds of Arbuscular mycorrhizal increased the leaf area and root length compared to control, this increase was not significant. Besides, the effect of Arbuscular mycorrhizal was significant on the increase of shoot and root fresh and dry weight, shoot length, area and diameter of roots ( $P < 0.05$ ). The highest amount of these traits were seen in the situation of *G. intraradice* inoculation. In general inoculation with Arbuscular mycorrhizal especially *G. intraradice* could improve the growth process of *Nepeta binaludensis*.

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**ANTIOXIDANT ACTIVITY AND CHEMICAL COMPOSITION OF FRUIT  
AND LEAF OF *LAURUS NOBILIS* ESSENTIAL OIL  
COMPARE WITH ITS EXTRACT**

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*Laurus nobilis* is an evergreen Mediterranean plant that dried leaves are used in food industry as spice. *Laurus nobilis* is widely found in north of Iran and its cultivation has been common due to evergreen leaves and beautiful appearance. This study describes the chemical composition and antioxidant activity of *Laurus nobilis* essential oil and its extract. Essential oil obtained by steam distillation leaf and fruit of *Laurus nobilis* was analyzed by using gas chromatography. Compounds such as 1,8 cineol,  $\alpha$ -pinene and  $\alpha$ -terpinene in leaf essential oil of *Laurus nobilis* were 55.3, 2.56 and 0.99 w/w%, respectively. While the amount of 1,8 cineol,  $\alpha$ -pinene and  $\alpha$ -terpinene in essential oil of fruit were 24.7, 1.2 and 4.4 w/w%, respectively. The results of antioxidant analysis showed that antioxidant activity of leaf extract ( $IC_{50}$ =55.4  $\mu$ g/ml) was better than antioxidant activity of essential oil ( $IC_{50}$  of fruit =322.5  $\mu$ g/ml and  $IC_{50}$  of leaf =635.8  $\mu$ g/ml).

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**STUDY THE CHEMICAL COMPOSITION OF WATER EXTRACT OF *CENTELLA ASIATICA* (L.) URBAN IN DIFFERENT GROWTH PHASES COLLECTED FROM THE AREA ABKENAR BANDAR ANZALI AND AQUEOUS EXTRACTS AND ETHANOL COLLECTED IN THE FLOWERING PHASE OF THE SHAFT AND COMPARE BOTH HABITAT CHOMACHA.**

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Centella asiatica is belong to Apiaceae family, it has stolons and cordate leaves, minute flowers in umbel inflaescence, This Species, has very medicinal properties as wound healing, memory and learning enhance ment, Immune system regulation, reduce of blood presure, antioxidant and anticancer, plant material for phytochemical studies obtained from Abkenar village in Anzali: to Three developmental phases, and Chamecha village in Shaft a flowering phase, Our Result's Show That aquatic extracts have much more effective products than to hydroalcoholic extracts. also post flowering phase in Abkenar papulation have maximum madecassoside and asiaticoside and pre flowering phase has maximum madeccasic acid, also comparison two habitats show that all of four effective products are increased in chamacha than Abkenar. Based on our resuts this medicinal plant has many properties specially in treat wound and increasing memory. Also the best time of its effects is the end time of flowering phase and form the fruit.

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**THE STUDY OF ESSENTIAL OILS CHEMICAL COMPOSITION OF  
*CENTELLA ASIATICA* (L0) URBAN AS A MEDICINAL PLANT IN  
THREE STAGES OF GROWTH AND DEVELOPMENT**

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*Centella asiatica* from Apiaceae family has 40 species in all over the world. It has Creeping herb, rooting at the nodes. Stems shallowly grooved, sometimes purplish. Leaves solitary or in groups of 2-5, kidney-shaped to almost circular, distinctly and broadly cordate at the base, up to 7 cm wide, hairless or with hairs on the petiole; margin crenate. Flowers in 2-8-flowered umbels, greenish-white to dark crimson. Fruit c. 3.5×3 mm, laterally flattened, round or ellipsoid, ribbed, brown when ripe. This species has medicinal properties for example, wound healing, Antioxidant, memory enhancement, Anti diabetic and so on. *C. asiatica* is distributed in Guilan province and plant materials are collected from three different stages of growth and development including beginning of growth, flowering and fruiting phase, and end of growth phase. The results are shown that essential oil yield was 0/16% (V/M) and 54 volatile compounds comprising 92.78% of total oil constituents were identified from *C. asiatica*. Sesquiterpenoids were the major class of volatile chemical (45/33%), with Germaerene-D as the predominant compound. (45.43%).

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**STUDY OF GENETIC DIVERSITY AND POPULATION STRUCTURE IN SOME WILD POPULATIONS OF *STACHYS LAVANDULIFOLIA* USING MOLECULAR MARKERS, ISSR**

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Betony (*stachys lavandulifolia*) is one of the 34 wild species of important genus *Stachys* from Lamiaceae family which grows naturally in Iran. In present study, seven endemic populations of *Stachys lavandulifolia* (including 56 samples) from five provinces were investigated. ISSRs (Inter simple sequence repeats) were used for surveying genetic diversity and population structure of Betony. In total, 12 used primers produced 176 fragments which all of them (100%) were polymorphic. By using NTSYS-pc software and UPGMA method, the samples were divided into six groups based on Jaccard genetic similarity matrix. Principal coordinates analysis (PCOA) confirmed the accuracy of clustering results. POPGENE software was used to describe genetic variation within populations according to Shannon's index and Nei's gene diversity analysis. Genetic diversity within the populations of Aznav and Toreh was the most and the least, respectively. The average observed number of alleles ( $n_a$ ) to the effective number of alleles ( $n_e$ ) was calculated and the number was 83%. Studies based on this average showed that the gene distribution were balanced in each population. Moreover, GeneAlex and POPGENE softwares were used to analyze genetic diversity and molecular variance among populations.  $G_{st}$  and  $N_m$  indexes average of the populations were accounted 0.20 and 1.94, respectively, indicating a balanced gene exchange among seven studied Betony populations. Molecular variance analysis of the populations showed that genetic diversity within and among the populations were 75% and 25%, respectively. According to the data obtained Nei's genetic similarity ranged between 0.79-0.97, the most similarity was distinguished between Toreh with Zia-Abad and Khoramdareh whereas the least one was between Toreh and Salavat-Abad. After investigating genetic structure of the populations using STRUCTURE software, they were divided into four groups. According to the obtained results, ISSR marker could be used as a valuable tool for getting molecular information and investigating genetic diversity. This marker has shown an effective genetic relationship between the populations and also helped us good understanding of genetic diversity among and within the populations. In spite of removal from natural areas, the results of this study showed a high variation among the investigated samples. The findings of the present study could also be applicable for domesticating and breeding programs of Betony.



THE POSSIBILITY OF INFECTION SOME MEDICINAL PLANTS TO CABBAGE  
CYST NEMATODE *HETERODERA CRUCIFERAE* FRANKLIN 1945  
IN GREENHOUSE CONDITION

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Phylum nematoda includes the group of multicellular and vermiform animals, which found in all different habitats from poles to hot springs. Plant parasitic nematodes are just 10% of the members of the phylum. The most destructive group of plant parasitic nematodes living in the plant so called endo parasites. the cabbage cyst nematode, *Heterodera cruciferae* Franklin, 1945 is one of the plant endo parasitic nematode, that have been reported from different parts of the world and Iran, as well. Plant has specific active ingredients which can have role in prevention of diseases in humans can be considered as medicinal plant. The use of herbs to treat disease is almost universal among non-industrial societies and aften more affordable than buying chemical drugs. By investigation the parasitic nematodes in plant growing area, optimum usage of soil will be available. In this study, since main hosts of cabbage cyst nematode (kohlrabia, *Brassica oleracea* L. var. *gongylodes*, and white cabbage, *Brassica oleracea* L. var. *capitata alba*) are naturally infected by cyst nematode in Tabriz vegetable growing areas and there is just generalization about the cabbage cyst nematode host rang in text book, in this study six medicand plant species namely *Mlissa officinal*, *Lallemantia iberica*, *Dracocephalum moldavica*, *Descurainia sophia*, *Brassica alba* and *Brassic ajuncea* infected by cabbage cyst nematode in greenhouse candition. After preparing the nematodes from vegetable growing area Tabriz, extraction of the nematodes (cyst) was performed using Fenwick 1940 and later or the cyst using needle and streomicroscope. Extracted cysts were sterilized by incubating in 0.6% sodium hypochlorde (Naocl) solution for 30 seconds. The soil was sterilized by autoclave and transferred to the greenhouse environment. Four to five cyst put in the vicinity of each seed in pots. In different stages from germination to flowering plants sampling carried on randomly and the roots were stained using a lactoglycerin-acidfouchin. White cabbage and kohlrabia were used as a control in this study. The results showed that in addition to control plants, black mustard (*Brassica alba*) and yellow mustard (*Brassica juncea*) are as cabbage nematode hosts.



## YIELD OF THYME VARIETIES IN TWO AREAS OF IRAN

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Thyme (*Thymus* spp.) is one of the most important genus of Lamiaceae family of which the vegetative parts have been widely mentioned as medicine in the majority of pharmacopoeia. Daily increasing attention to medicinal plants, has turned the selection of superior populations to the first research priority to be utilized not only as new cultivars but also as desirable materials for breeding programs. Five varieties of *Thymus vulgaris* including Varico3 and Deutscher Winter, Zardband, Jihad-E-Daneshgahi, and University of Shahid Beheshty selections as well as one variety of *T. daenensis* originated from Isfahan were planted in a randomized complete block design with three replications at Karaj(temperate) and Sepidan(cold) in mid-May, 2016. Sampling was carried out in December and fresh weight, dry weight, number of internodes, internode length, leaf length and width, main stem length, whole plant leaves and stems weight, and leaf wt/stem wt ratio were measured. The results showed that the number of internodes and internode length of *T. daenensis* were significantly higher than *T. vulgaris*, while there was no considerable difference among five varieties of *T. vulgaris*. *T. daenensis* had the highest leaf length. Zardband showed the highest whole plant leaf and stem dry weight, although there was no significant difference between Zardband and Jihad-E-Daneshgahi. Leaf/stem ratio was maximum in the University of Shahid Beheshty variety. Based on yield (i.e., fresh and dry weight), Zardband and Jahade-E-Daneshgahi were selected as the best and second best promising varieties which could be used in breeding programs.



**LAVANDULA ANGUSTIFOLIA MILL. FOR THE TREATMENT OF MILD TO MODERATE DEPRESSION. A DOUBLE-BLIND, RANDOMIZED TRIAL IN COMPARISON WITH FLUOXETINE**

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Depression is progressing worldwide rapidly and the need for an efficient treatment with low side effect is rising [1]. *Lavandula angustifolia* Mill is used traditionally for treatment of depression. Many textbooks of traditional Persian medicine refer to this herb for treatment of depression whilst there are no adequate clinical trials to support this claim [2,3]. The aim of this study was to evaluate the efficacy of *L. angustifolia* in comparison with fluoxetine for treatment of mild to moderate depression in an 8 week randomized, double-blind clinical trial. Thirty adult outpatients who met DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, 5th edition) for major depression, randomly assigned in 2 groups to receive daily either *L. angustifolia* (2g) or fluoxetine (20 mg) and assessed in weeks 0, 2, 4 and 8 by the Hamilton Rating Scale for Depression (HAM-D) 17-item. Our study showed *L. angustifolia* were as effective as fluoxetine in the treatment of mild to moderate depression ( $F= 0.183$ ,  $df= 1$ ,  $p= 0.672$ ). For investigation of the antidepressant effect of this herb in more detail designing large-scale trials is needed.

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**PHYTOCHEMICAL STUDIES OF POMEGRANATE PEEL EXTRACT VARIETY R  
(*PUNICA GRANATUM* VAR. *RABBAB*)**

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Pomegranate is one of the most famous native fruits cultivated in Iran and in many tropical and subtropical countries grows. In addition to the nutritional and medicinal uses of pomegranate peel, as a dye in textiles is important. Rich sources of polyphenols from pomegranate peel is, Studies have shown that pomegranate peel, dried and pulverized and extracted, with phenol and antioxidant content is very high [1]. The most important chemical compounds in pomegranate peel can be noted that the structure of phenolic ellagic acid in this combination it becomes strong antioxidant activity [2]. In this study, R. varieties of fruit orchards Srchhan region of Fars province were collected and dried by artificial drying. In order to study phytochemical extracts of maceration method using methanol, distilled water, hydrochloric acid, prepared And the tannin extract to identify the presence of iron chloride solution of boiling water and 6% were used. 3% sodium carbonate solvents and reagents to detect the presence of the Folin-Ciocalteu phenol were used. And for the presence of hydrochloric acid and sodium hydroxide used untreated flavonoids. It goes on to identify the presence of alkaloids from the announcement of Meyer and hydrochloric acid aqueous solution was used. In this study, the combination of flavonoids, tannins and phenolic plant was confirmed, combination of alkaloid found in this species. We extract the desired compounds indicate that This extract can be used to develop drugs that are more targeted, but this requires further investigation.

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**VALIDATED METHOD FOR RAPID ANALYSIS OF ISOQUINOLINE  
ALKALOIDS IN PAPAVERACEAE USING ION MOBILITY SPECTROMETRY**

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Opiates are alkaloid compounds naturally found in the Papaveraceae. The psychoactive compounds found in the Papaveraceae include morphine, codeine and thebaine [1]. Different methods have been developed for the detection and determination of alkaloids, including GC-MS [2], HPLC [3] and capillary electrophoresis [4]. The aim of this study was to validate an ion mobility spectrometry (IMS) method for analysis of three isoquinoline alkaloids from Papaveraceae family for the first time. In this work, through analysis procedure the morphine, codeine and thebaine were separated and detected by IMS. Several parameters affecting the analysis method such as carrier gas, drift and dopant flow, cell and injection temperature, shutter gride and voltage of drift cell were optimized thorough experimental design method. Validation of the method was studied under optimal conditions using water samples in which the presence of the target analytes. Linearity, specificity, precision, accuracy, limit of detection (LOD) and quantification (LOQ), robustness and ruggedness of the proposed method were investigated according to USP recommendations. Under the optimal conditions, the linearity of the method was determined to be in the range of 0.5-25  $\mu\text{g mL}^{-1}$ . The limits of detection for the target alkaloids were in the range of 0.05-0.5  $\mu\text{g mL}^{-1}$ . This procedure created better sensitivity through fast quantification than HPLC and GC methods. The results successfully introduced this method for separation and determination of the target alkaloids in the extracts of plant samples.

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**DETERMINATION OF ANTHOCYANINS IN FRUIT AND AERIAL PART OF  
*VACCINIUM ARCTOSTAPHYLOS* BY HPLC AND COLORIMETRIC METHOD**

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*Vaccinium arctostaphylos* or Caucasian whortleberry is a species of shrub with edible fruit of blue color. It is native to Western Asia (Iran and Turkey), the Caucasus (Armenia; Azerbaijan; Georgia; Russia), and Southeastern Europe (Bulgaria). The fruits (berries) of this plant are rich in anthocyanins [2]. The aim of this study was to determine of anthocyanin in fruit and aerial part of *Vaccinium arctostaphylos*. The assessment was done by two methods. Total anthocyanin content expressed as cyanidin-3-glucoside was measured in 528nm. Reversed-phase high-performance liquid chromatographic (RP-HPLC) method was used to determine the amount of cyanidin-3-glucoside. The HPLC separation was achieved on a Nucleodur 100-3 C<sub>18</sub> column (250 × 4.6mm) at ambient temperature. Results showed that total anthocyanin in fruit and aerial part were 1.07 and 0.12, respectively. The amount of cyanidin-3-glucoside in fruit (0.20% w/w) was higher than aerial part (0.02% w/w). There was a considerable difference between the amount of anthocyanins in the fruit and aerial part.

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**STUDY ON PEROXIDASE ACTIVITY FROM WHITE AND RED CABBAGE  
(*BRASSICA OLEARACEA*)**

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Peroxidase (PODS; EC 1.11.1.X) in different types of living organisms (animals, plants and microorganisms) is expanding [1]. This enzyme belongs to oxidoreductase enzymes family which catalyzes the oxidation reaction of some substrates, including phenolic compounds such as guaiacol, pyrogallol, chlorogenic acid and catechol in the presence of hydrogen peroxide H<sub>2</sub>O<sub>2</sub> or organic hydroperoxides as electron acceptor [2]. Peroxidases have wide applications in various fields of medical biochemistry, biotechnology, food industry and increases their attractiveness on the study to detoxification and removal of organic contaminants from wastewaters [3]. In this investigation, peroxidase were extracted and partially purified from cabbage leaves and the enzyme activity were determined. A crude extract from fresh white cabbage leaves was homogenized, centrifuged and precipitate by ammonium sulfate (40-75%) at 4°C. The enzyme activity in the crude extract and dialysate was monitored in 470 nm with H<sub>2</sub>O<sub>2</sub> as substrate and guaiacolas electron donor in phosphate-citrate buffer with pH 5 (optimum pH) and at 55°C (optimum temperature). Total activity and the specific activity of peroxidase were 3012.63 U and 1.87 U/mg in crude extract and 2922.63 U and 30.98 U/mg in dialysate after ammonium sulfate precipitation. While for red cabbage in phosphate-citrate buffer with pH 5.5 (optimum pH) and at 60°C (optimum temperature). Total activity and the specific activity of peroxidase were 3425.97U and 0.69U/mg in crude extract and 2766.65U and 20.01 U/mg in dialysate after ammonium sulfate precipitation. According to our study the antioxidant activity of white cabbage have been more than red cabbage. Our study suggested that the cabbage leaves can be used as a source of peroxidase enzyme for study on activity and kinetic characterizations in food industry and pharmaceutical.

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***HELICHRYSUM ARMENIUM* EXTRACT AS CORROSION INHIBITOR FOR MILD STEEL IN 0.5 M HYDROCHLORIC ACID**

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There are about 300 *Helichrysum* species from Asteraceae family in the world. *Helichrysum armenium* growing in Iran. This genus is one of the important genera of the asteraceae family. Corrosion inhibition effect of *Helichrysum armenium* extract on the corrosion of mild steel in 0.5 M HCl was studied using electrochemical impedance spectroscopy and Tafel polarization method at 25 °C. The obtained impedance diagram (Nyquist plots) of mild steel samples in 0.5 M HCl and 0.5 M HCl containing *Helichrysum armenium* extract showed only one capacitive loop. The results showed that the diameter of Nyquist plots and charge transfer resistance ( $R_{ct}$ ) of samples increases in presence of plant extract. Tafel polarization data illustrated that the addition of *Helichrysum armenium* extract decreases corrosion current density. The inhibition efficiencies of the extract were calculated. The extract acts as corrosion inhibitor, with about 45% efficiency at 0.0025 v/v% plant extract concentration in 0.5 M HCl. This behavior shows that *Helichrysum armenium* extract acts as a good inhibitor for the corrosion of mild steel in HCl media [1-3].

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STEM ANATOMICAL STUDY IN SOME PERENNIAL SPECIES OF  
*POLYGONUM S.STR* IN IRAN

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*Polygonum* L. ,the largest genus of Polygonaceae family, comprises about 230 species in the world mostly distributed in Northern hemisphere. In Iran, *Polygonum* consists of 9 annuals and 15 perennials [1]. Although the most literatures mentioned the medicinal importance of annual species, but some perennial ones also have important medicinal properties. For example *P.hyrceanicum* which is native to Iran is used for wound healing, inflammation and treatment of liver diseases. In Northern regions of the country, especially in the Turkmen Sahra, folk used this species to treat anemia, kidney stone and liver disorders. for infusion used [2]. In this study, stem anatomical studies were done on 9 perennial species of this genus includes: *P.alpester*, *P.spinsum*, *P.paronychioides*, *P.salicornoides*, *P.dumosum*, *P.thymifolium*, *P.hyrceanicum*, *P.luzuloides*, *P.botuliforme*. our observations showed that anatomical features such as shape of transections, presence or absence of collenchymatous hypodermis, number of layers of collenchymatous hypodermis, number of vascular bundles and thickness of pericycle, pith and parenchyma are of diagnostic value among species studied. Our results showed that *P.hyrceanicum* and *P.lozuloides* are very close in anatomical characters. The results of this study showed that the stem anatomical characteristics can be effective in species separation.

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**THE AMOUNTS OF FLAVONOIDS AND TOTAL PHENOL OF TWO POLAR AND NON-POLAR EXTRACTS OF ALGAE OF PERSIAN GULF COAST**

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The human body has several defense mechanisms especially enzymatic and non-enzymatic antioxidant systems for protection of cell molecules against free radicals such as reactive oxygen species (ROS) (1). Extraction of algae by maceration method was conducted for 24 hours at the lab temperature and dark condition. Total phenol levels in samples of algae extract with little change was measured by *Folin-Ciocalteu* method (4). Also the amount of flavonoids in the sample of algal extract was measured by the method of Zhishen et al. with slightly modification. *G. pygmaea* had the highest phenol content and lowest amount of phenol in ethanolic extracts was related to the algae *A. muscoid*. *A. muscoid* had the highest phenol of chloroformic extracts and the algae *A. nadyformis* had the lowest amount of phenol. Between the hydroalcoholic extract of algae *C. myrica* with algae *A. nadyformis* difference was statistically significant. Chloroformic extract of algae *G. pygmaea* had significant differences with other studied algae. The highest values of total flavonoids of hydroalcoholic extracts was related to algae *A. muscoid* and lowest values was seen in algae *G. pygmaea*. The highest values of total flavonoids of chloroformic extracts was related to algae *G. pygmaea* and lowest values was seen in algae *C. myrica*. Between the chloroformic extracts of algae *A. Muscoid* with *A. nadyformis* the difference was not significant. Hydroalcoholic extract of *G. Pygmaea* had significant differences with the all studied algae. Total phenol levels in hydroalcoholic extracts (70%) was nearly two to three times greater than the total phenol of chloroformic extracts. Also the amounts of flavonoids and total phenol in both of polar and non-polar extract were roughly equal. In summary, the lowest levels of phenols and flavonoids were Tom *A. nadyformis* algae. In summary, the lowest levels of phenol and flavonoids were measured in algae *A. nadyformis*.

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**ANTIOXIDANT PROPERTIES OF ETHANOLIC AND CHLOROFORMIC  
EXTRACTS OF FOUR ALGAE SPECIES OF THE COAST OF THE PERSIAN  
GULF WITH FRAP TEST**

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Oxidizing properties of oxygen play vital roles in different biological functions such as the use of food, electron transport for the production of ATP, while oxygen is essential for life, also makes oxidizing intracellular materials and has the role of destruction. Oxygen can be converted to many active forms such as superoxide radicals ( $O_2^-$ ), hydroxyl radicals ( $H_2O_2$ ) and can damage DNA in this way, or destroy essential enzymes and structural proteins. It can also stimulate chain reactions that are out of control like auto-oxidation and peroxidation reactions (eg polymerization of catlamyns s) (1). Extraction of algae by maceration method with 70% alcohol and chloroform was conducted for 24 hours at the lab temperature and dark condition (2). Benzie and Sterin method with slight modification was used to measure the reducing ability of extracts by FRAP method (3). The highest antioxidant activity of ethanolic extracts with above test was related to algae *C. myrica* and the least amount was seen in algae *G. pygmaea*. The highest antioxidant activity of chloroformic extracts was related to algae *G. pygmaea* with the above test. There were no significant difference between chloroformic extracts of *A. nadyformis* and *A. muscoid*. Between ethanolic extracts of all algae there were significant differences. With the above test, results of antioxidant activity for two types of chloroformic and hydro-alcoholic extracts of algae *G. pygmaea* were opposite. The antioxidant activity of revived iron is measured on the basis of the reduction power of ferric ion (III) to ferrous ion (II) and the results is reported on the basis of micromoles ferrous ion per gram of extract.

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## ANTIOXIDANT PROPERTIES OF SEVERAL ALGAE SPECIES OF THE COAST OF PERSIAN GULF

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Now synthetic antioxidants such as Butylhydroxytoluene, Butylhydroxyanisole, tert-butyl hydroquinone and propyl gallate have been strictly regulated and restricted because they are prone to important diseases such as cancer (1). Extraction of algae by maceration method with 70% alcohol and chloroform was conducted for 24 hours at the lab temperature and dark condition (2). The antioxidant activity of the extracts was measured through phosphomolybdenum complex by Prieto, Pnyda and Aguilar method and antioxidant activity of the extract samples by method of Van Gadow et al. The highest antioxidant activity of ethanolic extracts by the above test was related to *A. muscoid* and the lowest was related to algae *G. pygmaea*. The highest antioxidant activity of chloroformic extracts by the above test was seen in algae *G. pygmaea* and the lowest amount was in brown algae *C. myrica*. No statistically significant difference was seen between the ethanolic extract of algae *A. nadyformis* and *G. pygmaea*. The differences were significant between antioxidant activities of chloroformic extracts of all studied algae. The highest antioxidant activity of ethanolic extracts with free radical test of *diphenyl-picrylhydrazyl* was related to algae *C. myrica* and the lowest was in *G. pygmaea* algae. The highest percentage of inhibitory of chloroformic extract with the above test was related to *G. pygmaea* and the lowest percentage of inhibition test related to algae *A. nadyformis*. There was no statistically significant difference between the percentages of inhibition of ethanolic extract of brown algae *A. muscoid* with algae *C. myrica*. In general, antioxidant activity and inhibition percentage by DPPH test was high for ethanolic and chloroformic extracts of brown algae *C. myrica* and algae *A. Muscoid* and this demonstrates the high levels of antioxidant compounds both in the form polar and non-polar in this algae compared to other algae extracts studied in this research. Similar to DPPH test, anti-oxidant activity with PMD test was high for ethanolic extract of algae *A. muscoid*.

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**POLYPLOIDY INDUCTION IN *ARNICACHAMISSONIS* LESS. SSP. *FOLIOSA***

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*Arnica chamissonis* Less. ssp. *foliosa* has many uses in cosmetics. Chamisso's *Arnica* is a rhizomatous herbaceous perennial from the daisy family (Asteraceae), endemic to north America and Canada. Sesquiterpene lactones, flavonoids and fenolic acids found in the flower heads have many medicinal uses and are used to cure bruises, muscle and joint pain, cuts, insect bites and edema [1,2]. In order to induce polyploidy in *A. chamissonis*, a factorial experiment with completely randomized blocks was used and colchicine dose and exposure time were tested in 3 replications. Colchicine dose was tested in 0 and 0.05 % concentrations and exposure times of 6, 12 and 24 hours were used to induce polyploidy. In the first set of experiments, seeds were exposed to colchicine solution while in the second, apical meristems were exposed to colchicine both by the means of submerging or insertion of cotton balls. The results indicated that the best method to induce polyploidy in *A. chamissonis* can be achieved by the cotton ball method and 24 hours of exposure time. DNA content (2C) of diploid plants was 3.70 picograms and the chromosome count was  $2n= 2x= 38$ . Mixoploid plants had darker green foliage, thicker stems, larger and sparser stomata and lower height compared to diploid plants. In this study, plants with a pure tetraploid level were not observed.

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**THE EFFECT OF GAMMA RAY ON SEED GERMINATION IN  
*ARNICACHAMISSONIS* LESS. SSP. *FOLIOSA* AND DOSE DETERMINATION  
FOR GENETIC VARIATION INDUCTION**

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*Arnica chamissonis* Less. ssp. *foliosa* has many uses in cosmetics. Chamisso's Arnica is a rhizomatous herbaceous perennial from the daisy family (Asteraceae), endemic to north America and Canada. Sesquiterpene lactones, flavonoids and phenolic acids found in the flower heads have many medicinal uses and are used to cure bruises, muscle and joint pain, cuts, insect bites and edema [1]. Regarding the limited available genetic material and the necessity of selecting individuals compatible with the climate of Iran, different approaches like genetic mutation are required to induce variation. To achieve this, effect of different gamma radiation doses (0, 100, 200, 300, 400 and 500 Grey) on seed germination and seedling growth of *A. chamissonis* was assessed. Gamma radiation caused significant effect on parameters such as hypocotyl and rootlet length, germination percentage, germination rate, seedling vigor, rootlet wet weight, hypocotyle wet and dry weight ( $p \leq 0.01$ ) and also rootlet dry weight ( $p \leq 0.05$ ). Radiation with 200 Grey showed the most promising effects on germination parameters of this species. Compared to the control treatment, radiation by 300 Grey and higher caused adverse effects on all mentioned parameters. An LD<sub>50</sub> of 275.266 Grey was estimated for this species and the best estimated dose to induce highest genetic mutation was 225.180 Grey.

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**CHEMICAL CONSTITUENTS AND MEDICAL PROPERTIES OIL OF  
*MORINGA OLEIFERA* AND COMPARED WITH OTHER PLANTS OIL  
FROM ABAKALIKI, NIGERIA**

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*Moringa oleifera* is a tree that is sometimes called the Tree of Life or a Miracle Tree, but rather than this being in reference to its potential medicinal usage this is actually referring to how it is a very valuable food crop (it is drought resistant, grows very fast, and is highly nutritive) and even beyond food it serves many benefits in third world countries such as having an ability to be used for some crafts (due to being a tree) and cleaning water. 35-45% fatty acids (seeds) which are mostly odorless and colorless<sup>[1]</sup> and consists of mostly (73%) oleic acid with less than 1% polyunsaturated fatty acids, which gives the oils good oxidative stability<sup>[2]</sup> exceeding the stability of other oleic-acid rich oils such as Olive Oil, high-oleic sunflower, meadowfoam, macadamia, hybrid safflower, safflower, almond and apricot oils.<sup>[3]</sup> In this paper we identified Chemical Constituents and medical properties Oil of *Moringa oleifera* and compared with other plants Oil from Abakaliki, Nigeria.



DEVELOPMENT AND VALIDATION OF A HPLC-UV METHOD IN  
*SCROPHULARIA STRIATA* BOISS. CELL CULTURE FOR ACTEOSIDE QUANTITATIVE  
DETERMINATION

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Suspension culture of *Scrophularia striata* Boiss. (Scrophulariaceae) accumulate acteoside, an anticancer and antimetastatic agent [1, 2], and could therefore serve as an alternative source of this important phenylethanoid glycoside. This work was developed a simple and sensitive HPLC to monitor the acteoside quantification from *S. striata*. Cell culture was established in MS medium supplemented with 0.5 mg/L NAA + 2 mg/L BA. Determination of acteoside was performed using a (Knauer, Germany) HPLC system with a C-18 column (5 $\mu$ m  $\times$  250  $\times$  4.6 mm). To develop HPLC method, the chromatographic conditions were as follows: Polaris C- 18, a mobile phase in gradient mode composed of methanol- 0.4 % acetic acid aqueous solution, a flow rate of 1.0 ml/min and in last 5 min was 1.5 ml/min. The detection wavelength set in 333 nm. Acteoside showed good linear relationship at the range of 0.03-200 mg/L ( $r^2=0.996$ ). The average recovery was 100 and %,RSD 1.86%, method precision and accuracy fell within predefined limits (less than 20%) [3]. The optimized HPLC method was able to determine small amounts of acteoside in *S. striata* cell culture with great efficiency. This system is a simple, quick, sensitive and economical HPLC method for the simultaneous determination of acteoside in *S. striata* callus, cell cultures and wild plant.

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**INVESTIGATION OF ANTIBACTERIAL ACTIVITIES OF CLOVE ON BACTERIAL GROWTH OF *SALMONELLA TYPHIMURIUM* (POULTRY)**

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Resistance of microorganisms to drugs is a major threat that searching for antimicrobial agents is necessary. Plants provide materials for protection from microbes that have potential use as drugs. The aim of this study was to evaluate the antimicrobial properties of aqueous, ethanolic and methanolic extracts of Jaft on *Salmonella Typhimurium*. Clove was grinded after isolation and drying in the shade and then extraction was carried out by soaking method with the ratio of 1:5 with water, methanol, ethanol and chloroform. The antibacterial effect (1) as well as the MIC / MBC concentrations of 25, 50, 100 and 200 mg.mL<sup>-1</sup> of the obtained extract Was investigated by disc diffusion method (2) against the standard strains of *Salmonella typhimurium*. All zone diameter which measured in the regard of plant extract and positive control was studied and analyzed by ANOVA and t- test. Significance of data was investigated by Shapiro-Willk and they were analyzed using SPSS software if they were significance. In the disk method the difference was not significant between antibacterial activity of aqueous, methanolic and chloroformic extracts of clove against *Salmonella typhimurium*. In this study difference was statistically significant between the antibacterial activity of clove ethanolic extract (70%) with methanolic and aqueous extract against the bacterium *Salmonella typhimurium*. Chloroformic extract against *Salmonella typhimurium* showed no significant difference with any of the other extracts. The ethanolic extract had the maximum diameter of inhibition zone recorded in the disk diffusion method (equal to 9 mm) against bacteria. The minimum amount of MIC and MBC were obtained in ethanolic and methanolic extracts by microdilution method. With respect to diameter of growth inhibition zone and MIC and MBC results in disk diffusion method, ethanolic extract showed the best bactericidal activity against bacteria with effect on *Salmonella typhimurium*.

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**STUDY THE INHIBITORY EFFECT AND ANTIBACTERIAL ACTIVITY OF  
CLOVE (*EUGENIA CARYOPHYLLA*)**

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Essential oils in medicinal herbs regarded as sources of preservative and antioxidant in food, pharmaceutical and cosmetic products. The use of anti-microbial compounds found in plants as natural combination that have lethal and inhibitory effects on pathogenic agents have been paying more attention due to the growing resistance of bacteria to antibiotics derived from microorganisms [1]. Clove medicinal plant with scientific name, *Syzygium Aromaticum* and synonymous with *Eugenia Caryophylla* is from Myrtaceae family, which has many antimicrobial properties [2]. Extraction of clove with distilled water, methanol, ethanol and chloroform solvents was conducted by soaking method. The antibacterial effect and also MIC/MBC concentrations of 25, 50, 100 and 200 milligrams per ml of the extracts were studied by the well method against the standard strains of *Salmonella typhimurium*. In the well method maximum inhibition zone diameter (equal to 18 mm) was indicated in chloroformic extract. The minimum amount of MIC and MBC by microdilution method were obtained in ethanolic and methanolic extracts. In the well method the difference was not significant between the antibacterial activity of aqueous, ethanolic and methanolic extracts of clove against *Salmonella typhimurium*. In this study between the antibacterial activities of chloroform extract of clove with other studied extracts against *Salmonella typhimurium* difference was statistically significant. Generally, in the well method the best antibacterial activity was seen in the chloroformic extract with impact on the bacterium *Salmonella typhimurium*. Clove in addition to having a significant amount of volatile essential oil, it has 10 to 13 percent tannin and a crystalline material called *Caryophyllene* and different amounts of ester and *triterpene* acids. Clove glycosides include aliphatic alcohols, *monoterpenoids*, *eugenol*, *Isoeugenol*, *farensol*, *sitosterol*, *nerolidol* and *campestrol*.

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**EFFECT OF ELICITOR APPLICATION UNDER SALINITY STRESS ON SOME  
SECONDARY METABOLITES OF *CHELIDONIUM MAJUS***

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To evaluate the effect of salicylic acid and methyl jasmonate application under salinity stress on some secondary metabolites and chlorophyll contents of *Chelidonium majus*, a factorial experiment based on completely randomized design with four replications was conducted during 2016-2017 in greenhouse and laboratory of Imam Khomeini International University. The treatments were salinity at two levels (zero and 30 mM NaCl), Salicylic acid at two levels (zero and 2 mM) and Methyl jasmonate at two levels (zero and 100  $\mu$ M). Biochemical compounds including chlorophyll a, b and total, the contents of carotenoids, anthocyanines and flavonoids in three organs leaf, stem and root were measured using spectrophotometer. The results showed that salinity stress had positive and increasing effect on all studied traits exception for chlorophyll a and anthocyanines. The results of mean comparisons for elicitors showed that Methyl jasmonate increased carotenoids, anthocyanines and flavonoids, but chlorophyll a, b and total chlorophyll increased more by using Salicylic acid treatment. In stress $\times$ elicitor mean comparisons, maximum contents of chlorophyll a, b and total, carotenoids and flavonoids was shown at composition salinity + Salicylic acid. The highest amount of all traits recorded for leaf followed by stem and roots. In three-way interaction mean comparisons, the best factors composition for the contents of chlorophyll and carotenoids was salinity+salicylic acid+leaf, also for anthocyanines and flavonoids, non-stress+Salicylic acid+leaf and non-stress+Methyl jasmonate +leaf were the best compositions, respectively.

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**THE EFFECTS OF METHYL JASMONATE AND SALICYLIC ACID ON SOME PHYTOCHEMICAL TRAITS UNDER DROUGHT STRESS IN CELANDINE**

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The effect of methyl jasmonate and salicylic acid on some physiological characters of Medicinal Herbs Celandine was evaluated under drought stress at the greenhouse and laboratory of Imam Khomeini International University. The experimental design was as factorial (three factors) based on a completely randomized design (CRD) with four replications. In this research, the studied factors were drought stress at two levels, well-watered (control) and irrigation with 50% of field capacity (stress), elicitors with three levels (zero, 100  $\mu$ M methyl jasmonate (MeJA), 2 mM salicylic acid (SA) and organs with three levels (leaf, stem, root). The measured characteristics included contents of chlorophyll a, b and total chlorophyll, contents of carotenoids, anthocyanines and flavonoids in three organs. Analysis of variance showed that the simple effect of drought stress, methyl jasmonate and salicylic acid and their two-way, three-way interactions were statistically significant for all traits except for anthocyanines and flavonoids. The results of mean comparisons showed that methyl jasmonate increased all biochemical compounds especially the contents of carotenoids, anthocyanines and flavonoids, while salicylic acid increased only carotenoids and anthocyanines. The maximum amount of carotenoids, anthocyanines and flavonoids were shown in leaves followed by stems and roots. In three-way interaction mean comparisons, the best factor compositions for the contents of carotenoids, anthocyanines, flavonoids and total chlorophyll were leaf+SA+well-watered and leaf+MeJA+drought treatments.

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**EVALUATION OF TITANIUM DIOXIDE NANOPARTICLE ON MEIOTIC BEHAVIOR AND POLLEN FERTILITY IN CUMIN (*CUMINUM CYMINUM*)**

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Cumin (*Cuminum cyminum*), known as king of seed spices, is one of the most important medicinal plants in Iran which is cultivated in arid and semi-arid regions of the country. Previous results showed the positive effect of titanium dioxide (TiO<sub>2</sub>) nano particle (NP) in different traits of cumini. To study the effect of this NP on pollen fertility and meiotic behavior of cumini two optimum concentrations (0.13 and 0.15 percent) were applied as foliar spray beside control (only water). Immature inflorescence of cumini plants were collected and the rate of abnormalities including stickiness, clumping, disorganized chromosomes, anaphase bridge, laggard chromosome, leader chromosomes, anaphase delayed, micronucleus, threepolar, Sincyt and chromosome nondisjunction measured at all levels. Pollen fertility was assessed considering its size rather normal pollen grain. The highest reduction in fertility (86%) was observed in 0.13 percent of TiO<sub>2</sub> NP and the lowest observed in control samples.





**MOLECULAR PHYLOGENY OF *ONOSMA* L. (BORAGINACEAE) BASED ON  
PLASTID TRNH-PSBA SEQUENCES**

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*Onosma* L. a taxonomically difficult group consisting of some 150 species is the largest genus of the tribe Lithospermeae. The Asia and Mediterranean regions particularly Iran and Turkey are the main centers of diversity of the genus. They usually grow in open, sunny habitats, and are well adapted to dry and rocky soils. In Iran, *Onosma* represented by 46 species, so that many of these plants are endemic and have a medicinal value. The phytochemical reports of this genus show that it comprise mainly aliphatic ketones, lipids, naphthazarins, alkaloids, phenolic compounds, naphthoquinones, flavones while most important are shikonins and onosmins. The plants are traditionally used as laxative, anthelmintic and for alexipharmic effects. The plants are also equally use in eye, blood diseases, bronchitis, abdominal pain, stangury, thirst, itch, lecoderma, fever, wounds, burns, piles and urinary calculi. The flowers of various plants are prescribed as stimulants, cardiogenic, in body swelling while leaves are used as purgative and in cutaneous eruptions. The roots are used for coloring food stuffs, oils and dyeing wool and in medicinal preparations. The phylogeny of *Onosma* were examined. Maximum parsimony (MP), Bayesian inference (BI), and maximum likelihood (ML) were used for the phylogenetic analyses. A total of 69 species of *Onosma* and 2 species of *Alkana* and *Echiumas* outgroups were included in analyses using trnH-psbA sequences. Our results demonstrated that species of subsec. *Heterotricha* is placed near to subsec. *Asterotricha*. Chromosome rearrangement have happend in subsec. *Heterotricha*. The results reveal that gene flow is occured very easily between species of *Onosma* and the interspecific hybridization have an important role in this plant speciation and evolution. The aims of the present paper are: 1-To determine if *Onosma* is monophyletic 2-to assess the evolutionary relationships within the species of this genus 3-to evaluate the interrelationship between the sections and its allies.

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**EFFECTS OF SILVER NANOPARTICLES ON GROWTH AND ALKALOID CONTENTS OF *HYOSCYAMUS RETICULATUS* L. HAIRY ROOTS**

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Hyoscyamus species such as *Hyoscyamus reticulatus* L. are rich sources of tropane alkaloids, mainly hyoscyamine and scopolamine, used for their mydriatic, antispasmodic, anticholinergic, analgesic and sedative properties. Due to complex chemical structures, these alkaloids obtained from natural sources, mainly Solanaceous plants. Recently, there has been considerable interest in the production of these compounds by genetically transformed hairy roots culture because of their stable production of tropane alkaloids which is often comparable to plant roots. Elicitation of secondary metabolites biosynthetic pathways by different kind of elicitors is an effective strategy to increase secondary metabolites productivity. In particular, the production of compounds involved in plant defense, such as alkaloids, can be increased by this way. In the present study, in order to increase production of tropane alkaloids, cotyledon-derived hairy root cultures transformed with *Agrobacterium rhizogenes* strain A7, elicited with nanosilver particles (AgNPs) as abiotic elicitors. Effect of different concentrations (0, 0.4, 0.8 and 1.2 mM) of AgNPs elicitor at different exposure times (24 and 48 hour) were investigated. According to the results, the highest hyoscyamine and scopolamine production (about 5.5- fold increase over the control) was achieved with 0.4 and 0.8 mM AgNPs at 24 and 48 hours of exposure times. Activity of antioxidant enzymes including catalase and ascorbate peroxidase was also elevated in treated hairy roots rather than of the control. Based on the results, it can be concluded that elicitation with AgNPs lead to induce an oxidative stress. These results suggest that AgNPs can be used as effective elicitors in plants biotechnology for the production of plant secondary metabolites such as tropane alkaloids.

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**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF NORTH SARROD MOUNTAINS IN KOHGILOYEH AND BOYERAHMAD PROVINCE**

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Existence of the relationship among people and plants is of the oldest features of all human cultures. Ethnobotany is among related issues to medical plants that discusses an area native people way of using plants in relation to medical, esculent, forage, and instrumental aspects, etc. based on wide demand of medicinal plant, it is important to investigate in this regard and development of researches is founded, as well. In present study after collecting and recognizing species, plant species used by native people of area and traditional usage way of them by people were determined for providing plants in terms of medical plants during communication with local informed people, medical plants' sellers, farmers, gardeners, etc. Among all 180 recognized plant species from North Sarrod mountains, 76 species belonging to 31 plant families were used by native people of area. Asteraceae with 9 species, Fabaceae and Apiaceae with 8 species, Lamiaceae, and Rosaceae each with 7 species and Liliaceae with 5 species are the largest families of area plants in this regard. It is important to note that 15 plant species among used plants of area are of rare plants of Iran.

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**ZATARIA MULTIFLORA ADMINISTRATION ATTENUATES PRENATAL LEAD EXPOSED INDUCED LEARNING AND MEMORY IMPAIRMENTS IN MALE RATS**

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Lead exposure during pregnancy causes deficits in cognition and decrements in intelligence. Since *Zataria multiflora* has been used in Iranian traditional medicine, for its beneficial effects on mental abilities, so this study was performed to evaluate the effects of ZM on learning and memory. Pregnant rats in case group received tap water containing 0.2 % lead acetate throughout the gestation period. Control rats had free access to tap water. Two male offspring from each mother (2 months old, weighing 180-200g) were randomly selected and were treated with either saline or *Zataria multiflora* (50, 200, 400 and 800 mg/kg/ i.p./20 d). Spatial memory of control, saline and ZM-treated rats was evaluated by a training trial and probe test using Morris water maze (6-8 rat/group). The data showed increased escape latency and a greater travelled distance as well as decrements in the frequency of crossings into target quadrants in antenatally lead exposed male offspring compared to control. ZM treatment (200 mg/kg/i.p) ameliorate the memory deficits in male offspring by increasing the time spent and travelled distance in the trigger zone ( $P < 0.01$  vs saline). There was no significant difference in swimming speed between groups. In conclusion, The results showed memory deficits in antenatally lead exposed male offspring. ZM treatment (especially 200 mg/kg) in prenatally lead exposed male rats ameliorated the cognitive behavior. The exact mechanism (s) is not determined yet, but it could be mediated through the anticholinesterase and antioxidant effects and also alterations in CNS neurotransmission in the central nervous system.



**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS OF SAVERZ  
MOUNTAIN IN KOHGILOYEH AND BOYERAHMAD PROVINCE**

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It's perhaps out of history remembrance to know the antiquity of plants' medical values. One of important reasons is deep-rooted believes of people in different areas in respect of using plants. This study aims to identify those plants that have been used widely by local habitants medically, esculent, forage, and instrumentally. In present study after collecting and recognizing species, plant species used by native people of area and traditional usage way of them by people were determined for providing plants in terms of medical plants during communication with local informed people, medical plants' sellers, farmers, gardeners, etc. Among all 295 recognized plant species from Saverz mountain, 60 species belonging to 51 genders and 25 families of plant were used by native people of area. Apiaceae with 8 species, Lamiaceae, Fabaceae, and Rosaceae each with 6 species, Asteraceae and Liliaceae each with 4 species and Cruciferae with 3 species of plants are the largest families of plants in this regard.

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## HISTOCHEMISTRY OF THE GLANDULAR TRICHOMES OF *MENTHA AQUATIC*

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*Mentha aquatica* L. is an annual herb belonging to the family Lamiceae. Because of having significant metabolites such as terpenoids, it is commonly used as medicinal plant. There are diversity of chemical compounds that are produced by specialized secretory cells in the form of Glandular Trichomes which differ in different plants with other functions. Histochemical studies of the trichome on leaves of *Mentha aquatica* were carried out using light and scanning electron microscopy, concurrently to this their secreted material were also characterized using histochemical reagents. One type of glandular trichome were distinguishable in leaves. The glandular trichomes were peltate. Glandular trichomes displayed a high accumulation of terpenoids which could suggest that they are probably main accumulation sites. Results of histochemical tests confirmed that secondary metabolites including lipids, polysaccharides, pectic and phenolic compounds are present in glandular trichome.

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**EVALUATION OF TOTAL ANTOCYANINS CONTENT OF  
MULLEIN (*VERBASCUM SONGARICUM*) ECOTYPES  
IN THE SOUTHWEST OF IRAN**

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The mullein genus is the largest genus of Scrophulariaceae family which has extensive natural habitat in Southwest of Iran. Mullein containing this compounds such as phenolic compounds, mucilage, saponins and anthocyanin. In study 7 ecotypes of *V. songaricum* for determination of total anthocyanin content were collected. Total anthocyanin content measured by pH differential spectroscopic method. The results showed that total anthocyanin content was different among ecotypes. The highest and lowest content of total anthocyanin obtained from Sandegan (69/54 mg/g dry extract) and Klar (12/16 mg/g dry extract) ecotypes, respectively. To sum up, our results revealed a high level of variation in total anthocyanin among *V. songaricum*, collected from different regions in south west Iran.

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**THE EFFECTS OF PLANT GROWTH REGULATORS AND EXPLANTS TYPE  
ON CALLUS INDUCTION AND PLANT REGENERATION IN  
IRANIAN CELANDINE (*CHELIDONIUM MAJUS* L.)**

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Celandine (*Chelidonium majus* L.) is a medicinal plant belonging to the Papaveraceae and rich in isoquinoline alkaloids which has many uses in traditional medicine. Recent studies have proved its anti-inflammatory, anti-cancer and anti-viral effects. The purpose of this research was optimization of a repeatable method for callus induction and *in vitro* propagation in celandine. Celandine seeds after surface sterilizing with 1.6 % sodium hypochlorite were placed on 1/2MS medium for germination. Cotyledonary and hypocotyl explants were prepared from 20-day-old sterile seedlings and leaf explants from 3-month-old plants. Explants were put on MS medium supplemented with different plant growth regulators (PGRs), combination of an auxin including: 2,4-D or IAA with a cytokinin including: BAP or TDZ, to callus induction or organogenesis. Mediums supplemented with 2,4-D in combination with BAP or TDZ produced more callus weight. Induced calluses were compact and their color was light yellow at first, but became brownish after subculture. Indirect organogenesis was observed only in few treatments after repetitive subculture. Plant regeneration only happened in PGRs free MS medium, from cotyledonary calli after 2 months with frequency of 11.11 % by one shoot per explant. Shoots were rooted in PGRs free MS medium with frequency of 77.78 % by 2.36 roots per explant.

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## MORPHOLOGY OF THE GLANDULAR TRICHOMES OF *MENTHA AQUATIC*

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*Mentha aquatica* L. is an annual herb belonging to the family Lamiceae. Because of having significant metabolites such as tepenoids, it is commonly used as medicinal plant. There are diversity of chemical compounds that are produced by specialized secretory cells in the form of Glandular Trichomes which differ in different plants with other functions. morphological studies of the trichome on leaves and stems of *Mentha aquatica* were carried out using light and scanning electron microscopy. Morphological studies revealed one type of non-glandular and one type of glandular trichome on the both stems and leaves of *Mentha aquati*. Non- glandular trichomes are uniseriate and multicellular and glandular trichome is reported peltate.

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**EFFECT OF DIFFERENT SOLVENTS ON PHENOL AND ANTIOXIDANT  
COMPOUNDS IN BURDOCK (*ARCTIUM LAPPA*)**

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The medicinal plants are important sources of antioxidants and phenolic compounds. Natural antioxidants increase the antioxidant capacity of the plasma and reduce the risk of certain diseases such as cancer, heart diseases and stroke. Synthetic antioxidants commonly used in processed foods have side effects and are toxic. Therefore, there is a need for more effective, less toxic and cost effective antioxidants derived from medicinal plants [1, 2]. To determine the effect of different solvents on amount of phenol and antioxidant in Burdock (*Arctium Lappa*) as materials valuable medicinal randomized complete block design experiment with three replications was carried out in 2016. In this study, Five Solvent different water, methanol, ethanol, water-methanol (50%-50%) and water-ethanol (50%-50%) were compared. Results showed that Solvents had significant effect of on amount of phenol and antioxidant compound. Minimum and maximum antioxidant was achieved by the water-methanol (50%-50%) and water, respectively. Also, Minimum and maximum phenolic compound was achieved by the methanol-water (50%-50%) and water, respectively. The results showed that the type and contents of solvent significantly affect the phenolic values and antioxidant activity. Result demonstrated that maximum amount of phenolic substances and antioxidant had direct correlation with water solvent.

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**EVALUATION OF VARIOUS SOLVENT ON CHEMICAL COMPOSITION OF  
*ARCTIUM LAPPA***

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*Arctium lappa* is a medicinal plant, which natively grows in Iran. Phenolic, antioxidant and flavonoid are three of the most important secondary metabolites produced in this plant and used as anticancer reagents [1]. The aim of this study was to investigate and compare the chemical composition of *Arctium Lappa* in the solvents of methanol, ethanol, water, ethanol-water and methanol-water. Aqueous, methanol, ethanol, water- methanol (50-50)% and water- ethanol (50-50)% extract of Burdock root were obtained by rotary [2] then after it analyzed by Hplc. The results of Hplc showed that water-methanol (50%-50%) is the best solvent to extraction Burdock. There were Hesperidin and Trans-ferulic acid compounds in all solvents, Vanillin in all solvents except water-methanol (50%-50%), Rosmarinic acid in all solvents except ethanol and methanol, Quercetin and Hesperetin only in water solvent and Chloregenic acid in ethanol and water- ethanol and the other compounds were not detected in any of the solvents. Results of HPLC analysis showed that phenolic, antioxidants and flavonoids compounds were identified.

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**STUDY EFFECT OF LOW IRRIGATION AND POLY AMINE  
(SPERMIDIN) ON YIELD OF *THYMUS DAENENSIS* IN KERMAN**

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Water stress is the condition that available water is less than a plant needs for maximum growth. Poly amine compounds have important role in plant response to stress that depend on plant species and type of stress. In order to study effect of water stress and spraying poly amine (spermidin) on yield and some plant parameters of *Thymus daenensis*, this experiment was conducted in Kerman Natural Resources Research Station in 2016, using RCBD with split plots and 3 replications. 3 levels of irrigation (1- conventional (without water stress) as control; 2- irrigation cut off in plant vegetative growth satage; 3- irrigation cut off in plant reproductive stage) and 3 concentrations of poly amine (0, 1, and 2 mM) in sub plots were compared. Morphologic and phonologic traits of *Thymus daenensis* plant were recorded and data were statistically analyzed by MSTATC software and means were compared by multi-range Duncan's method. ANOVA results show that water stress in various stages of plant growth affected yield and yield components, significantly. Spraying of poly amine had significant ( $p < 0.01$ ) role in decreasing of negative effects of water stress on *Thymus daenensis* plant. As water stress increased, *Thymus daenensis* plant yield decreased. Increase in (spermidin) concentration resulted in increase in plant resistance to water stress in *Thymus daenensis* plant. The highest economical yield (0.41 Kg/m<sup>2</sup>) was observed in treatment of irrigation cut off in reproductive stage that was sprayed by 2 mM spermidin.



**PENCONAZOLE TREATMENT IMPROVES DROUGHT STRESS TOLERANCE  
IN *BRASSICA NAPUS* L.**

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Drought stress is one of the most important environmental stresses that limit plant growth. Canola (*Brassica napus*) is an important agricultural crop grown primarily for its edible oil. The mechanism of growth amelioration in canola was investigated by exogenous application of penconazole (PEN). Ten weeks after sowing, plants were treated with difference concentrations (0, 5, 10, and 15 % PEG) with or without PEN (15 mg l<sup>-1</sup>). Drought stress decreased fresh weight (FW) in RGS003 and Sarigol. PEN reversed prominently the negative effects of drought stress on FW in RGS003. The relative water (RWC) content in RGS003 under drought stress and with PEN did not showed any significant changes as compared to control. Drought stress increased protein content in both cultivars and PEN treatment reversed the inducing effects of drought. Malondialdehyde (MDA) content increased at all levels of drought and PEN treatment decreased significantly MDA content only in RGS003 under drought stress. Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) content in Sarigol under various levels of drought increased more than that of RGS003, but decrease in H<sub>2</sub>O<sub>2</sub> content by PEN in RGS003 was higher than that of Sarigol. Superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (APX) activities induced in both cultivars under drought. SOD and CAT activities were induced by PEN in both cultivars under drought stress; however the inductions were higher in RGS003 comparing to that of Sarigol. These results suggest that PEN-induced tolerance to drought stress in canola plants may be related to regulation of antioxidative responses, MDA and H<sub>2</sub>O<sub>2</sub> level.

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**PHYTOCHEMICAL DIVERSITY AND POPULATION GENETIC STRUCTURE  
IN IRANIAN LANDRACES OF DRAGONHEAD  
(*DRACOCEPHALUM MOLDAVICA* L.)**

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*Dracocephalum moldavica* L. (Moldavian dragonhead), an aromatic herb with useful medicinal properties, is widely cultivated in northwest Iran. Different bioactive constituents of essential oil from the plants have been suggested to contribute to the sedative, painkiller properties [1] and anti-helicobacter pylori activity of this plant [2]. Seven cultivated populations (landraces) of *D. moldavica* L. was studied in the present work. Inter-simple sequence repeat (ISSR) molecular markers and analysis of essential oils' compositions were used to evaluate genetic polymorphisms, population structure, and phytochemical diversity among and within populations. The studied individuals in populations were distinguished, based on quantity and quality of essential oils and ISSR markers. Essential oil yields of the seven landraces studied, varied from 5.62 to 13.97 kg/hectare. Essential oil compounds were found to be extremely variable in the various individuals. Geranyl acetate (19.8-45.5%), Geranial (20.22-25.60%), and Neral (15.8-18.5%) were determined as the dominant compounds. A total of 94 bands were produced by 14 ISSR primers, among which 91.4% were found to be polymorphic. The degree of genetic similarity among individuals varied between 0.15 and 0.75, which is indicative of a high level of genetic diversity. Cluster analysis, population inference, and principal coordinates analysis (PCoA) based on ISSR molecular data confirmed the high level of variation, and divided samples into two main groups. In the first group, Moldavian Balm populations included *Keshtiban* (West Azerbaijan), *Jahangir* and *Shiraz Valley* (East Azerbaijan). Further the populations of the *Keshtiban*, *Topragh Ghalee*, *Baghchajogh*, *Naghadeh* (West Azerbaijan), *Jahangir* and *Hokmabad* (East Azerbaijan) were placed in the second group. Understanding the phytochemical diversity and genetic in the landraces of dragonhead can be beneficial in germplasm management and plant improvement, in the context of pharmaceutical and industrial applications.

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**REGRESSION ANALYSIS AND PATH ANALYSIS OF TRAITS AFFECTING  
SAFFRON STIGMA YIELD UNDER NORMAL AND DEFICIT  
IRRIGATION CONDITIONS**

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Saffron is one of the plants that had very low expectations and is cultivated under rainfed condition in Iran. Although one or two times irrigation, it will lead to increased yields. In order to investigate the traits affecting saffron stigma yield, an experiment was conducted with biennial plants of 8 Iranian saffron ecotypes in normal (four times irrigation) and deficit (once) irrigation conditions, in a randomized complete block design with three replications at the research farm of the agricultural faculty, University of Zanjan in 2015. During flowering number of flowers per plant, length of stigma, dry weight of stigma per flower and stigma yield were measured. Stepwise regression analysis in both experiment conditions showed that number of flowers per plant and dry weight of stigma per flower justify most changes of saffron stigma yield [1,2]. Also, path analysis showed that number of flowers per plant and weight of stigma per flower in normal irrigation, and weight of stigma per flower and number of flowers per plant in deficit irrigation, had highest direct effects on stigma yield per m<sup>2</sup>, respectively [4] Therefore, these traits can be used to improve and achieve higher yield in saffron.

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**GLYCYRRHIZIC ACID MODULATES ALUMINUM-INDUCED OXIDATIVE STRESS AND APOPTOSIS IN PC12 CELLS**

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Aluminum (Al) as a potent environmental neurotoxin, is very closely related to neurodegenerative disorders like Alzheimer's disease [1]. The neuroprotective effects of Glycyrrhizic acid (GA), which is the most important bioactive compounds of licorice root with remarkable pharmacological and biological activities [2], against Al-induced cytotoxicity in PC12 cells were investigated. The intracellular reactive oxygen species (ROS) level and glutathione content, the activity of the antioxidant enzyme of catalase, the mitochondrial membrane potential (MMP) were determined. Also, the double staining (7-ADD/AnV-PE) cells performed by flow cytometry to quantitative analysis of cell apoptotic death. Pretreatment of PC12 cells with different concentrations of GA (5,10, 50, 100 and 200  $\mu$ M) markedly ameliorated all changes, in oxidative indices induced by Al (1mM) and considerably the cell survival recovered at low concentrations of GA. The results suggest that GA may protect PC12 cells from Al toxicity via modulation of the intracellular antioxidant system and mitochondrial-induced apoptosis. This study also, suggests GA is a compound that can potentially reduce aluminum-induced adverse effects and use for general neuronal health.

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**PENCONAZOLE ALLEVIATES DROUGHT STRESS IN CANOLA PLANTS  
THROUGH MODIFYING SOME PHYSIOLOGICAL AND  
BIOCHEMICAL PARAMETERS**

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In this study, penconazole (PEN), a triazole growth regulator, was used to analyses its role in water stress amelioration in *napus* L. plants. Ten weeks after sowing, plants were treated with difference concentrations (0, 5, 10, and 15 % PEG) with or without PEN (15 mg l<sup>-1</sup>) for next 3 weeks. Decrease in dry weight (DW) in Sarigol under drought stress was higher than that of RGS003. PEN improved DW in RGS003 under drought. Drought stress significantly induced proline content in both cultivars and PEN treatment improve the content at higher drought levels. Similar increasing trends were observed in Glycine betaine content under drought stress in both cultivars. However, significant positive effect of PEN can be seen only at 15% PEG. Ascorbate content was enhanced significantly under higher levels of drought stress only in RGS003. Whereas, PEN treatment enhanced ascorbate content only in Sarigol under drought. Tocopherol content increased in both cultivars under drought stress. Drought stress caused a significant increase in soluble sugars content in both cultivars. However improvement in soluble sugars content can be seen only in Sarigol. A slight increase in flavonoid content was occurred only in RGS003 under drought stress and PEN did not induce any changes. Anthocyanin content was induced in both cultivars under higher levels of drought (10 and 15%) and PEN improved the content only at 5% PEG. No specific effects of drought on Lipoxygenase activity were observed. However, a significant synergism between PEN and drought can be seen at 5% PEG in both cultivars. Phenylalanine ammonia-lyase and Tyrosine ammonia-lyase activities showed no specific trend under different levels of drought in absence of PEN. However, PEN treatment improved these enzymes at most of the drought levels. The results of this study showed that application of PEN achieved multi significant positive effects on many of previous mentioned parameters which led to improve the growth of canola plants under drought stress.

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**DETERMINATION OF TOTAL PHENOLIC AND FLAVONOID CONTENT WITH ASSESMENT OF ANTIOXIDANT ACTIVITY OF *LAMIUM AMPLEXICAULE***

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The genus *Lamium* L. is an important medicinal plant of Lamiaceae family comprising about 40 different species all around the world. Seven annual and perennials species of the genus has been reported in Iran while some of them have shown medicinal properties. *Lamium amplexicaule* L. is an annual species which found in Europe, Asia and Mediterranean area. This species grows as a weed in most gardens, agricultural lands, the newly created gardens and on mountainous slopes in different provinces of Iran. This species is known as anti-rheumatic, sudoriferous, stimulant, antipyretic, laxative and analgesic agent in pharmacological perspective [1]. The antioxidant activity of different extracts of *L. amplexicaule* was evaluated in some other countries and higher phenolic and flavonoid content of methanolic extract was reported in compare with other solvents [2]. There is not any information about antioxidant activity, total phenolic and flavonoid content of and this may be considered as the first study on Iranian populations of this plant in Iran. Methanolic extract of the aerial parts of two populations from Razavi khorasan and Northern Khorasan were obtained by ultrasonic method extraction and the yields of extract were calculated. Total phenol and total flavonoid contents were evaluated according to the Folin–Ciocalteu procedure and colorimetric method, respectively. As the results Phenol contents were (65.29±1.92 mg/gr extract) and (62.48±1.92 mg/gr extract) As Galic Acid and flavonoids were (151.83±2.08 mg/gr extract) And (188.16±2.10 mg/gr extract) As Rutin for the Razavi Khorasan and the Northern Khorasan Provinces Respectively. Also The antioxidant activities were determined by DPPH (1,1-diphenyl-2-picrylhydrazyl) method and finally IC<sub>50</sub> value reported about (173±0.03 ppm) and (188.34±0.03 ppm) for two studied population respectively. There was a significant relationship between the amount of total phenolic and flavonoid content with antioxidant properties of the species and according to the value of IC<sub>50</sub> the extracts were remarkable power sweep.

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**ANTIOXIDANT AND ANTIBACTERIAL ACTIVITIES OF *FERULA MACROCOLEA* FROM LORESTAN**

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The role of free radicals and active oxygen is becoming increasingly recognized in the pathogenesis of many human diseases, including cancer, aging and atherosclerosis. So it is necessary to screen out medicinal plants for their antioxidant potential. *Ferula* is one of the most important genera of the family Umbelliferae. This genus presents interesting phytochemical features. Some *Ferula* species are used since ancient times in folk medicine for treatment of diseases such as tonic, digestive and aphrodisiac. It comprises about 170 species occurring in the world particularly in the Mediterranean region and central Asia. The Iranian flora comprises of 30 species of *Ferula*, of which some are endemic. Biological effects may be attributed to the presence of phenols and flavonoids in the extract [3]. Antioxidant activity of *Ferula Macrocolea* flowers obtained from Koohdasht region of Lorestan, Iran was determined by using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging method. The *F. macrocolea* flowers extract showed significant DPPH radical scavenging activity with IC<sub>50</sub> value of 463.22 µg/ml. Total phenolic and flavonoid compounds as determined by the Folin Ciocalteu and Aluminium chloride [8] methods were 176±0.1 mg gallic acid /g and 52 mg Catechin /g of extract powder, respectively. Antibacterial activity of *F. macrocolea* extract was studied by disk diffusion method. The extract showed activity against Gram positive bacteria but no antibacterial activity was found against Gram negative bacteria.

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***NIGELLA SATIVA* AMELIORATES KIDNEY FUNCTION IN A RAT MODEL  
OF UNILATERAL URETERAL OBSTRUCTION**

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Obstructive nephropathy is one of the important renal diseases caused by obstruction in urinary tract and if untreated, can lead to chronic kidney disease (CKD). Unilateral ureteral obstruction (UUO) is one of the most important and common laboratory models for pathophysiologic evaluation of renal fibrosis (1). Renin-angiotensin system plays an important role in the pathophysiology of kidney injury following UUO (2). *Nigella sativa* (NS) is a plant with many pharmacological effects (3). In the present study, the effect of captopril and NS extract against kidney damage following UUO was evaluated. 32 male albino Wistar rats were randomly divided into 3 groups: 1- sham-operated, 2- UUO, 3- captopril (30 mg/kg)+UUO, 4- NS (400 mg/kg)+UUO. 3 days after the administration of captopril and NS extract, the animals were anaesthetized. Then, the abdomen was opened with a midline abdominal incision and the left ureter was ligated with 4-0 silk at two points and was cut between the ligatures to prevent urinary tract infection. The administration of captopril and NS extract was continued two weeks after UUO. Blood sample was collected on day 1 and 48 h, 5 days, one and two weeks after UUO. Serum urea and creatinine concentrations were determined. Compared with day 1 in the UUO group, there was a significant increase in serum urea and creatinine concentration 48h, 5 days, one and two weeks after UUO. Serum urea concentration in captopril+UUO and NS (400)+UUO groups showed no significant change compared with day 1. Serum creatinine concentration in captopril treated rats significantly increased 48h and 5 days after UUO compared with day 1. However, two weeks after UUO, serum level of creatinine significantly decreased compared with 48h following UUO. In NS (400)+UUO group serum creatinine concentration significantly increased compared with day 1. However, serum level of creatinine significantly decreased one and two weeks following UUO, compared with 48h after UUO. The current study suggests that NS extract are able to improve the UUO-induced renal dysfunction. These favorable actions of NS extract on UUO model in rat are comparable with the well-known RAS inhibitor captopril.

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**EXTRACTION AND DETERMINATION OF PHARMACEUTICAL COMPOUNDS  
FROM *MELISSA OFFICINALIS* SEED USING SUPERCRITICAL FLUID  
EXTRACTION AND ULTRASOUND ASSISTED EXTRACTION  
BY GC-MS ANALYSIS**

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From archaic era people have been tend to use herbal plants for treatment. Nowadays the benefits of using herbal drugs are clear for anybody. The purpose of this study is extraction and determination of pharmaceutical compounds of *Melissa Officinalis* (Lemon Balm) an herb from mint family and native to the East south of Europe, and Asia, and Specifically Iran. Thistonic herb has used for years in traditional medicine of Iran for diverse treatment studies, and psychological problems such as anxiety, insomnia, dyspepsia, vomiting, bloating, attention deficit-hyperactivity disorder (ADHD), dysmenorrheal, cramps, headache, toothache, anesthetic, infections, tumors, insect bites, Alzheimer's disease, hysteria, melancholia, colic, palpitations, rheumatism, and high blood pressure. In recent years the tendencies have been toward Green Chemistry for using environmentally safe techniques such as SFE and UAE. The UAE technique uses acoustic energy and a kind of appropriate solvent to the aim of extraction of target analytes from a solid matrice. The SFE technique is based on using a supercritical fluid which contains the benefits of liquid and vapor solvent simultaneously. Other advantages are requiring less organic solvent and consuming short extraction time which makes it a useful technique for extraction of essential oils from seeds of Lemon Balm. The experimental parameters of SFE such as pressure, temperature, modifier volume, static and dynamic extraction time were optimized using a Central Composite Design (CCD) after a 25 factorial design. The optimum conditions in UAE were as follows: solvent (n-hexane) volume, 23 mL; extraction time, 41 min; and extraction temperature, 38 °C. This resulted in a maximum oil recovery of 20.52%. The extracts were analyzed using GC-MS to investigate their structures. There were a wide range of effective compounds in the Lemon Balm seed such as 9.12 – octadecanoic acid , 9.12.15 – octadecatrienoic acid and octadecanoic acid.

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**EFFECT OF PENCONAZOL ON PHSIOLOGYCAL AND BIOCHEMICAL  
PARAMETERS IN SESAME UNDER SALINITY**

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Sesame (*Sesamum indicum* L.) is a drought tolerant plant. However; this species is sensitive to drought at germination and seedling stages. Sesame is one of the oldest and important oil seed crops. It is usually cultivated in arid and semi-arid regions of the world for its high quality edible oil and it is very responsive to the changing environmental conditions. The aim of the present study was to investigate the effect of salt stress on some physiological and biochemical parameters and to assess the possibility of improving salt tolerance of Sasame by application of Penconazol (PEN). Four weeks after sowing, plants were treated with difference concentrations of Nacl (0, 50, 100, and 200) with or without PEN (15 mg l<sup>-1</sup>). Salt stress decreased fresh weight (FW) and dry weight (DW) in both cultivars (Darab and Oltan). The relative water (RWC) content decreased under salt stress and PEN treatment increased it in both cultivars. Salinity decreased plant height in both cultivars. In contrast to Darab, Salt stress increased protein content in Oltan. Protein content reduced in both cultivars by PEN. Superoxid dismutase activity only increased in Darab under salt stress. Salinity decreased peroxidase activity in both cultivars, whereas PEN treatment induced it in Darab cultivar. These results suggest that PEN- induced salt stress tolerance in sesame plants may be related to regulation of antioxidative responses.

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**THE EFFECT OF HYDRO-ALCOHOLIC EXTRACT OF AGRIMONIA  
EUPATORIA L. LEAVES ON KIDNEY INJURY INDUCED BY CARBON  
TETRACHLORIDE IN MALE RATS**

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Various materials can cause liver and kidney damage which carbon tetrachloride is one of these substances. Medicinal plants and their essential oils and extracts have been used to a large extent as drugs to better control and management of kidney diseases. The aim of this study was to investigate the effect of hydro-alcoholic extract of *Agrimonia eupatoria* L. leaves in the treatment of renal toxicity induced by carbon tetrachloride. Forty two male rats were randomly divided into 6 groups (n=7): control (taking normal saline, 0.5 ml/day, intraperitoneally; i,p), sham (taking olive oil, 0.5ml/day, i,p single dose), injury induced by carbon tetrachloride (CCl<sub>4</sub>) 1:1 with olive oil, 0.5ml single dose, i,p), treated groups 1, 2 and 3: by carbon tetrachloride 1:1 with olive oil, 0.5ml single dose and 200 mg/Kg, 400 mg/Kg or 800 mg/kg *Agrimonia eupatoria* extract (AEE)/day for 96 hrs, i,p). By direct blood sampling from the heart, the plasma concentrations of lactate dehydrogenase (LDH), BUN and creatinine were measured. Kidney sections were prepared from all groups and the histological examinations were performed. The results were analyzed using one-way ANOVA. The results indicated the significant (p<0.05) increase of serum level of LDH, BUN and creatinine in the group receiving CCl<sub>4</sub> compared with the control group. The treatment with hydro-alcoholic extract of *Agrimonia eupatoria* leaves caused a significant (p<0.05) decrease in serum levels of these enzymes in treated groups compared with the group receiving CCl<sub>4</sub>. Histological investigation of renal tissue sections showed that the treatment with *Agrimonia eupatoria* extract reduced the necrosis, inflammation and also improved the renal tubules. Carbon tetrachloride cause kidney damage and *Agrimonia eupatoria* extract is able to reduced the damage of carbon tetrachloride because it have antioxidant compounds.

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**MOLECULAR DOCKING STUDY OF SELECTED ANTICANCER ABIETANE-TYPE DITERPENOIDS WITH MACROMOLECULAR**

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Many compounds from natural sources have been reported with considerable anticancer potential; however, their modes of action have not been clearly characterized. In the present study, some abietane-type diterpenoids that demonstrate anticancer properties were subjected to docking simulations using AutoDock 4.2. Five molecular targets CDK-2 (cyclin-dependent protein kinase 2), CDK-6, DNA Topoisomerase I, Topoisomerase II and VEGFR-2 (vascular endothelial growth factor receptor 2) were considered for this experiment because of their important role in regulating cellular proliferation and apoptosis. The binding energies of best docked compounds ranged between  $-9.08$  kcal/mol and  $-10.20$  kcal/mol. The docking results indicated that 14-deoxycoleon U exhibited better binding interaction to CDK-2 than the known CDK-2 inhibitors.  $7\alpha$ -acetoxyroyleanone showed higher binding affinity against CDK-6 than its native co-crystal ligand. Horminon was best bound to DNA topoisomerase I. Taxadone was best docked with topoisomerase II and taxodione demonstrated very good binding interaction with VEGFR2. The obtained results help us to understand the structural features required to increase the inhibitory activities.





**THE EVALUATION OF QUALITY AND QUANTITY OF CORIANDER  
(*CORIANDRUM SATIVUM* L.) AFFECTED BY VERMICOMPOST  
AZOTOBACTER AND MYCORRHIZA SYMBIOSIS**

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In order to investigate the quantitative and qualitative characteristics of coriander affected by vermicompost, Azotobacter and mycorrhiza symbiosis, an experiment as a split-plot in randomized complete block design with three replications was conducted. The examined factors was included three levels of vermicompost with animal based contains zero, 5 ton per ha and 10 ton per ha levels as the main plots and two levels of mycorrhiza fungi at zero and *Glomus mossea* strains and two levels of zero and using of the bacteria as subplots. The measured characteristics was included plant height, biomass, thousand seed weight, and oil content and mycorrhiza fungi symbiosis percent with the roots. The results showed that the using of Azotobacter increases plant height, biomass, and thousand seed weight and oil percent, also the using mycorrhiza increases plant height, biomass, essential oil percent and mycorrhiza symbiosis percent. Based on the obtained results 5 and 10 ton per ha using of vermicompost was increased the mycorrhiza symbiosis percent.

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**MODULATION OF KIDNEY FUNCTION BY *NIGELLA SATIVA* EXTRACT AND ANGIOTENSIN II INHIBITION IN UNILATERAL URETERAL OBSTRUCTION**

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Unilateral ureteral obstruction (UVO) is a good and common laboratory models for evaluation of renal fibrosis pathophysiology (1). Renin-angiotensin system plays an important role in the pathophysiology of kidney injury following UVO (2). *Nigella sativa* (NS) is a plant with many pharmacological effects (3). In the present study, the effect of losartan and NS extract against kidney damage following UVO was evaluated. 32 male albino Wistar rats were randomly divided into 3 groups: 1- sham-operated, 2- UVO, 3- losartan (15 mg/kg)+UVO, 4- NS (400 mg/kg)+UVO. 3 days after the administration of losartan and NS extract, the animals were anaesthetized. Then, the abdomen was opened with a midline abdominal incision and the left ureter was ligated with 4-0 silk at two points and was cut between the ligatures to prevent urinary tract infection. The administration of losartan and NS extract was continued two weeks after UVO. Blood sample was collected on day 1 and 48 h, 5 days, one and two weeks after UVO. Serum urea and creatinine concentrations were determined. Compared with day 1 in the UVO group, there was a significant increase in serum urea and creatinine concentration 48h, 5 days, one and two weeks after UVO. Serum urea concentration in losartan+UVO group showed no significant change 48h and 5 days after UVO compared with day 1. Serum creatinine concentration in losartan treated rats significantly increased in different days following UVO. However, two weeks after UVO, serum level of creatinine decreased by 8.5% compared with one week following UVO. In NS (400 mg/kg)+UVO group, there was no significant change in serum urea concentration between different days following UVO. In this group, serum creatinine concentration significantly increased compared with day 1. However, serum level of creatinine significantly decreased one and two weeks following UVO, compared with 48h after UVO. The current study suggests that NS extract are able to improve the UVO-induced renal dysfunction. These favorable actions of NS extract on UVO model in rat are comparable with the well-known RAS inhibitor losartan.

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**EFFECT OF NANO ELICITORS ON MUCILAGE PRODUCTION IN FLAX  
(*LINUM USITATISSIMUM* L.) UNDER *IN VITRO* CULTURE CONDITIONS**

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Flax (*Linum usitatissimum* L.) is an important medicinal herb that also cultivated to produce both oil and fiber. Flax seeds are a source of mucilage and remarkable secondary metabolites like phytoestrogens. Plant cell and tissue culture technologies can be established to improve the production of secondary metabolites. Advances in cell and tissue culture techniques has made possible the production of a wide variety of secondary metabolites under *in vitro* conditions. The callus tissue of Flax contains a good amount of mucilage as well as plant parts. The present study was conducted to evaluate callus induction and assessment of mucilage production by means of tissue culture. Callus induction was optimized using different explants on MS medium containing various concentrations of plant growth regulators. To study the effects of different elicitors on mucilage and some other secondary metabolites production, the calli were sub-cultured on MS medium supplemented with different concentrations of nano particles including  $Al_2O_3$ ,  $SiO_2$  and 2,4-D. The results showed that the highest callus fresh weight and mucilage content were obtained from root explants on MS medium supplemented with  $10\text{ mgL}^{-1} Al_2O_3$  as elicitor.



**EVALUATION ANTIOXIDANTACTIVITY OF DIFFERENT  
EXTRACTS OF PURSLANE**

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Purslane (*Portulaca oleracea* L.) is an herbaceous weed, which widely distributed in throughout the world. The plant has been used as a vegetable and for medical purpose for hundreds of years. Recent research demonstrated that purslane is a good source of compounds with antioxidant properties and have a positive impact in human health [1, 3]. So, the objective of this study was to evaluate the antioxidant activity of different extracts of purslane. The parts of the plant suitable for consumption were dried in shade and used for extraction. Several extraction method such as water (WE), boiling water (BWE), Ethanolic (80%) (EE) and Methanolic (pure) extract (ME) were used. The antioxidant capacity of samples were determined using Ferric reducing antioxidant power (FRAP), 2,2'- azino-bis-3-ethylbenzthiazoline-6-sulphonic acid (ABTS), and 1,1-diphenyl-2-picrylhydrazyl (DPPH) methods. In the FRAP essay, antioxidant capacity was measured as the ability of the antioxidant components in the test sample to reduce ferric (III) to ferrous (II) in a redox-linked colorimetric reaction [2]. Our results showed that there was no differences between four extraction methods for this assay. ABTS scavenging capacity denotes the ability of antioxidant components in the test sample to remove the ABTS<sup>•+</sup> radicals, which were generated from the oxidation of ABTS by potassium persulphate (K<sub>2</sub>S<sub>2</sub>O<sub>8</sub>). The ABTS scavenging activity of different extracts of purslane was highest in EE and lowest in ME and BWE. There was no significant differences among EE and WE. DPPH is a compound that contains a nitrogen free radical which is readily destroyed by a free radical scavenger. This assay is a test on the ability of the antioxidant compounds functioning as proton radical scavengers or hydrogen donors [2]. In this study DPPH scavenging activity was highest in EE, and lowest in ME. Therefore, it can be concluded that Purslane EE has powerful antioxidant activity rather than other extraction method and it can be used for prevention of oxidative stress in human and animal diet.

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**CHEMICAL COMPOSITION, ANTIOXIDANT AND ANTIBACTERIAL  
ACTIVITIES OF THE ESSENTIAL OIL OF *FERULA MACROCOLEA*  
FROM LORESTAS**

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Oxidative stress results from an imbalance between the generation of reactive oxygen species and endogenous antioxidant systems [1]. The harmful action of free radicals can be blocked by antioxidant substances, which scavenge the free radicals and detoxify the organism. So, it is necessary to screen antioxidant substances from various sources like medicinal plants [2]. The *Ferula* genus is much utilized in folklore medicine [3]. *Ferula macrocolea* which belongs to the Umbelliferae family is an endemic species of Iran [4]. In present study, chemical compositions, antioxidant and antibacterial activities of essential oil of the *Ferula macrocolea* flowers obtained from Koohe Dasht region of Lorestan, Iran were determined. The chemical composition of the essential oil was analyzed by GC/MS. From forty-seven identified components representing 93.6 % of the oils, the major constituents were found to be Z-7,7-Dimethyl-3-octen-2-one (25.49%), 2-methyl-4-Heptanone (10.94 %),  $\alpha$ -Selinene (9.8%),  $\alpha$ -Fenchene (9.03%) and beta Pinene (6.04). Antioxidant activity of the essential oil was determined by using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging method. The essential oil exhibited 50.1% DPPH radical scavenging inhibition activity. Antibacterial activity of *F. macrocolea* extract was studied by disk diffusion method. The essential oil showed activity against tested Gram positive bacteria but no activity was found against tested Gram negative bacteria.

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**THE EVALUATION OF BASIC CRITERION FOR MEASURING THE SIZE OF THE *STEVIA REBAUDIANA* BERTONI PLANT IN THE HARDENING PROCESS**

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The leaves of *Stevia rebaudiana* Bertoni produce much sugar. Produced Sugar in this plant is 300 times sweeter than sucrose. So it can be used as a major source of natural sugar. *S. rebaudiana* is a self-incompatible plants and generate a few seeds that their germination is also weak. Therefore asexual reproduction of this plant has a noticeable importance. Optimization of appropriate culture medium for plant micropropagation of this plant in vitro, then rooting the explants and their compatibility under greenhouse conditions have the most value in economic planning. These conditions could help to increase the plant production in the shortest time and at the lowest cost. The results showed that the best criterion for the size of the plants include the explants, grown in vitro medium containing 0.08mg / l NAA and 0.8 mg / l BAP, and their branches with 4-20 mm length, rooted under greenhouse conditions without external auxin. Considering the economic and industrial importance of this plant, the establishment, compatibility and rooting of explants, with 4-20 mm length, which grown in medium containing 0.08mg / l NAA and 0.8 mg / l BAP, will increase plant production. In other words, the highest efficiency of tissue culture and micropropagation is created in this condition and that will be practical in commercial and industrial programs.

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**CONSTRUCTION OF A PLANT EXPRESSION VECTOR OF *ASN* GENE FOR  
EXTRACELLULAR SECRETION OF RECOMBINANT  
L-ASPARGINASE II ENZYME**

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The increasing need for and value of recombinant proteins has been the driving force behind the development of transgenic plant systems for foreign protein production. However, the extraction of recombinant proteins from plant tissues can be an expensive and time-consuming process involving plant harvesting, tissue maceration, and subsequent protein purification. The secretion of proteins into the culture medium via plant cells has also been developed as an easier alternative to cell lysis for protein recovery and facilitating the downstream purification processes. For secretion of proteins to the apoplastic spaces, an ER signal peptide is required. In the present study, a recombinant expression construct for secretion-based production of L-asparaginase II (ASN), an enzyme used in the treatment of acute lymphoblastic leukemia (ALL), was developed. To direct ASN to the secretory pathway, the tobacco codon-optimized *AsnB* gene was N-terminally fused to the tobacco pectin methylesterase (PME) signal sequence in binary vector pBI121. For high-level expression of the *Asn* gene, a CaMV 35S promoter with a duplicated enhancer region and the 5' untranslated region of chalcone synthase gene was also used in the gene cassette. The resulting construct (named pBI121-NtPME-*Asn*) was introduced into *E. coli* and its structural integrity were confirmed by PCR and restriction analyses. The recombinant vector can be used for expression and production of ASN in a rhizosecretion platform in the future studies.

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**DESIGNING AND CONSTRUCTION OF A PLANT EXPRESSION VECTOR  
HARBORING THE *ASN*B GENE ENCODING L- ASPARAGINASE II FUSED  
TO ZERA DOMAIN OF MAIZE  $\gamma$ -ZEIN**

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Plants have shown promise over the past 20 years as bioreactors for the large-scale production of various recombinant proteins, such as vaccines, antibodies, biopharmaceuticals and industrial enzymes. However, the low-production yield of many recombinant proteins and the lack of efficient purification methods are two major challenging problem limiting the commercial exploitation of transgenic plant expression systems. Several genetic approaches such fusion proteins (PBs) have been developed to increase recombinant protein accumulation in heterologous expression systems or to assist in their subsequent purification. Zera sequence, a domain of the maize seed storage protein  $\gamma$ -zein, can be promote the formation of PBs in the ER when fused to the N-terminus of other of proteins. L-asparagnase II (ASN) is one of the important recombinant proteins which is marketed under the brand name Elspar for the treatment of acute lymphoblastic leukemia (ALL). The aim of this study was to construct a plant expression vector containing the tobacco codon-optimized *AsnB* gene encoding ASN, fused in-frame with Zera sequence in the binary vector pBI121. For high-level expression of the *Asn* gene, a CaMV 35S promoter with a duplicated enhancer region and the 5' untranslated region of chalcone synthase gene was also used in the gene cassette. The resulting construct (named pBI121-Zera*Asn*) was introduced into *E. coli* and its structural integrity were confirmed by PCR and restriction analyses. The recombinant vector developed in this study can be used for production of Zera-ASN PBs in tobacco expression platform and quick, simple and inexpensive non chromatographic purification of the enzyme, which can be scaled up to industrial levels of ASN production.

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**ECONOMIC EVALUATION OF PLANT MICROPROPAGATION PROTOCOLS  
FOR *STEVIA REBAUDIANA* BERTONI**

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The leaves of *Stevia rebaudiana* Bertoni produce too much sugar. Produced Sugar in this plant is 300 times sweeter than sucrose. So it can be used as a major source of natural sugar. *S. rebaudiana* is a self-incompatible plants and generate a few seeds that their germination is also weak. Therefore asexual reproduction of this plant has a noticeable importance. Based on economic and industrial importance of *Steviarebaudiana*, optimization of appropriate culture medium for plant micropropagation of this plant in vitro, then rooting the explants and their compatibility under greenhouse conditions have the most value in economic planning. These conditions could help to increase the plant production in the shortest time and at the lowest cost. According to the results of this study, the medium is consisted of 0.08mg / l NAA and 0.8 mg / l BAP. In the medium with this hormonal composition, a large number of branches has been produced in vitro. Using this method, thousands of plants could be produced and transferred to the farm or greenhouse, provided that these conditions would be available (the cost of 130,000 \$, 50 days and 30 hours per each labor). These results can be used to provide economic projects of *Stevia rebaudiana*.

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**EFFECT OF HYDROALCHOLIC EXTRACT OF OPUNTIA HUMIFUSA FRUIT ON  
LEAD INDUCED HEPATOTOXICITY IN WISTAR RATS**

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Lead is an abundant metal in the Earth's crust and can naturally find as a result of volcanic emissions and chemical weathering of Earth. In addition, its intense use in human activities has significantly increased its emission into the atmosphere. A comparison of concentrations of lead in human tissues shows that Lead concentrations in bone greatly exceeded the concentrations in soft tissues and were highest in denser bones and soft tissues like liver were anorgan that affected by lead too. Opuntia humifusa (OH) contains high levels of antioxidants like vitamin C, flavonoids and polyphenols that can have a great radical scavenging. The present study is conducted to evaluate the antioxidant effect of opuntia humifusa on lead induced hepatotoxicity in wistar rats. After acclimation period, rats were divided into three groups of 6 rats in each group. The first group was treated with 0.01% lead in the drinking water in 30 days and other group control group serving just distilled water in the third group served 100mg/kg of hydroalcoholic extract of OH by oral gavage. At end of the experimental period, rats were sacrificed and the samples of Liver were fixed in formalin and transferred to a lab for histopathological evaluation. Serum samples were collected for ALT, AST and enzyme evaluation. Histopathological evaluation of samples showed reduction in toxicity signs like cell death and necrosis in treating group this sign was reduced. AST, ALT analysis showed treatment of rats with the OH hydroalcoholic extract significantly reduced the frequency of these enzymes in serum samples of treated rats ( $p < 0.05$ ). Some researches had shown the total phenolic profile of this fruit is responsible for the radical scavenging activity induced by superoxide and hydroxyl anions. In this research our evaluation showed that administration of this extract reduced the hepatotoxicity induced by lead in wistar rats.

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**EFFECT OF ESSENTIAL OIL OF *GONTCHAROVIA POPOVII* ON VIBRIO SPP  
ISOLATED FROM SHRIMP FARMS IN BUSHEHR PROVINCE**

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In this study the antibacterial effects of essential oil of *Gontcharovia Popovii* on *Vibriospp* (*V. owensi*, *V. brasiliensis* and *V. harveyi*) isolated from shrimp farms in Bushehr province were investigated. In order to determine the antimicrobial activity, standard methods dilution and disk diffusion were used. The results showed that in all three *Vibriospp*, highest growth inhibitory zone belonged to 10ml/disk essential oil. The results showed that antimicrobial activity of *Gontcharovia Popovii* essential oil on *V. harveyi* is more effective than two other species. According to the results, *Gontcharovia Popovii* essential oil has the highest antibacterial effect on *V. harveyi* bacteria. In general, it can be concluded that due to the effect of *Gontcharovia Popovii* essential oil, it can be used as an alternative to the elimination of *Vibrio spp*.

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**EFFECT OF PHENOLIC MONOTREPENE CARVACROL ON FAT  
DISTRIBUTION AND DEPOSITION IN CARCASS OF BROILER CHICKEN**

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The increase in growth rate through genetic selection in broiler chickens has been associated with increased fat deposition. Abdominal and subcutaneous fat are regarded as the main sources of waste in the slaughterhouse. The research results indicate that genotype, sex, age and nutrition of the broiler chicken are some of the main factors affecting fat deposition. In recent years, consumer preference for leaner meat has increased due to the correlation between human consumption of certain fats and cardiovascular diseases. It has been reported that the carvacrol-rich essential oils from the Lamiaceae family plants such as savory have antioxidant, antiviral, antibacterial, and antifungal effects. Recently, particular attention has been focused on hypolipidemic effects of phytochemical remedies in poultry meat and egg. Among many herbal spices or extracts examined, essential oils of onion and garlic, thyme, turmeric, and oregano exhibited superior hypocholesterolemic effects in chicken. This study was conducted to examine the effects of phenolic monoterpene carvacrol on fat distribution and deposition in the carcass of Ross 308 female broiler chicken. In this trial, the effects of addition of 400 mg/kg carvacrol, into a non-supplemented control diet on carcass fat deposition and distribution pattern were evaluated using 96 female broiler chicks in 12 replicates of two birds in each from 14 to 42 days of age. The addition of carvacrol to diet resulted in 6.86 ( $P > 0.05$ ), 6.95 ( $P > 0.05$ ), 38.01 and 10.50 ( $P < 0.05$ ) percent reduction in abdominal, neck, subcutaneous and thigh intramuscular fat depots, respectively. In conclusion, dietary carvacrol may cause reduction in ileal fat digestibility and carcass fat in broilers especially in subcutaneous fat depot.

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**EFFECTS OF GROWTH SUBSTRATES ON ROOTING AND EARLY  
PLANT GROWTH OF PEPPERMINT (*MENTHA×PIPERITA*)**

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Peppermint (*Mentha×piperita* L.), belonging to the *Labiatae* family, is an herbaceous medicinal, which is cultivated in temperate or subtropical climates. Peppermint propagates via rhizome that obtained from field-grown plant. Both soil and harvest condition influence rhizome quality. It is not a standard manual to evaluate rhizome quality and little information is about new methods of peppermint stock plant production. The present experiment conducts to evaluate the effects of different growth substrates (cocopeat, perlite, soil,s and, cocopeat+perlite) on vegetative growth and some biochemical compounds of peppermint stock plants. Rhizomes of peppermint were planted in 7 kg plastic pots and plants were watered every day with Cooper nutrient solution, regularly. Results showed that growth substrates had significant effects on vegetative growth indices (number and length of shoot and rhizome, leaf area, fresh and dry weight), specific leaf weight (SLW), leaf pigmentation (spad index, chlorophyll *a* and *b*, and total carotenoids) and some biochemical indices (total phenolic compounds, soluble carbohydrates and total flavonoids). Peppermint in cocopeat or cocopeat+perlite showed significant increase in vegetative growth compared to sand, soil or perlite. The significant differences of vegetative growth may be due to water holding capacity and aeration of growth substances, because, the water content, measured by fresh weight of root, rhizome, leaf and shoot, was changed in peppermint plants. Based on the results of present experiment, soilless culture can be used for improving quality of peppermint stock plants and accelerating vegetative propagation.



**PHYTOCHEMICAL, ANTIOXIDANT AND ANTIBACTERIAL INVESTIGATION  
OF EXTRACTS OF *JASMINUM OFFICINALE* LEAVES**

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*Jasminum officinale* is a species of flowering plant in the olive family Oleaceae. Jasmine has been used for liver disease (hepatitis), liver pain due to cirrhosis, and abdominal pain due to severe diarrhea (dysentery). It is also used to cause relaxation (as a sedative), to heighten sexual desire (as an aphrodisiac), and in cancer treatment. *Jasminum officinale* is endowed with phytochemicals that are vital to counter various metabolic disorders like oxidative damage in cells causing various degenerative diseases [1]. The present study deals with phytochemical screening, antioxidant [2] and antibacterial assessment of *Jasminum officinale* leaves. The leaves of *Jasminum* were collected from home gardens in Ahvaz, air dried and powdered. The extracts of *Jasminum* leaves were prepared by maceration using different solvents such as methanol, chloroform, n-hexane, ethyl acetate and petroleum ether. 100 mL of each solvent was placed on 10 g of the dried leaves and stirred for 48 hour. The screening tests revealed the presence of tannins, flavonoids, terpenoids, alkaloids, steroids and glycosides in the extracts. On the contrary phytochemical screening also revealed the absence of anthocyanins, anthraquinones, emodins, leucoanthocyanins, phlobatanins, proteins and steroids. Phenolic compounds are well known as antioxidant and scavenging agents for free radicals associated with oxidative damage. Antioxidant potential was evaluated in vitro using free radical scavenging assays for superoxide and reducing power assessment. The results for antioxidant properties of the extracts using ascorbic acid as standard showed that maximum effect is observed for methanol extract.

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**GROUPING OF IRANIAN LANDRACES THYME, BASED ON QUALITATIVE TRAITS OF DISTINCTNESS, UNIFORMITY AND STABILITY PROTOCOL**

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Medicinal plants are an important source of drug production that mankind has used for many years. Thyme is one of the most important genus of mint family that drugs and medicinal properties have been approved. In this study, 15 populations from 3 species was used. Also, Thyme seed crops (*Thymus vulgaris*) was planted with Iranian landraces Thyme as a control. The results of qualitative morphological traits analysis showed that the Markazi landrace of the Daenensis species having 6 common trait among the 15 trait measured, has the highest similarity with *Thymus vulgaris*. As well as with only one common trait, the Fars landrace of the Daenensis species has the lowest similarity with *Thymus vulgaris*. Also four characters: leaf variegation, leaf main color, Flower color of petal and Plant male sterility indistinctness, uniformity and stability (DUS) protocol, used for grouping varieties of thyme. grouping by these four characters, the Iranian landraces thyme Will be divided into 10 categories.

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**THE IMPACTS OF ORGANIC AND BIO-ORGANIC FERTILIZERS ON MORPHOLOGICAL PROPERTIES AND QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF CUMIN (*CUMINUM CYMINUM* L.) IN JIROFT**

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In order to examine the impacts of different sources of organic and bio-organic fertilizers, a field factorial experiment in randomized complete block design was conducted in three consecutive times in Jiroft. In this research the impacts of bio-organic fertilizer were investigated in two factors (two-factor design), and the first factor had four levels of bio-fertilizer treatments: no bio-fertilizer (control group); Nitroxine bio fertilizer; Phosphate Barvar 2; and PotaBARVAR-2. The second factor had three levels of manure treatments: no manure fertilizer (control group); cow manure fertilizer 10 tons per hectare; chicken manure fertilizer 5 tons per hectare. The variance analysis has revealed that the impacts of manure and bio-fertilizer on the height of a plant, a plant's number of seeds, the weight of 1000 seeds, and finally the weight of the plant's fresh shoot (upper components) were significant. Moreover, the interaction effects of manure and bio-fertilizer on the plant's number of umbels and the amount of extract (at 5% level), and the biological performance and ultimate seed function (at 1% level) were significant. The highest amount of extract was obtained through treatment of cow manure and PotaBARVAR-2 the highest level of ultimate seed functions was obtained through the treatments of Nitroxine bio-fertilizer and chicken manure which were classified in the same statistical group with cow manure and PotaBarvar-2.





**EFFECT OF VARIOUS LEVELS OF VERMICOMPOST AND DROUGHT STRESS  
ON QUANTITATIVE AND QUALITATIVE PROPERTIES AND ADSORBING  
SOME ELEMENTS IN LEMON BALM**

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In order to investigate effect of various levels of vermicompost and drought stress on growth properties and absorbing some elements in lemon balm, a test was conducted as factorial full random blocks design with 16 treatments in 3 replications in a farm in Karaj in 2015. The examined factors include various levels of vermicomposts (0, 0.5, 1.5, and 2.5 kg/m<sup>2</sup>) and drought stress in 4 levels of 25, 50, 75, and 100% field capacity). He measured properties including plant height, leaf number, leaf area, essential oil content, number of lateral branches, wet and dry weight and some elements. Results showed that drought stress leads to reduce plant height, leaf number, leaf area, number of lateral branches, wet and dry weight; however, they have positive effect on plant extraction and increase it. Among the measured elements, the absorbed nitrogen and potassium weren't influenced by stress and their absorption was reduced by stress. Application vermicompost improves physical properties of soil and reduces stressed effect.



**DETERMINATION OF MOST PRESCRIBED PLANTS IN TRADITIONAL  
MEDICINE CLINICS AFFILIATED TO TEHRAN UNIVERSITY  
OF MEDICAL SCIENCES**

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Traditional Medicine (TM) in Iran dates back more than 4000 years ago (1). Iranian People use TM for various reasons like efficacy and economical benefits (2). In recent years, WHO strategies were focused on developing TM to ensure public health protection especially in developing countries. Based on these strategies and to spread correct knowledge of TM in society, school of traditional Iranian medicine was established by Tehran University of Medical Sciences (TUMS) in 2007 (3). Three educational clinics and pharmacies affiliated to TUMS also provided health services to people in the community. In this study plants prescribed by physicians during June to December 2016, are investigated. Data were collected from medical record information. Obtained data feed into an Excel-spreadsheet for analysis. As the result of this study there are 109 medicinal herbs which are presented in affiliated pharmacies. These samples are including aerial parts and leaves (33 types), fruits (27 types), seeds (21 types), rhizome and roots (15 types), flowers and buds (8 types), resins and manna (5 types). 10 samples were widely used are including *Matricaria chamomilla* (11%), *Pimpinella anisum* (10%), *Ziziphus jujuba* (10%), *Ziziphora clinopodioides* (8%), *Nardostachys jatamansi* (6%), *Melissa officinalis* (6%), *Trachyspermum ammi* (5%), *Thymus vulgaris* (5%), *Fumaria parviflora* (5%), *foeniculum vulgare* (5%), *Althaea officinalis* (5%). According to Persian traditional manuscripts, all of these 109 plants have various applications and used for different diseases based on patient's condition. Some of their properties are approved via different researches but there may be cases that have not been studied. Investigation of the key usages of these herbs especially the best-selling ones, via clinical researches can be subjected for future studies.

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**ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED TO TREAT  
CONSTIPATION IN THE HORAND REGION**

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Indigenous knowledge can be part of the unique culture of each country, in order to study ecological and social circumstances of the region. An ethnobotanical and ethnoecological branches of local knowledge study the plants grow in habitat. Ethnobotany studies ecology and plants used by local people [1]. Constipation is one of the diseases that a large number of people are suffering that can lead to many complications of the diseases such as hemorrhoids, ulcers and gastritis. In this disease, hardened feces in the intestines and disposal is done with difficulty. Constipation is the source of many diseases and chronic discomfort when passing a man languishing and dull and creates gaping. This study was performed in the city of Horand located in East Azerbaijan province. On the basis of our results plants used in the region Horand to prevent and treat constipation includes: *Descurainia Sophia*, *Lepidium sativum*, *Artemisia dracunculus*, *Achillea millefolium*, *Rubus sp*, *Malva sylvestris*, *Rumex acetosella L*, *Polypogon monspeliensis* [2].

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**THE EFFECT OF *ZATARIA MULTIFLORA* ON THE POSTPARTUM  
ENDOMETRITIS IN DAIRY COWS**

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Postpartum endometritis is one of the most factors that reduce reproductive performance in dairy cows. This is one of the most common uterine disorders in dairy cows. The objective of the present study was to determine the effects of intrauterine (i.u) infusion of *Zataria multiflora* extract and comparison with penicillin+streptomycin on cure rate of clinical endometritis and reproductive performance. Holstein cows (n = 131) were determined for clinical endometritis between 30-40 DIM. Manual vaginal examination, transrectal palpation and ultrasonography were used to inspection of the genital tract and diagnosis of clinical endometritis. Cows with clinical endometritis were randomly divided into three treatment groups: *Z. multiflora* extract (n=56), penicillin-streptomycin (n=55), and placebo (n=20) i.u. infusion. Cervical cytology was done at first and second examinations in all studied cows. In dairy cows with endometritis of score 1, clinical cure rate of studied groups include placebo, pen+strep and *Z. multiflora* extract were 45.5, 34.5 and 53.6%, respectively; it was 66.7, 84.6 and 56.0% in dairy cows with endometritis of score 2, 3. Overall, proportion of successfully treated cows was 55.0, 58.2 and 54.7% in treatment groups of placebo, pen+strep and *Z. multiflora* extract, respectively, at the second examination (P > 0.05). Changes value of percentage of neutrophils in cervical cytology were significant different (p < 0.05) in the treatment groups of *Z. multiflora* extract and pen+strep between first and second examination (p < 0.05); while, in placebo group, were not significant (p > 0.05). The results showed the first service conception rate of studied cows in *Z. multiflora* extract group (48.9%) was higher compared to those in other groups (38.8 and 42.9% in pen+strep and placebo groups); however, this difference was not significant (P > 0.05). Also, there was no significant difference in days open and service per conception among studied groups (P > 0.05). In conclusion and, *Z. multiflora* extract can be effective on the cure rate of clinical endometritis and also partially improved reproductive performance. So, it is recommended that the *Z. multiflora* extract as alternative therapy could be useful to treat the clinical endometritis in dairy cows under field condition [1,2].

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**ISOLATION AND IDENTIFICATION OF TOXIC COMPOUNDS FROM  
*CUMINUM CYMINUM* FRUIT EXTRACT**

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*Cuminum cyminum* is a medicinal plant all over the world from Apiaceae family. *Cuminum cyminum* is the second most popular spice after *Piper nigrum*. The fruits of this plant is used in cooking and flavouring and also have used for treatment of toothache, epilepsy, diarrhea, emphysema and used for their therapeutic effects on gastrointestinal problems in Iranian traditional medicine [1]. In this study we evaluated toxicity of the different (hexane, chloroform, ethyl acetate and methanol) fractions of *Cuminum cyminum* through *Aretemia salina* lethality test. This test have provided by US national cancer institute and used to evaluate the toxic characteristics of different types of plant extracts, heavy metals, pesticides, food additives and medicinal compounds[2]. The toxicity evaluation showed that hexane and ethyl acetate fractions have the highest lethality in 100 µg/ml with 62.43± and 58.74± percent respectively. Thus these fractions have evaluated through column chromatography and their subfractions also tested against brine shrimp larvae lethality test. Ultimately, we separated and identified the effective compounds rom toxic fractions. Four flavonoids including Apigenin, Luteoline, Apigenin-7-*O*-glycoside and Luteoline-7-*O*-glycoside, separated from ethyl acetate fraction and Cuminoid A identified from hexane fraction as potent compounds of active subfraction.

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**ANTI-ANGIOGENESIS AND ANTI-CYTOTOXICITY EFFECTS OF ESSENTIAL OIL OF *ZHUMERIA MAJDAE* ON AGSCCELL LINE**

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*Zhumeria majdae* and *Wendelbo*. (Lamiaceae) is an Iranian native medicinal herb. It has long been used in folk medicine as antispasmodic and carminative. In addition, this plant has been used for gastritis and to ease the pain of menstrual. The aim of this research is investigation of cytotoxicity and anticancerous activity of essential oil of *Z. majdae* on Adenocarcinoma Gastric cancer (AGS). AGS cells were treated with various concentration of essential oil (0.15% , 0.25% , 0.35% , 0.45% ,0.55% and 0.65%) of the plant. Then, cytotoxicity effect of essential oil on cell line had been investigated by MTT assay. Finally, semi quantitative RT-PCR was carried out for VEGF-A gene. The results demonstrated that 0.65% $\mu$ l has the highest cytotoxicity effect (23/87%) and the lowest cytotoxicity effect (71/82%) was recorded when 0.15% $\mu$ l of essential oil was used.

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**AN IMPROVED METHOD TO INCREASE DIOSGENIN YIELD  
FROM FENUGREEK**

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Diosgenin is a steroidal sapogenin found in plants such as *Dioscorea nipponoca*, *Solanum incanum*, *Solanum xanthocarpum* and *Trigonella foenum-graecum* [1]. There are different methods to extract diosgenin from plant material. There have been several attempts to optimise the extraction of diosgenin from *T. foenum-graecum* as a source of diosgenin [2]. In this study three methods were tested to optimise the extraction procedure of diosgenin from fenugreek seeds. A hydrolysis method involving 4N H<sub>2</sub>SO<sub>4</sub> in 70% isopropanol rather than use of 3N aqueous HCl, yields more diosgenin. This is an important improvement from a biotechnological standpoint because more diosgenin can be extracted which makes the whole process economically more viable.

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**EFFECT OF SALICYLIC ACID AND SALT STRESS ON SAVORY SEED GERMINATION AND ANTIOXIDATIVE ENZYMES ACTIVITY**

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Seed germination is the critical stage for species survival. Salinity affects germination and seedling growth and yield of crops, such as medicinal plants. This study was carried to evaluate the effects of NaCl on seed germination and influence of salicylic acid in order to improving salt tolerant on savory (*Satureja hortensis*). In many cases savory is grown on saline soils where growth and yield are limited by salinity. In this experiment seeds were pre-soaked in set of seeds in 0, 2 and 4 mM of Salicylic acid (SA). Seeds were then placed in Petri-dishes with 8 ml of diameter and irrigated by 0, 100, 200 and 300 mM NaCl solutions. The results showed that saline water significantly reduced all seed germination parameters in comparison with the respective control. The most percent of seed germination, Germination rate and seedling dry weight under saline condition (200 and 300 mM of NaCl) were obtained by pre-soaking in 2 mM SA. Salt stress significantly increased the activity of the anti oxidative enzymes catalase and peroxidase in savory seedlings, and salicylic acid reduced the activity of antioxidant enzymes as stress signal molecules. Overall, the positive effect of SA towards resistance to the salinity of summer savory will provide some practical basis for cultivation of this plant.

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**CHEMICAL COMPOSITION OF *CENTAUREA URVILLEI* SUBSP.  
*DEINACANTHA* ESSENTIAL OIL**

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*Centaurea urvillei* is a biennial plant, reliable, short, green and has many trichomes [1]. It is a kind of wheat flower. This species is distributed in West, North and North-West in Iran [2,3]. Aim of this study is to determine chemical composition in essential oils of *C. urvillei* for food, cosmetics-health industry and medicinal uses. The plant parts of *C. urvillei* were collected at flowering stage from Uromieh (Ghasemloo Valley) on June 2010. The plant parts include stem plus the leaf and inflorescence, dried in laboratory and crushed to particles. The essential oils were obtained by hydrodistillation and were analyzed by GC and GC/MS. The yields of essential oils of stem plus the leaf and inflorescence (w/w dried weight) were 0.023% and 0.065% respectively. The major constituents of stem plus the leaf oils were benzyl benzoate (38.7%), caryophyllene oxide (17.9%) and  $\beta$ -eudesmol (19.8%) and the major constituents of inflorescence oil were caryophyllene oxide (25.7%), spathulenol (14.8%) and eudesma-4(15)-7-dien-1- $\beta$ -ol (21.0%).

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**CHEMICAL COMPOSITION OF *CENTAUREA PTEROCAULA* TRAUTV.  
ESSENTIAL OIL**

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*Centaurea pterocaula* is a kind of wheat flower. This Species distributed in West and North-West in Iran [1,2]. Aim of this study is to determine chemical composition in essential oils of *C. pterocaula* for food, cosmetics-health industry and medicinal uses. The plant parts of *C. pterocaula* were collected at flowering stage from Janjan on June 2010. The plant parts include stem plus the leaf and inflorescence dried in laboratory and crush to particles. The Essential oils were obtain by hydrodistillation and were analyzed by GC and GC/MS. The yields of essential oils of stem plus the leaf and inflorescence (w/w dried weight) were 0.06% and 0.09% respectively. The major constituents of stem plus the leaf and inflorescence essential oils were germacrene D (20.4% and 5.4%), thymol (10.6% and 3.8%), cyperene (3.5% and 11.5%), spathulenol (7.7% and 4.9%), caryophyllene oxide (6.8% and 13.4%) and E-caryophyllene (4.9% and 8.1%) respectively.

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**THE EFFECT OF PLANTING DATE AND PLANT DENSITY ON YIELD, YIELD ELEMENTS, ANDESSENCE CHANGES IN *OCIMUM BASILICUM* MEDICAL PLANT**

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A Test was conducted in as factorial full random blocks design in 3 replications in a farm in Karaj in 2015 in order to examine effect of planting date and plant density on yield, yield elements, and essence changes in testing ocimum basilicum medical plant. Treatments include planting date in 3 levels (15 and 30 of the first month of spring and 15 of the second month of spring) and plant density in 3 levels of (50, 75, and 100 plants in per m<sup>2</sup>). Examined traits include plant height, leave numbers, number of lateral branch, leaf area, dry and wet weights, and essence percentage. Results showed that planting date of 15 of the second month of spring and density of 50 plants per m<sup>2</sup> had the best growth and the highest essence amount than other treatments. The mentioned result is obtained for providing proper conditions of plant growth and having more growing space and nutrition by plant.



**STUDY ON EMERGENCE OF *PIMPINELLA* L. SEED IN FIELD**

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The number of medicinal properties and recognized medical of genus *Pimpinella* L. are known. *P. anisum* is the most significant species in this regard [1,2]. In this research the Emergence of *Pimpinella* L. seeds in field evaluated in complete blocks design with three replicatioins. Treatments were 11 accessions of *Pimpinella* (Khojir, Noshahr and Chalous Road). The experiment was performed in the Alborz farm research complex located in Karaj in 2016. The results of variation analysis of experiment showed that the effect of different accessions on Emergence percent of *Pimpinella* seed in field had significant on the level of 1%. Mean comparison showed that the most of Emergence percents are *P. aurea* belonging to Touchal locality (%43.4), *P. aurea* from Ilam locality (%37.2), *P. tragiium* belonging to Uromieh locality (%40.5), *P. barbata* from Ilam Locality (%36.7), while *P. tragiium* Accessions of Ardebil and Zanzan did not germinate at all. Seed of Main locality was introduced for cultivation of plant.

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**HAIRY ROOT INDUCTION IN *PHYSALIS ALKEKENGII* L.**

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*Physalis alkekengi* L. is a medicinal plant belonging to the Solanaceae and rich in phytochemicals such as: physalins, withanolides, sterols, polysaccharides and flavones. *P. alkekengi* has many uses in traditional medicine and modern pharmacologic. The extraction of medicinal compounds from *in vivo* plant cultures can be limited by various problems. Hairy root cultures can be efficient solution to overcome some of these problems. In this research, the effects of 5 strains of *Agrobacterium rhizogenes* (GM, C58, A4, MSU and 15834) and leaf and stem explants were studied on hairy root induction in *P. alkekengi*. The most transformation rate was related to explants which were inoculated with A4, MSU and 15834 strains. Leaf explants by 5.601 hairy roots per explant had better yield than stem explants by 2.906 hairy roots per explant. To our knowledge, this work describes for the first time.



**COMPARATIVE STUDY ON THE DUAL ANTIOXIDANT AND ANTIBACTERIAL PROPERTIES OF *MENTHA AQUATICA* EXTRACT AND ESSENTIAL OIL**

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Antioxidant and antimicrobial activity of plant essential oils and extracts has been the basis of various scientific applications in the food processing industries, pharmaceuticals, and traditional medicine [1]. *Mentha aquatica* as a member of the Mint family used in traditional South African medicine and is grown in many regions. The objective of the present study is to evaluate antioxidant and antibacterial properties difference between extract and essential oil of *M. Aquatic*. Ethanolic extracts and essential oil prepared by maceration and hydrodistillation method respectively. Total phenolic contents were measured spectrophotometrically with folin ciocalteu method. The antioxidant capacity of the extract was assessed by DPPH (2,2-diphenyl-1-picrylhydrazyl) radical-scavenging activity and compared to synthetic antioxidant BHT. In addition, antioxidant capacity of extracts was also analyzed with ABTS (acid sulphonic-6-ethylbenzthiazoline-3-azinobis, 2, 2, cation radical method [3]. Eventually the antibacterial activity was assessed from minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) using the microdilution method. Data were analyzed using Duncan's multiple test by SPSS software. Total phenolic content of extract and EO was  $231.61 \pm 10.80$  and  $23.10 \pm 3.41$  mg Gallic acid / g, respectively. In testing percent of inhibition of free radicals (DPPH and ABTS), the extracts showed a significant inhibitory effect but there is a significant difference ( $p < 0.05$ ), between ethanolic extract and EO. So that antioxidant effect of extract was significantly higher than EO in all concentrations. Both extract also showed reducing effect which was relatively low performance compared to the BHT. Minimum inhibitory concentration (MIC) values of EO against *L. Monocytogenes* (ATCC 19115), *S. aureus* (ATCC 25923), *E. Coli* (PTCC 1533) and *S. typhimurium* (ATCC 14028) was  $5.12 \text{ mg mL}^{-1}$ ,  $5.12 \text{ mg mL}^{-1}$ ,  $2.5 \text{ mg mL}^{-1}$  and  $2.5 \text{ mg mL}^{-1}$  and MBC also was  $10 \text{ mg mL}^{-1}$ ,  $10 \text{ mg mL}^{-1}$ ,  $5.12 \text{ mg mL}^{-1}$  and  $5.12 \text{ mg mL}^{-1}$ , respectively. Based on our results the ethanolic extract did not show any antimicrobial effect. Our findings showed that *M. aquatic* extract has relatively good antioxidant activity but in contrast EO has relatively strong antimicrobial effect against some pathogenic microorganisms. So, considering the difference in effects they seem quite useful and reasonable as a potential source of natural antioxidants and antimicrobial in food and pharmaceutical industries.

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**EVALUATION OF ADDITION OF YAGHOOTI GRAPE METHANOLIC  
EXTRACTION, MEAL AND JUICE WITH COMMERCIAL ANTIOXIDANT  
ON HUMORAL IMMUNE RESPONSE AGAINST NEWCASTLE AND AVIAN  
INFLUENZA VIRUSES IN BROILERS**

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The current experiment was conducted in order to evaluate the addition of Yaghooti Grape Methanolic Extraction, Meal and Juice with commercial Antioxidant on Humoral Immune Response against Newcastle and Avian Influenza Viruses in Broilers at day 21 and 42. 150 day-old Ross 308 (mixed sex) were used in 5 replicates, 3 replicates and 10 chicks per replicate for 42 days in completely randomized design manner. Experimental treatments were 1) control (with no additive); 2) basal diet with 150 ml/kg grape juice; 3) basal diet with 30 g/kg grape meal; 4) basal diet with 30 mg/L of grape juice and 5) basal diet with 200 mg/kg BHT. Results showed that grape juice and BHT treatments were significantly increased the ND titer at day 21, compared with control. BHT treatment showed significantly higher antibody titers against AI at day 42. Grape juice, meal and BHT have increased the AI titers at day 42, compared to control. It can be concluded that using 30 ml/kg grape juice have positive effects on antibody titers against Newcastle and Avian Influenza at day 21 and using 200 mg/kg BHT has significantly improved the ND and IBD titers.



**COMPOSITION, ANTIOXIDANT AND ANTIBACTERIAL ACTIVITIES OF THE ESSENTIAL OIL OF *FERULAGO MACROCARPA* FLOWERS**

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*Ferulago macrocarpa* locally known as Chavil is an endemic species from Apiaceae which grows in West of Iran. In present research, chemical compositions, antioxidant and antibacterial activities of essential oil of the *Ferulago macrocarpa* flowers obtained from koohdasht region of Lorestan, Iran were determined for the first time. The chemical composition of the essential oil was analyzed by GC/MS. From forty-four identified components representing 93.6 % of the oils, the major constituents were found to be bornyl acetate (38.3%), terpinolene (10.9%),  $\beta$ - pinene (4.4%),  $\alpha$ -phellandrene (3.6%), limonene (2.8%), *para*-cymene (2.7%), *n*- decane (2.5%) and myrcene (2.4%). The essential oil was tested against both Gram-positive (*Bacillus cereus*) and Gram-negative (*Escherichia coli*) bacteria using disc diffusion method [1]. The sample show no activity against both of the bacteria, but exhibited 45% scavenging activity against DPPH free radicals.

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**EVOLUTION OF PHENOLIC COMPPUNDS, ANTIOXIDANT AND  
ANTIBACTERIAL ACTIVITIES OF *FERULAGO MACROCARPA* LEAVES**

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*Ferulago macrocarpa* (Chavil) is a folk medicinal plant from Apiaceae family used as food preservative and flavoring agent in Iran [1]. In other species of this plant antioxidant properties have been reported. In present research, antioxidant activity, total phenol, flavonoid contents and anthocyanin compounds of the *F. macrocarpa* leaves obtained from koohdasht region of Lorestan, Iran were spectrophotometrically determined by using the 2,2- diphenyl-1-picrylhydrazyl (DPPH) radical scavenging [2], Folin Ciocalteu [3], Aluminiumchloride [4] and pH-differential methods [5], respectively. Antibacterial activity was studied by disc diffusion method [6]. The *F. macrocarpa* leaves extract showed moderate DPPH radical scavenging activity with IC<sub>50</sub> value of 1505.59 µg/ml. The total phenol, flavonoid and anthocyanin were 45.57 ± 3.01 mg GAE /g, 11.53 ± 3 mg QUE/g, and 0.73 ± 0.2 mg ECG/g dry extract, respectively. The extract showed not significant activity against tested bacteria. With increasing concentration, the total phenols and flavonoids increased, while monomeric anthocyanins reduced. Our findings revealed that the leaves hydroalcoholic extract of *F. macrocarpa* may be suggested as a source of natural antioxidant.

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**EFFECTS OF DIFFERENT PRETREATMENTS ON SEED GERMINATION  
IMPROVEMENT OF *PEROVSKIA ABROTANOIDES* KAREL**

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*Perovskia* L. belongs to Lamiaceae family (subfamily: Nepetoideae) and three species of this genus (*P. atriplicifolia* Benth, *P. abrotanoides* Karel., *P. artemisoides* Boiss.) are grown in Iran [1,2]. The *P. abrotanoides* have various pharmacological properties including anti-bacterial, anti-inflammatory, anticancer, anti-infection, cytotoxic and ameliorating rheumatic pains effects. These biological activities are related to the presence of tanshinones and phenolic acids, especially rosmarinic acid. Because of the low rate of seed germination, the proliferation and micropropagation of this plant may have high importance. The aim of present investigation was to evaluate the effects of different pretreatments in order to reduce dormancy period, and increasing the seed germination rate and percentage. The effects of pretreatments including temperature (-20, -80, and -180 °C), humid and dry pretreatments at 4 °C, as well as some physical and chemical pretreatments (sand paper, H<sub>2</sub>SO<sub>4</sub> (1%), running water) on seed germination rate and percentage were evaluated on filter paper or MS and 1/2 MS basal medium. For statistical analysis of data, 100 seeds were cultured in three replicates in each pretreatment. The results showed that the highest values for seed germination percentage were achieved by pretreatments of the cultured seeds on filter paper with sandpaper (95%) and H<sub>2</sub>SO<sub>4</sub> (89.66%), as compared to control (50%). The maximum seed germination rates were obtained for the seeds pretreated by sandpaper (7.3 in 10 days) and H<sub>2</sub>SO<sub>4</sub> (6.383 in 10 days), while the lowest germination rate (3.42 in 10 days) was measured for the seeds pretreated at -20°C for 24 hr. In conclusion, in this study we presented efficient methods for improvement of seed germination of *P. abrotanoides*, as a useful plant and a rich natural source of active compounds for medicinal and efficient propagation purposes.

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**EFFECTS OF EXTRACTION DURATION ON NATURAL COMPOUNDS OF  
THREE IRANIAN ECOTYPES OF *LAWSONIA INERMIS* L.**

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Henna (*Lawsonia inermis* L., Lythraceae) is a worldwide traditional cosmetic agent containing the dye lawson. It has an affinity for bonding with protein, and thus has been widely used for staining of skin, hair, and nails in cosmetic industry as well as leather, silk and wool in carpetic and textile. Moreover, during long past times, the leaves of *Lawsonia Inermis* L. have been used as medicine because of high amount of phenolic compounds resulting in anti inflammatory and antioxidant properties. The present study was undertaken in order to evaluate the effects of duration of hot water extraction on natural compounds of three ecotypes of *Lawsonia Inermis* L. The plants were collected from Jiroft (Kerman province), Dalgan (Sistan province), and Kazerun (Fars province). The leaves were extracted with boiling water for 2 and 6 h, and the natural compounds of the extracts were determined spectrophotometrically using appropriate methods and standards. Total phenolics, tannins, and flavonoids were measured using Folin-Ciocalteu and acidic ethanol, respectively. Lawsone were extracted with ethyl acetate, evaporated and the percipitate was dissolved in methanol and quantitated spectrophotometrically. The results showed the adverse effect of boiling duration on flavonoids, total phenolics, and lawson contents of all three examined ecotypes, so that the lowest amounts of these compounds were detected in 6h extractions. The content of tannin however, significantly increased by the time of extraction. The maximum contents of total flavonoids and lawson were determined in Jiroft ecotype ( 20 mg/g Dw and 1.13 mg/ g DW, respectively). Based on the results and regarding the importance of flavonoids and lawson ingredients, short extraction period can be suggested for herbal shampoo in cleaning and cosmetic industry, while longer extraction seems to be more appropriate for remedy of skin disorders were tannins are more effective.



## ANTIMICROBIAL ACTIVITY OF *NIGELLE SATIVA'S* OIL

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The ancient tradition of medicinal plant application has turned into a highly beneficial business in the global market, resulting in the release of a large number of herbal products. Black seed with scientific names *Nigella sativa* is widely cultivated throughout southern Europe, middle east and India for culinary and medicinal purposes (1). The most important substance of this seed is quinone and located in active compound and the most popular substance are thymoquinone that has many property like impeding of cancer. In this study, oil extraction from the seed of plant was carried out by the evaporative system Soxhlet extract using ethanol as solvent. Subsequently, antimicrobial activity of extract was survey by minimum inhibitory concentration. For this reason *Staphylococcus aureus* as gram positive bacteria and *Escherichia coli* as gram negative bacteria were examined. The result showed that growth of bacteria in different density of extract and pure thymoquinone was inhibited (2).

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**EFFECTS OF 3, 5, 4-TRIHYDROXY-STILBENE ON THE STRUCTURE AND CATALYTIC ACTIVITY OF CATALASE**

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Resveratrol (3, 5, 4-trihydroxy-stilbene; RES) is a natural polyphenolic product exists at high level in red grape skin. In this work, the interaction of *trans*-resveratrol (tRES) with bovine liver catalase (BLC) was monitored using spectroscopic techniques including UV-vis absorption, fluorescence, synchronous fluorescence and circular dichroism (CD) spectroscopy. UV-vis spectroscopy results indicated a little changes in Soret-band spectrum, which represented that changes in heme group position is not significant. *In vitro* kinetic studies indicated that tRES can inhibit BLC activity in an uncompetitive manner. The results of spectrofluorimetric analysis represented that the binding of tRES with BLC can change the micro-region around aromatic amino acids (tryptophan (Trp) and tyrosine (Tyr)) and quench intrinsic fluorescence emission of BLC by a static mechanism. According to the fluorescence quenching data analysis, it was revealed that tRES has one binding site on BLC and the values of binding constant at 25°C and 37 °C were obtained to be  $4.9 \times 10^3$  and  $2.6 \times 10^3$  M<sup>-1</sup>. The thermodynamic parameters demonstrated that tRES can bind to BLC by van der Waals forces and hydrogen bonds. Molecular docking results indicated that tRES binds to BLC away from heme group and near to the Tyr 324 and Phe 265. These results are in agreement with the experimental findings.

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**ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES OF ETHANOL  
EXTRACT OF LEAF BEET (*BETA VULGARIS*) IN MALE RATS AND MICE**

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Inflammation and pain are common nonspecific manifestations of diseases. NSAIDs and opiates used classically, but adverse reactions occur such as GI disturbances, respiratory depression and possible dependence [1-2]. In recent years, there is an increasing interest to find new anti-inflammatory and analgesic drugs from natural sources and medicinal plants. Groups of rats treated with hydro-alcoholic extract of the leaves of *Beta vulgaris* at doses of 300, 700, 1000 mg/kg (i.p.), tween plus distilled water (vehicle) and distilled water and sodium salicylate. The rat paw edema induced by 2.5% formalin. The plant extract was injected to animals 1 hour before formalin injection in day 1 and paw volume was measured during 8 days after formalin injection. Hot plate test was performed to measure anti-nociceptive activity of *B. vulgaris*. Male mice (n=48) were used and the latency time was measured. Writhing test was also used for analgesic activity of *B. vulgaris*. Acetic acid (0.6%) was injected to induce abdominal contraction. Morphine was used as positive control. Number of abdominal contractions during 30 minutes after acetic acid injection were reported. Different doses of *B.vulgaris* had significant anti-nociceptive effects on both animal models. *B. vulgaris* at two doses reduced the count of abdominal contractions in writhing test. Also in hot plate test, *B. vulgaris* could increase the latency time of nociception. These data were significantly different compared to control group (p<0.05). Accordingly, it was indicated that in the acute phase, the *B. vulgaris* could reduce the edema and in the chronic phase, it also reduced edema, but was not statistically significant compared to control group. The analgesic effects of *B. vulgaris* was shown and justify the traditional use in management of pain. It does not show anti-inflammatory effects in comparison to control group.

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**PREPARATION AND EVALUATION OF CURATIVE EFFECT OF HERBAL SYRUP OF HYDRO-ALCOHOLIC EXTRACT OF *TILIA PLATYPHYLLOS* LEAVES IN EXPERIMENTAL INDUCED NEPHROLITHIASIS**

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Nephrolithiasis is a common disease that refers to calculi in kidneys which may indicate symptoms such as severe flank pain, hematuria, infection and even acute obstruction. Various strategies including diuretic drugs, extra corporeal shock wave lithotripsy (ESWL) and surgery are used for treatment of the disease. In recent years, usage of herbal medicine in treatment of kidney stone has been advised as an effective method that is safer in comparison to ESWL and surgery. However, *Tilia platyphyllos* is one of the indigenous plants of Iran, which is readily available and traditionally used to treatment of kidney stone. So the aim of this study was to elucidate the effect of formulated Tilia-syrup on an animal model of induced-nephrolithiasis. Tilia leaves hydro-alcoholic extracts were prepared by maceration and concentrated by lyophilization. This extract was used further for preparation of herbal-syrup using simple syrup (66.67%w/v) as base. Formulated syrup was characterized of its various physicochemical parameters like color, odor, taste, pH, specific-gravity, and refractive-index. Curative-effect of the above prepared syrup was evaluated as; 20 male Wistar-albino rats were randomly divided into 5 groups (each group contained 4 rats). Normal control-group (G0) received distilled-water for 24 days. Nephrolithiasis was induced in treatment-groups (G1, G2, G3) and negative-control group (G4) by ethylene-glycol (EG) 0.75% and ammonium-chloride 1% for 24 days. Tilia-syrup was given 150, 300, 450mg/kg orally in groups 1, 2, 3, respectively for 2 weeks while G4 didn't receive the syrup, and G0 just received normal saline during this study. 24hr urinary oxalate and volume were measured on day 0 (a day before starting treatment), 1, 3, 7 and 14. Kidneys were removed, weighted and subjected to histopathological examination and calcium-oxalate (CaOX) depositions counted by polarized light microscope. At last, results expressed as mean values  $\pm$  standard error of the mean (SEM). All parameters were analyzed by one-way ANOVA. *Tilia platyphyllos* showed significant improvement in renal function and kidney weight in Treatment-groups as compared to ethylene-glycol controls ( $P < 0.05$ ). The prepared syrup showed significant reduction of urine CaOX concentration; kidney CaOX depositions and kidney weights in all celery treated-groups in a dose dependent manner. The activity was compared with the negative control ( $P < 0.05$ ) Calcium-oxalate was also inhibited by 35% and 65%. Significant reduction of kidney weight in treatments group rats indicates that prepared Tilia-syrup can improve kidney tissue inflammation and apoptosis and possess significant activity for treatment of renal calculi.

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**INSECTICIDAL ACTIVITY OF THE ESSENTIAL OILS OF *MENTHA PIPERITA*  
AND *THYMUS VULGARIS* AGAINST THREE STORED- PRODUCT PESTS**

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The environmental problems caused by overuse of pesticides have been the matter of concern for both scientists and public in recent years [1]. The use of the essential oils extracted from aromatic plants to control pest has been investigated and is well documented [2]. In this study the fumigant toxicity of the essential oils of *Mentha piperita* and *Thymus vulgaris* were investigated on three economically important pests, *Callosobruchus maculatus*, *Oryzaephilus surinamensis* and *Trogoderma granarium*. So, pick up drying of the leaves done at the first and then essential oils of the herbs was collected by hydrodistillation method and Clevenger apparatus, which used in bioassay tests to assess their lethal concentration (LC<sub>50</sub>). Experiments were carried out at 27 ± 1°C and 60 ± 5% R.H. in dark condition. The LC<sub>50</sub> values of *M.piperita* and *T.vulgaris* against *C.maculatus* and *O.surinamensis* were 3.1, 1.21, 1.92, 1.16 µl/l air after 24h respectively. Furthermore, LC<sub>50</sub> values of the fumigant test of *M.piperita* and *T.vulgaris* essential oils against *T.granarium* were 2139.7 and 1756.01 µl/l air after 48h. The results showed that the essential oils of *M.piperita* and *T.vulgaris* had more insecticidal effects on adults of *C.maculatus* and *O. Surinamensis* compared with the larvae of *T.granarium*.

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**COMPARISON OF DIFFERENT MEDIA FOR INDUCTION OF CALLUS  
FROM *ASTRAGALUS VERUS* SEEDS**

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*Astragalus* (Fabaceae) is the largest genus of vascular plants. The plant has been widely used in food and medical industry. So far, various bioactivities including antioxidant, antihypertensive, antiviral, anti-cancer, anti-inflammatory, anti-diabetic, and immunomodulatory activities have been reported in *Astragalus* extracts. Invasive harvesting of the plant for extraction of its natural compounds have severely endangered it. Establishment of cell culture of this plant provides of the consumers with a sustainable and renewable alternative resource for active compounds without the necessity for damaging the intact plants. The goal of the present study was introducing media appropriate for callus induction from seeds. *Astragalus* seeds were collected from Soltan Nasir, (Nain, Isfahan province). In order to overcome inhibitory effects of certain compounds in seed coat, the seeds were first scratched with sandpaper, surface sterilized by subsequent washing with detergent, sodium hypochlorite (containing 5% active chlorine), H<sub>2</sub>O<sub>2</sub> (30%), and EtOH (70%), with interval rinsing with distilled water. The callus formation was assessed in three modified LS media. Basal LS medium was used, supplemented with different concentrations of kinetin and 2,4-dichlorophenoxyacetic acid (2,4-D) and 30 g sucrose. Induction of callus was observed in all applied media after 6 days. However, based on the size and fresh weight of callus, LS medium containing 3 mg. L<sup>-1</sup> 2,4-D can be introduced as a favorable environment for callus induction in this species.

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**MOLECULAR PHYLOGENY OF PSYCHROGETONBOISS. (ASTERACEAE;  
ASTEREAE INFRED FROM NRDNA ITS AND ETS SEQUENCES DATA IN IRAN**

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The genus *Psychrogeton* with 11 species (ca.20 species in Asia) is the largest genus of tribe Astereae (Asteraceae) in IRAN that distributed in rocky habitats in higher elevations of Irano-Touranian region in center, Northeast, South and West of Iran. Among these species, two species *Psychrogeton aellenii* and *psychrogeton chionophilus* are endemic and species *Psychrogeton amorphoglossus* is polymorphic with widespread distribution. The species of this genus are similar together and don't show high morphological differentiation. Members of genus are characterized by disc florets functionally male and pistilate florets tubular or with short erect limbs. In this study internal transcribed spacer (ITS1, 5.8S and ITS2 regions ) and External transcribed spacer (3' ETS region) of the nuclear ribosomal DNA genes as combined nuclear data sets were analyzed for phylogenetic reconstructions in this genus using Bayesian and Maximum Likelihood phylogenetics analyses. *Crinitina villosa*, *Galatella punctata* and *Chamaegeron oligocephalus* as outgroups were also included in the analyses. On the base of results, the monophyly of the genus *Psychrogeton* was not supported. The analyses showed all species of *Psychrogeton*, except *Ps. obovatus* constitute a monophyletic well-supported single clade (*Psychrogeton* s.st). Two accessions of *Ps. obovatus* well-embedded in a clade with *Neobrachyactis roylie* and emerged as sister to it. Some accessions of *Psychrogeton amorphoglossus* displayed low genetic divergence among themselves. While, a few accessions have great genetic distances and embedded within other species of *Psychrogeton*. open pollination systems, gene flow and hybridation between populations of different species or ecological factors causing habitat diversity are important factor affecting polymorphism.

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**FUMIGANT TOXICITY OF ESSENTIAL OILS OF *HERACLEUM PERSICUM* AND  
*H. ANTACIATICUM* ON TWO STORED- PRODUCT PESTS**

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Essential oils are the volatile lipophilic components extracted from plants [1], which may have attractive or repellent effects and insecticidal action against certain insect pests. It was found that these bioactive compounds are potentially toxic to insects but relatively safe to human [2]. This study aimed to investigate the fumigant toxicity of the essential oils of *Heracleum persicum* and *H. antaciaticum* on *Tribolium castaneum* and *Oryzaephilus surinamensis* that are two important species of stored-product pests. The essential oils of seeds of *H. persicum* and *H. antaciaticum* were prepared by hydro distillation method, using a Clevenger-type apparatus that used in bioassay tests to assess their lethal concentration (LC<sub>50</sub>). Experiments were carried out at 27 ± 1°C and 60 ± 5% R.H. in dark condition. Mortality was recorded after 24 hours of treatment. LC<sub>50</sub> values of essential oil of *H. persicum* and *H. antaciaticum* were found to be 791.29 and 891.79 µL/L air on *T. castaneum* adults and 190.47 and 115.08 µL/L air on *O. surinamensis* adults, respectively. The result revealed that two essential oils had strong fumigant and insecticidal activity against adults of *O. surinamensis* and *T. castaneum*, but *O. surinamensis* was more susceptible. So these essential oils which potentially prove to be efficient insecticides and can be used as a natural pesticide for control of these pests.

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**BIOGEOGRAPHY OF *ASTRAGALUS* L. SECTION *INCANI*(FABACEAE) BASED ON NRDNA ITS AND PLASTID *RPL32-TRNL*(UAG) SEQUENCES**

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*Astragalus* L. (Fabaceae), the largest genus of family Fabaceae, contains an estimated 3000 species and more than 250 sections that almost all species are herbaceous annuals and perennials. *Astragalus* root is a very old and obvious drug in traditional Chinese medicine. Section *Incani* DC. was established with 12 species by De Candolle. *Incani* with perennial habit, acaulescent, bifurcate hairs and mostly leaves imparipinnate but in a few species tri- or unifoliolate and 140 species worldwide is one of the richest and the most important sections of *Astragalus*. Section *Incani* distributed throughout Southern Europe, North Africa, Anatolia, Central Asia and the Caucasus. Its main centre of diversity seems to be in Iran and Turkey with about 120 species. Bayesian and Maximum Likelihood phylogenetics analyses applied to ITS and *rpl32-trnL* (UAG) sequences for 94 species of sect. *Incani*. *A. frigidus*, *A. stocksii* and *A. aegobromus* were selected as outgroup. The present study indicated that sect. *Incani* forms a monophyletic group. Our analyses reveal that clade *Incani* is divided into four subclade. The first subclade includes 9 species from section *Incani* formed the most basal branch and the earliest diverging lineage in this clade. This subclade included exclusively eastern taxa in Iran as sister to the remaining subclades. The eastern most of the section (except *A. ackerbergensis* and *A. gueldenstaediae*) form the basal branches of the clade. Disjunction in geographical distribution these two species relative to its closest allies in the section is possibly due to factors such as the stepping-stone mechanism, birds capable of long distance flight and monsoon trade winds coupled with oceanic currents. A further geological event that is likely to have induced the diversification of *Incani* within the Irano-Anatolian region was orogenic activities, especially mountain uplifts, have been presented to contribute to processes of floristic diversification

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**IDENTIFICATION OF ANTIOXIDANT COMPOUNDS OF THE ESSENTIAL OILS  
FROM THREE *MENTHA* SPECIES BY TLC- BIOAUTOGRAPHY  
AND GC ANALYSIS**

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The family of Lamiaceae consists of about 230 genera and 7100 species worldwide [1]; many species of this family such as: sage, oregano and mentha show strong antioxidant activity [2]. *Mentha* genus is one of the most important members in Lamiaceae family; this genus includes 25-30 species that are of high importance; both medicinal and commercial [3]. This study was designed to identify the essential oil constituents and main active compounds and to evaluate the antioxidant activities of the essential oils of three *Mentha* species including: *Mentha spicata*, *Mentha piperita* and *Mentha pulegium*. Antioxidant activity of the essential oils was studied by quantitative and qualitative methods such as: DPPH<sup>·</sup>, ABTS<sup>+</sup> and  $\beta$ -carotene bleaching inhibition tests and TLC-bioautography. Chemical compounds of the essential oils and the constituents of active fractions were determined using GC-FID, GC-MS. Although *M. pulegium* essential oil was the most active oil in the DPPH assay, *M. piperita* and *M. spicata* were more active in ABTS<sup>+</sup> and  $\beta$ -carotene bleaching inhibition tests. Carvone, Menthone/ Menthol and Pulegone were identified as the major constituents of *M. spicata*, *M. piperita* and *M. pulegium* oil respectively. GC-FID analysis of the active fractions showed that Menthol, iso-menthol and Piperitone in *M. piperita* oil, Terpinen-4-ol, Piperitone and Cubenol in *M. spicata* oil and Menthone, Pulegone and Dihydroedulane in *M. pulegium* oil are the most active compounds exist in the essential oils.

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**ALLELOPATHIC EFFECTS OF ARTEMISIA SIEBERI BESER AND MENTHA PIPERITA ON GERMINATION OF SEED OF AMARANTHUS RETROFLEXUS**

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in order to investigate the inhibitory effect of Allelopathic combinations presence in essence of medicinal plants such as Mentha piperita and Artemisia sieberi Beser on seed germination of Amaranthus retroflexus as common weed in farmland, This study was conducted by factorial design based on randomized complete block design with three replications. Experimental treatments included combination of two essences with concentrations four levels (0, 100, 200 and 300 ppm). Results revealed that efficacy of two combined essences on germination of seed were effective and had a significant difference in 5% probability level. Hence that Concentration of 300 ppm treatment had the most inhibitory on germination of Amaranthus retroflexus among others and also Concentrations of 100, 200 and 300 ppm treatments decreased rate of germination of Amaranthus retroflexus compared to control (distilled water) as 46%, 83%, and 97%, respectively.

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## EFFECT OF BLACK SEEDS MEAL ON TIBIA CHARACTERISTICS OF BROILER CHICKEN

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Soybean meal is the preferred protein source in broiler diets due to its high protein quality and palatability. However, due to its high cost and its low production in many countries of the world, many attempts have been made by nutritionists to replace soybean meal partially or totally in diets of different poultry species with various plant protein sources. Black seeds (*Nigella sativa* L.) are cultivated in the Mediterranean region and Asia [2]. The seeds are rich in oil and the defatted black seeds (black seed meal) has a high level of true protein [1]. Black seed meal is a novel protein source which has recently been used in poultry feeds [3]. Thus, the aim of the present study was to evaluate the effect of different levels of black seed meal on tibia characteristics of broiler chickens. Two hundred forty 1-day old broiler chicks (Ross 308) were randomly assigned to 5 treatments with 4 replicates and 12 chicks per replicate to receive rations supplemented with 0 (control) 5, 10, 15 and 20% black seed meal for 42 days. At the end of rearing period one chick per replicate was selected randomly, slaughtered and the left tibia was separate. The results of this experiment indicated that except tibia dry matter (%) and tibia ash (%) content, other tibia parameters such as tibia length (mm), tibia weight (gr), proximal and distal length of epiphysis (mm), internal and external diameter of diaphysis (mm) and distal condyle depth (mm), were not affected by inclusion of different levels of black seed meal in broiler diets. Tibia dry matter content were highest in 15% inclusion and in this level significantly higher than 10 % black seed meal ( $P<0.05$ ). The lowest values in tibia ash content were recorded in 10 % and highest value were recorded in 15 % inclusion of black seed meal. It could be recommended to use black seed meal in broiler diet as a non-traditional source of plant protein up to 20% without harmful effects on the tibia characteristics.

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**CYTOTOXICITY AND APOPTOTIC EFFECTS OF STANDARDIZED EXTRACT  
OF *SOPHORA ALOPECUROIDES* ON HUMAN  
ACUTE LYMPHOBLASTIC LEUKEMIA**

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Acute Lymphoblastic Leukemia (ALL) is the most common form of cancer in children [1]. Despite recent advances, treatment of ALL has usually associated problems. Some *Sophora* species are commonly used in traditional Chinese medicine. Their alkaloids have variety of pharmacological effect, including anti-inflammatory, antioxidant and anticancer. *Sophora alopecuroides* is a species of plant in the genus *Sophora*. Here we investigated the cytotoxicity and apoptotic effects induced by extract of *Sophora alopecuroides*. Apoptosis is a form of cell death in which a programmed sequence of events leads to the elimination of cells without releasing harmful substances into the surrounding area. Lymphocytes were collected from patient donors ranging from 2-9 years old. Cell cytotoxicity was assessed using (3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyl tetrazolium Bromide (MTT) and Mitochondrial membrane potential was determined according to the Spectrofluorometric method. In the final step, we investigated the apoptotic effects mitochondrial swelling by using ELISA Readers. Our results showed at the concentration of 6.75  $\mu$ M of extract has half maximal inhibitory concentration (IC<sub>50</sub>). Extract at concentrations of 3.4, 6.75, 9.5, 12 and 15  $\mu$ M, significantly ( $p < 0.0001$ ) reduced cell viability only in ALL but not normal B-lymphocyte mitochondria. We investigated the use of rhodamine123 to monitor the membrane potential of mitochondria. MMP significantly ( $p < 0.0001$ ) decreased in our extract treated lymphocytes in a time and concentration dependent manner. Our result showed that the extract of *Sophora alopecuroides* could induce cytotoxicity and apoptotic effects and Addition of extract (1.68, 3.4, and 6.75 mg/ml) induces mitochondrial swelling only in ALL but not normal B-lymphocyte mitochondria. It was observed the extract of *Sophora alopecuroides* had acceptable MTT and it could induce selective cytotoxicity and apoptotic effects on ALL B-lymphocytes by targeting their mitochondria. These results are in agreement with previous anticancer studies on *Sophora*.

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**STUDY AND ASSESSMENT OF THE MORPHOLOGICAL AND PHENOLOGICAL TRAITS OF BARBERRIES NATIVE OF NORTHEAST IRAN**

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Native barberries of Iran enjoy a wide range of variety among which some of the genotypes can be commercialized. Selecting these genotypes may finally result in introducing novel types. The present research intends to not only identify pleasant properties of the native barberries but also to assess them in terms of nutritious, medical and ornamental functions. The following research was conducted in the collection garden of Research Institute of Food Science and Technology (RIFST) in 2013 & 2014. The traits measured in the research included: height and growth habit, blossom time, the length of the cluster, type of the cluster, fruit color change time the specification of the fruit such as shape, color, number of the seeds in the fruit and the flavor of the fruit, brix, the amount of the acid capable of titration, the amount of phenolic compounds and anthocyanin of the fruit extract. The course of the time the buds of the fruit took to blossom was 45 to 52 days (the process begins in late February). The genotype codes 3-2, 6-2 and 9-2 had the shortest blossoming period lasting 7 days and the genotype codes 11-1 and 13-1 took the longest to blossom, lasting 14 days. The earliest barberries to blossom were the genotype codes 12-1, 11-2 and 13-3 and the code genome codes taking the longest time to blossom were 3-2, 10-3, 9-2. The earliest genotype codes to fruit color change time was 14-2 and 3-2 the process was noticed on July 26<sup>th</sup> and the genotype codes to fruit color change time the last was 2-2, 1-2 and 2-3 (the process was noticed September 21<sup>st</sup>). The greatest amount of total anthocyanin was assessed in genotype codes 9-3 and 14-2. Therefore the afore mentioned genotype codes were found to be the best types to produce edible colors. The genotype codes were classified in four groups considering their flavor and color. The genotype code 2-2 was also offered as the proffered type for ornamental functions.

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**PHYTOCHEMISTRY AND ANTIOXIDANT ACTIVITY OF  
*CENTAUREA ALBONITENS***

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*Centaurea* a genus of about 70 species of flowering plants in the Asteracea family has a widespread usage by different cultures and also a high reputation in herbal medicine by several known healing attributes. Considering the endemism and diversity of the species used in traditional and folk medicine in Iran, *C. albonitens* was selected for phytochemical study along with its antioxidant activity [1,2]. The air-dried ground aerial parts of *C. albonitens* (450g) was extract with 4L petroleum ether, 4L chloroform and 4L methanol respectively, for a period of 24h in triplicate through maceration at room temperature. Subsequently, the crude extracts were filtered, concentrated and dried at 40°C using a rotary vacuum evaporator. Further evaluation of methanol extract was accomplished by fractionation via different methods of chromatography (SPE, HPLC and preparative TLC) using different solvents. Structure elucidation for the isolated purified compounds was achieved with various spectrophotometric methods including 1D NMR and 2D NMR. Besides, the antioxidant property of *C. albonitens* methanol extract together with its phenolic and flavonoids content were evaluated. Structure elucidation of the purified compounds from methanol extract of *C. albonitens* based on the 1D NMR (<sup>1</sup>H NMR and <sup>13</sup>C NMR) and 2D NMR (COSY, HSQC and DEPT 135) revealed presence of a flavonoid and lignan derivatives. Moreover, the RC<sub>50</sub> value for DPPH antioxidant activity of the methanol extract was determined as 407mg/mL and values for the total phenolic and flavonoids content was calculated as 2.87g gallic acid equivalent and 0.28g quercetin equivalent per 100g of dry plant material. Overall, the present study is the first report on the phytochemical analysis of *C. albonitens* which revealed presence of apigenin-4'-o-glucoside (a flavonoid) and arctiin (Dibenzyl butyro lactone lignane). (a lignan) alongside admissible DPPH scavenging activity with increasing extract concentrations; however the antioxidant potency of the extract were negligible compared to the standard of quercetin.

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**EFFECT OF SEED COATING ON SOME GERMINATION AND SEEDLING INDICES OF CUMIN (*CUMINUMCYMINUM* L.)**

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Cumin (*Cuminumcyminum* L.) is an annual plant with medicinal properties including numerous stimulus appetite, strengthen the stomach, anti-flatulence, which has low germination, poorly vigor, low storage substances and weak establishment in the soil [1]. Seed coating one of the methods the improvement seedling establishment medicinal plant have small seed. Seed coating can be used to control insects, facilitating the process of cultivation, control pathogenic fungi and addition the useful microorganism's to seed [2]. In order to investigate the effects of seed coating on some germination and seedling indices of cumin experiments was conducted at genetic laboratory of agriculture faculty of Yasouj University. The second experiment was laid out with nine levels of coating treatments combined of Vermiculite (V), Kaolin (K) and Perlite (P) with different portions than seed weight (5g) (V3K3P3, V2K3P3, V2K1.5P4, V3K1.5P2, V5K2P2, V3K2P3, V4K4P2, V4K1P2 and uncoated) as Compleately Random Design (CRD) in four replications. The results of experiment showed that the highest germination percentage (%70.66) was related to non-coated treatment and coated treatment with combined ratio (V2 K1.5 P2) was located in the next rank. Among the coating treatments, coating with V3K1.5P2 had more seedling vigor weight index compared to other treatments that was 0.61 lower than uncoated seed (control). Based on obtained result it can be stated that need more study the effect of coating to seed.

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## THE QUALITY PROPERTIES OF *ZIZIPHUS JUJUBE* UNDER OSMOTIC DRYING

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Osmotic dehydration is a process in which water from fruit or vegetable as a result of immersion and direct contact with concentrated osmotic solutions is removed. This process has potential advantages such as less thermal damage, the effect of good whitening, less enzymatic browning, better maintenance of flavor and saving in energy because the phase change is not happening. In this study, the process of jujube osmotic dehydration carried out in osmotic solution containing sucrose with concentrations of 40, 45 and 50% and temperatures of 30, 40 and 50 ° C. Water loss, solid gain, pH and color measurements and sensory properties were evaluated during osmotic dehydration. The results showed that time duration had significant effect on water loss and solid gain. An increase in time duration of osmotic process caused an increase in water loss and solid gain. In addition, an increase in temperature and sucrose concentration led to a decrease on pH value. In all sucrose concentration, increasing the temperature resulted to an increase in L\* and b\* values and a decrease in a\* value. Furthermore, ΔE decreased by increasing in temperature and sucrose concentration. Finally, the sensory evaluation revealed that ziziphus jujube slices dehydrated in sucrose concentration of 40% at temperature of 30° C and sucrose concentration of 45% at temperature of 50° C obtained the lowest and highest overall acceptability, respectively.

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**EFFECT OF DIETARY ECHINACEA SUPPLEMENTATION ON PRODUCTIVE PERFORMANCE AND MORPHOLOGICAL INDICES IN LEGHORN LAYING HENS**

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The present study was carried out to investigate the effect of dietary supplementation of *Echinacea purpurea* (EP) powder on performance parameters and jejunal morphology in laying hens. A total of 150 Hy-Line W-36 laying hens, 44 wk of age, were randomly assigned into the 5 cage replicates (6 hens each) of 5 dietary treatments. Experimental diets consisted of the graded levels of EP powder (0, 0.25, 0.5, 0.75, and 1% of diet), that were fed to the hens during a 77 d feeding trial, including 7 d for adaptation and 70 d as the recording period. At the final trial day, 2 randomly-selected hens per replicate were slaughtered to investigate the morphological alterations in jejunal epithelium. Results showed that dietary supplementation of EP increased ( $P < 0.05$ ) egg production percentage and subsequent egg mass. Feed intake and feed conversion ratio, however, weren't influenced by dietary treatments. Although crypt depth wasn't affected by supplemental EP, dietary inclusion of at least 0.5% EP increased ( $P < 0.01$ ) villi height in jejunal epithelial cells. As a result, villi height to crypt depth ratio was greater ( $P < 0.05$ ) in EP-supplemented hens. The present findings suggest that dietary EP supplementation, by at least 0.5% of diet, could improve reproductive performance of laying hens. It seems that a part of beneficial effect of supplemental EP on performance is due to its impact on morphological indices of absorptive surface area.

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**EFFECT OF DIETARY INCLUSION OF EUCALYPTUS LEAVES ON  
PERFORMANCE AND IMMUNE RESPONSES OF LAYING HENS**

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The present study was conducted to evaluate the influence of dietary inclusion of eucalyptus (*Eucalyptus globulus*) powder on performance and immunological responses in Leghorn laying hens. A total of 144 Hy-Line W-36 laying hens (51 wk of age) were randomly allotted to the 6 replicates (6 birds per replicate) of each 4 dietary treatments. Experimental diets included a corn-soybean meal-based control group and diets supplemented with 2, 4, and 6% eucalyptus leaf. Trial lasted for 70 d, including 10 d for adaptation and 60 d for recording period. Results showed that dietary inclusion of 4 and 6% eucalyptus leaf decreased ( $P < 0.05$ ) average daily feed intake during both 30 d periods. As a result, egg production percentage and egg mass were numerically ( $P > 0.05$ ) lower in birds supplemented with 6% eucalyptus leaf. Feed conversion ratio, however, wasn't affected by dietary treatments. Although antibody response against Newcastle disease virus wasn't influenced by dietary eucalyptus supplementation, antibody titers to infectious bronchitis were greater ( $P < 0.01$ ) in hens supplemented with 2 and 4% eucalyptus leaf. In addition, supplemental eucalyptus leaves tended ( $P = 0.08$ ) to increase antibody response to sheep red blood cells. The present results suggest that dietary supplementation of eucalyptus leaves at high levels decreases performance parameters in laying hens. At the lower inclusion rates (about 2 to 4% of diet), however, eucalyptus leaf could improve antibody responses to infectious bronchitis virus.

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**EFFECT OF SUPPLEMENTAL GARLIC ON BLOOD BIOCHEMICAL  
PARAMETERS AND EGG QUALITY IN LAYING HENS**

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The study presented here was conducted to investigate the effect of dietary supplementation of garlic powder on serum lipid metabolites and egg quality in Leghorn laying hens. A total of 168 white Leghorn hens (Bovans) at 32 weeks of age were randomly distributed among 7 replicates of each of 4 dietary treatments (6 hens per cage). Dietary treatments included different levels of garlic powder (0, 0.2, 0.4, or 0.8% of diet). The experimental diets were fed for a 70 d recording period, commenced after a 10 d adaptation period. Results showed that dietary supplementation of garlic powder decreased ( $P < 0.01$ ) serum cholesterol level, with the lowest concentration assigned to the hens supplemented with 0.8% garlic powder. Moreover, supplemental garlic at the levels of 0.4 and 0.8% of diet decreased ( $P < 0.05$ ) serum concentration of low-density lipoproteins. Interestingly, dietary supplementation of garlic powder (0.4 and 0.8% of diet) resulted in a marked ( $P < 0.001$ ) decrease in yolk cholesterol content, while it increased ( $P < 0.05$ ) yolk triglyceride concentration. Supplemental garlic powder decreased ( $P < 0.01$ ) malondialdehyde (MDA) content of egg yolk, with the lowest MDA value allotted to the hens supplemented with 0.4% garlic powder. From the present findings, it can be concluded that dietary supplementation with 0.4% garlic powder could increase egg oxidative stability and decrease yolk cholesterol content.

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## ANTIBACTERIAL EFFECTS OF SOY GENISTEIN IN A CHICK MODEL

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The present study was conducted to investigate the comparative effect of an isoflavone (genistein) and antibiotics on intestinal microflora and jejunal morphology in broiler chicks. A total of 675 one-day-old male Ross 308 broiler chicks were randomly distributed among the 5 pen replicates of 9 experimental diets. Dietary treatments included a negative control diet, 2 positive controls (virginiamycin or zinc-bacitracin, 20 mg/kg), and diets supplemented with 10, 20, 40, 80, 160, or 320 mg/kg of genistein. At d 28 of age, 3 randomly-selected chicks from each pen were euthanized to measure ileal bacterial counts and jejunal morphology. Results showed that dietary supplementation of both antibiotics diminished ileal *Salmonella* ( $P < 0.001$ ) and *Escherichia coli* ( $P < 0.01$ ) counts compared with control birds. Similarly, supplemental genistein at the levels of 20 to 320 mg/kg reduced ( $P < 0.01$ ) *Salmonella* enumeration. *Escherichia coli* count was also reduced ( $P < 0.01$ ) as the result of dietary genistein supplementation. The greatest ( $P < 0.01$ ) villi height (VH) was assigned to the birds fed antibiotics-diets, followed by those fed 40 mg/kg genistein-supplemented diet. Feeding genistein supplemented-diets (at the levels of 20 to 80 mg/kg) decreased ( $P < 0.05$ ) crypt depth (CD), consequently increased ( $P < 0.01$ ) VH to CD ratio. The present results indicate that supplementation of 20 to 80 mg/kg of genistein to broiler diets could beneficially affect intestinal microflora, with lowering pathogenic bacteria within the gut.

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**QUALITATIVE AND QUANTITATIVE CHANGES OF ESSENTIAL OILS OF TWO AND FIVE YEARS OLD *ARTEMISIA ABSINTHIUM* PLANTS AT DIFFERENT STAGES OF PLANT GROWTH**

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*Artemisia absinthium* L. (Wormwood) is an important perennial shrubby plant that belongs to the family *Asteraceae*. These plants are mainly found in the northern and eastern regions of Iran and have several therapeutic effects. In this research, quantitative and qualitative changes in the essential oils of *Artemisia absinthium* at phenological stages (vegetative, early flowering and full flowering) and at two ages (two years old and five years old) were studied. Also the effects of the above factors on the presence of alpha- and beta-thujone compounds in the essential oils were studied. The collected plant materials were dried in shadow, and the essential oils were prepared by hydro distillation method. The component identification was achieved by the GC and GC-MS analysis. The essential oil yield of two and five years old was 0.37 % and 0.33 %, respectively. A total of 40 compounds were detected in the plant that (Z)- $\beta$ -ocimene oxide was highest. Also results indicated that *Artemisia absinthium* at both age was free of alpha- and beta-thujone compounds. Important and common compounds, including (E)- $\beta$ -ocimene oxide, sabinene,  $\beta$ -myrcene and geranyl isovalerate have been identified in both age of *Artemisia absinthium* plants.



**EFFECT OF DRINKING ADMINISTRATION OF MARIGOLD ON  
IMMUNOCOMPETENCE AND SENSORY CHARACTERISTICS OF THIGH  
MEAT IN BROILER CHICKS**

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The present study was conducted to investigate the effect of administration of aqueous extract of marigold on immunological responses and carcass quality in broiler chickens. A total of 288 one-day-old broiler chicks (mix-sexed) were randomly assigned into the 4 experimental groups (with 6 pen replicates of 12 birds each) based on a completely randomized design. Experimental treatments consisted of the graded levels (0, 1, 2, and 4%, vol:vol) of aqueous extract of marigold in drinking water. Antibody responses to different antigens were assessed after the related immunostimulations. In addition, 4 birds per replicate were slaughtered at the final day to evaluate sensory characteristics of thigh meat. Results showed that inclusion of marigold extract in drinking water had no marked effects on body weight gain and feed intake throughout the trial period. However, feed conversion ratio ( $P < 0.01$ ) was improved as the result of administration of 2% marigold extract during the grower period. Inclusion of marigold extract at the levels of 1 and 2% increased antibody responses to Newcastle disease virus ( $P < 0.05$ ) and sheep red blood cells ( $P < 0.01$ ). Administration of marigold extract in drinking water increased yellowness ( $P < 0.01$ ) and redness ( $P < 0.05$ ) of thigh muscle. On the other hand, drip loss and shear force were lower ( $P < 0.01$ ) in thigh muscle of birds supplemented with 2% marigold extract. The present findings indicate that marigold extract could improve sensory characteristics and stability of carcass in broiler chicks.

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**OREGANO EXTRACT COULD IMPROVE IMMUNOLOGICAL RESPONSES AND  
INTESTINAL BACTERIAL BALANCE IN BROILER CHICKS**

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The present trial was conducted to investigate the effect of dietary supplementation of oregano (*Origanum vulgare L.*) extract on immune functions and ileal microflora in broiler chickens. A total of 300 day-old Ross 308 broiler chicks were randomly allocated into the 5 dietary treatments with 5 replicates of 12 birds each. Experimental diets included a control group (without any feed additive) and groups supplemented with 250, 500, 750, or 1000 mg/kg of oregano extract. Trial lasted for 42 days. At the final day, 3 randomly-selected birds from each replicate were slaughtered to collect ileal digesta for bacterial examinations. Results showed that dietary supplementation with oregano extract at the levels of 500 and 750 mg/kg increased antibody responses against avian influenza ( $P < 0.01$ ), Newcastle ( $P < 0.05$ ), and infectious bronchitis ( $P < 0.001$ ) disease viruses. Antibody production titer against infectious bursal disease, however, wasn't influenced by supplemental oregano extract. All supplemental levels of oregano extract affected bacterial populations within the intestinal tract. *Salmonella* and *Escherichia coli* counts were linearly ( $P < 0.05$ ) decreased as the results of dietary supplementation of oregano extract. On the other hand, Lactobacillus enumeration was increased ( $P < 0.01$ ) as the result of dietary supplementation with 250 mg/kg of oregano extract. It seems that oregano extract at the levels of 250 and 500 mg/kg of diet could improve immune responses against different viral diseases.

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**IDENTIFICATION OF CHEMICAL COMPOUNDS IN  
*VITIS VINIFERA* EXTRACTS**

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Coneventional antineoplastic drugs are being used for the treatment of different kinds of tumors but these therapeutics have a number of serious side effects. These challenges have led the researchers to discover new therapeutic approaches. In modern science, the use of herbal medicine with fewer side effects has always been a right choice. Iranian traditional medicine approach with its brilliant history can be a useful developments in this field to create more effective and less hazardous therapeutic agents. The fields of anticancer herbal medicine or antineoplastic medicinal plants demands extensive research and collaboration among researcher, practitioners of traditional medicine and pharmacists in this field. Due to the abundance of antioxidant compounds such as phenolic compounds and flavonoids in black grape extract (*Vitis vinifera*), it can be used to make effective drugs with fewer side effects than chemotherapeutic agents. These novel herbal medicinal agents can be used to cure cancer. In this study, we extracted the fruit of black grape (*Vitis vinifera*) via Soxhlet extraction technique with two different solvents (acetic acid and chloroform). The resultant extract was characterized via different techniques for the presence of different bioactive chemical compounds. Because grape extracts are a convenient alimentary source of salutary phytochemicals to supplement currently prevalent occidental food and the resveratrol appears to be especially useful. The amount of extracted resveratrol could conveniently be increased in bio-significant amounts based on the type of extraction procedure and the solvent used.

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## SCREENING OF PHYTOCHEMICAL CONTENTS OF EPHEDRA INTERMEDIA

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*Ephedra* genus belongs to the Ephedraceae Dum family. The genus consist of over 60 species. *Ephedra* plants are known as non-flowering ones. The plants are used to treat of allergies, bronchial asthma, chills, colds, coughs, edema, fever, flu, headaches, and nasal in Chinese traditional medicine [1]. *Ephedra* species are well known as natural source for *Ephedrin* alkaloids such as ephedrine, pseudoephedrine, norpseudoephedrine [2]. This study focus on screening of phytochemical contents of the methanolic extract of stem from *Ephedra intermedia*. The plant was collected at April 2016 from north of Sabzevar. The plant part was dried and macerated in methanol for 72 h. The extract was fractionated by two solvents with different polarity including n-hexane and ethyl acetate. The fractions were concerted under low pressure. Finally, reagents of: 1) aqueous FeCl<sub>3</sub> (1%), 2) ethanolic AlCl<sub>3</sub> (1%), 3) ethanolic KOH (5%), and 4) Wagner reagent were sprayed on the TLC profile of different extracts to identify phenolic, flavonoid, anthraquinone, and alkaloids compounds respectively. The presences of the compounds were recognized by changing in colors with the following observations: blue or green spots for phenolic; yellow spots for flavonoid, orange or red spots for anthraquinones, and brown precipitate for alkaloids compounds. The results are summarized in the following Table.

Fraction Name	Phenolic compounds	Flavonoid compounds	Alkaloid compounds	Anthraquinone compounds
n- Hexane	-	+	+	-
Methanol	-	-	+	-

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**ANTIMICROBIAL ACTIVITY OF METHANOLIC EXTRACTS OF  
*EPHEDRA INTERMEDIA***

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*Ephedra* plants are known as medicinal plants in different regions around the world. The plants are used to cure different diseases such as fever, cough in China, east of Europe, and central of America [1]. The genus belongs to Ephedraceae family. *Ephedra* is a genus of non-flowering seed plants. The antimicrobial activity of *E.procera*, *E.pachyclada* and *E. strobilacea* extracts was evaluated with antibiotic susceptible and resistant microorganisms. The plant shows significant antimicrobial activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Klebsiella pneumoniae* [2]. In this research, we evaluated the antibacterial activity of methanolic extract of *Ephedra intermedia*. using disc diffusion assay. The plant of *Ephedra intermedia* was collected from north of Sabzevar at April 2016. The plant part was dried and macerated in methanol for 72 h. A sterile cotton swab was dipped in bacterial suspension and used to inoculate on the surface of Mueller-Hinton agar plates. Sterile paper discs (6 mm in diameter) were impregnated with 1  $\mu$ L of extract (30mg/mL) and placed on the inoculated agar. The plates were incubated at 37.5 °C for 24 h. Antibacterial activity was determined by measuring the diameter of inhibition zone (in mm) produced by the extract against four Gram-negative and three Gram-positive bacteria. The extract inhibited the growth of Gram-positive bacteria including *Staphylococcus coagulase* (10mm), *Staphylococcus aureus* (7mm), and *Enterococcus faecalis* (10mm) and Gram-negative bacteria including *Klebsiella pneumoniae* (13mm) and *Proteus vulgaris* (10mm). The extract was unable to prevent Gram-negative bacteria of *Pseudomonas aeruginosa* and *Escherichia coli*.

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## INHIBITORY KINETICS AND MECHANISM OF CURCUMIN ON CATALASE

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Curcumin is an antioxidant widely used in various food products, coloring agent in foods and cosmetics. In this work, we have investigated the effects of curcumin on the structure and function of catalase by different spectroscopic and theoretical methods. UV-vis absorption, fluorescence spectroscopy, synchronous fluorescence and circular dichroism (CD) studies revealed conformational changes in the structure and the heme group of BLC in the presence of different concentrations of curcumin. Kinetic studies showed that curcumin can inhibit BLC activity in a competitive manner with  $IC_{50}$  of 0.92  $\mu$ M. The fluorescence quenching data show that static type of quenching mechanism mostly is involved in the quenching of intrinsic emission of the enzyme. Thermodynamic data suggested that hydrophobic interactions play a major role in the binding reaction of curcumin on BLC. The molecular docking study indicated that curcumin interacts with active site area close to the heme position of catalase.

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**EFFECT OF DIFFERENT PEG CONCENTRATIONS ON GERMINATION OF  
CHIA (*SALVIA HISPANICA*) PLANT**

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The effect of drought stress on germination of chia seeds was studied by conducting an experiment on the basis of completely randomized design (CRD) with three replications under laboratory condition. Drought stress induced by Poly Ethylene Glycol (PEG) 6000 at four levels of osmotic potential including 0 (control), -6, -8 and -10 bar. Results showed that G.R. (Germination Rate) and G.P. (Germination Percentage) decreased by enhancing stress levels. Significant difference was observed among G.R. means at different stress levels. G.P. in -6 bar potential was more than control, therefore it can be concluded that drought stress by -6 bar improved germination characteristics. In general, results indicated the negative effects of drought stress on chia germination.





**EFFECT OF VERMICOMPOST FERTILIZER ON SOME QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF PEPPERMINT (*MENTHA PIPERITA* L.)**

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Peppermint (*Mentha piperita* L.) is one of the most important plants producing essential oil which is used widely in terms of pharmaceutical, food and health. An experiment was carried out using a randomized complete block design with 4 replications to study the effect of vermicompost fertilizer on growth parameters and essential oil percent of peppermint. 4 levels of vermicompost fertilizer containing 0, 5, 10 and 20 percent by weight growth media used in a greenhouse. The results showed that vermicompost fertilizer significantly affected plant height, stem and root diameter, number of nodes on the main stem of the plant, number of lateral branches per plant, leaf area, shoot wet and shoot dry weight, leaf chlorophyll and essential oil. Overall results showed that application of vermicompost can have useful role in shoot growth and yield characteristics and quality of medicinal characteristics in peppermint.

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**PREPARATION AND PHYSICOCHEMICAL EVALUATION OF STABLE  
HERBAL GEL FROM *MALVA SYLVESTRIS* AND IN VITRO  
RAT SKIN ABSORPTION**

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*Malva Sylvestris* (Malvaceae) which is native to Europe, North Africa and South-west Asia, commonly used as vegetable and a medicinal plant in Iran. The plant leaves and flowers are used as a remedy for cut wound, eczema, dermal infected wounds, and skin local inflammations from long time ago [1]. The aim of this research was to develop gel formulation of *M. Sylvestris* for topical delivery in skin ulcers and inflammations. Leaves of *M. Sylvestris* were collected, dried and hydroalcoholic extract was achieved using maceration method with ethanol:water (80:20) for 72 hrs. The extract was then concentrated and total phenolic and flavonoids compounds was detected using spectrophotometric method using Folin ciocaltue reagent and Quercetin as standard [2,3]. Total phenolic and flavonoids contents of extract was  $4.7 \pm 0.1$  and  $1.9 \pm 0.1$  mg Quercetin/g respectively. Thengel base was prepared from Carbomer which had better sustainability compared to Na CMC and Methyl Cellulose after loading extract. Carbomer base was mixed with 1, 5 and 10 percents of extract and the base containing 10% extract had acceptable phenolic and flavonoids compounds comparison to pure extract. Then the percentage of glycerin was increased from 2% to 40 % to improve phenolic and flavonoids contents release. The best formulation (F9) consisted of Carbomer (3%), *M. Sylvestris* extract (10%) Triethanolamine (q.s.) and water (q.s.) with thixotropy. The release profile of extract in F9 was evaluated using franz diffusion cell and rat skin absorption detecting phenolic and flavonoids contents. the stability studies were performed and the results showed stable gel after 3 months.

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**EVALUATION OF SEDATIVE-HYPNOTIC EFFECTS OF  
*ASTRAGALUS FASCICULIFOLIUS* AQUEOUS EXTRACT IN MICE**

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Insomnia is one of the most common sleep disorders in human. It causes problems in daily activities and increases the risk of major depression. Therefore, appropriate and persistent treatment of insomnia is very important in medical field. Benzodiazepines are the common treatment for insomnia but they show several side effects including negative effects on learning and memory. It seems that new medications with fewer side effects are needed for treatment of sleep disorders. Nowadays, using medicinal plants has increased because they may have less undesirable effects compared to other medicines. This study was designed to evaluate the effect of the aqueous extract of *Astragalus fasciculifolius* on sleeping time in mice. In this study the effect of the aqueous extract was evaluated using experimental set up. Male mice in the range of 18-25 g of weight were used in this study. Pentobarbital induced loss of righting reflex test was used to evaluate the hypnotic effect of the extract. Open field test, was used to evaluate the locomotor activity of the mice in all groups. *Astragalus fasciculifolius* (100, 200, and 400 mg/kg i.p.) increased the sleeping time, and showed significant hypnotic effect compared to the control group in the righting reflex test. In the open field test, the extract at dose of 100, 200, and 400 mg/kg decreased the total distance moved. The results indicate that the aqueous extract of *Astragalus fasciculifolius* has sedative-hypnotic effects. Further works are needed to elucidate the active component of the extract and exact mechanism of these effect, the toxicological profile and active components of extract.

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**HIGH ANTI- FIBRILLATION ACTIVITY AGAINST  $\alpha$ -SYNUCLEIN HAS BEEN DETERMINED IN CHAMOMILE**

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Neurodegenerative disorders including Parkinson's disease (PD) a scoreless and prevalence diseases represent growing socio-economic problems particularly with increase human longevity. It is believed that  $\alpha$ -synuclein ( $\alpha$ -SN) has a pivotal role in the pathogenesis of PD [1]. During amyloid fibrillation (AF),  $\alpha$ -SN self-assembles and products deferent toxic aggregated species including oligomers, protofilaments and finally fibrils that are detected in postmortem of PD patients [2].  $\alpha$ -SN-AF causes bio-membranes permeable, increases mitophagy and ROS production and finally enhances neurodegeneration. Impediment of  $\alpha$ -SN-AF can protect neurons against neurotoxic aggregates and inhibit disorder progression through brain. Small molecules such as polyphenols are excellent compounds that inhibit  $\alpha$ -SN-AF as well as protect neurons versus  $\alpha$ -SN pre-formed toxic aggregates. There is a specific focus on medicinal herbs as treasures of small molecules. Chamomile is a common name for a large plant family, Asteraceae family. Popular uses and benefits of chamomile as a traditional medicine therapy includes anodyne, anti-allergy, anti-inflammatory, brain disorders, and migraine relief. However, there is no report about the anti-Parkinsonism effect of Chamomile. According to our studies on small molecules as  $\alpha$ -SN-AF/neurotoxicity remediation compounds, via using a two-step extraction method we achieved an effective fraction. Briefly, at first, different organic solvents were used in a two-phase system. The obtained extractions were applied on the test tubes with 70  $\mu$ M  $\alpha$ -SN in 50 mM PBS, pH: 7.2 and the samples were incubation at 37°C.  $\alpha$ -SN-AF was verified via ThT fluorescence, Congo red absorbance, and AFM assays. It was revealed that two extractions possessed significant inhibitory against  $\alpha$ -SN-AF. To find the best extraction with no-neurotoxicity effect both extractions were fractionated by chromatography. Finally one fraction was determined with high inhibitory effect on  $\alpha$ -SN-AF without any cytotoxicity. GC-MS and FTIR studies revealed that a terpinoid may be an effective compound in this study.

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**EVULATION OF DIFFERENCES BETWEEN ESSENTIAL OIL DERIVED FROM AROMATIC WATER OF THREE THYME SPECIES**

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*Thymus vulgaris*, *Thymus daenensis* and *Thymus kotschyanus*, which is known as "avishan" in Persian, are perennial and aromatic plants belonging to the Lamiaceae (Labiatae) family [1]. Essential oil of the dry herb has been used for treating heart diseases, pain killing, disinfection, antispasmodic, liver and digestive problems, and promoting awareness. Several techniques have been used for extraction of the essential oil from different parts of the aromatic plants [2]. In this study, the essential oil of the aromatic water of three thyme species cultivated in Semnan Province were extracted by n-pentene and were analyzed by GC-MS. About thirty constituents were found representing approximately 90% of different essential oils. The main components of the essential oil extracted from aromatic waters were *p*-cymene (3.08-22.85 %),  $\gamma$ -terpinene (2.65-10.50 %), thymol (9.02-56.82 %) and carvacrol (3.42-8.65 %).  $\alpha$ -Terpinyl acetate was the main constituent of *Thymus kotschyanus* whereas it was not found in the other two species [3].

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**EFFECT OF DIFFERENT DRYING METHODS ON ESSENTIAL OIL CONTENT  
AND COMPOSITION OF *TEUCRIUM POLIUM***

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*Teucrium polium* L. (family Lamiaceae) is a valuable medicinal plants which is used for treating many diseases such as abdominal pain, indigestion, common cold and type 2 diabetes in traditional Iranian medicine (TIM). Because drying methods has many effect on the essential oil content and composition of medicinal plants, this study was done to assess the changes in essential oil content and constitutes of *T. polium* aerial part under various drying methods. The drying methods were: the freshly harvested plant, sun-drying, shade-drying, oven-drying at 35, 45, and 55 °C. The essential oil content was extracted by Clevenger-type apparatus and its components were analyzed with GC/MS and GC. The result showed that the different drying methods had a significant effect on the essential oil content and constituents. In general, the shade-drying was the best drying method for *T. polium* in respect of quality and quantity of essential oil.

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**DESIGN AND FORMULATION OF EDIBLE POLYMERIC FILM CONTAINING  
*SATUREJA KHUZESTANICA* ESSENTIAL OIL NANOEMULSION**

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Edible packaging has been long recognised as a useful mean to improve product stability, quality and safety [1]. Many essential oils deliver antimicrobial properties against food pathogens in edible films in an effort to replace synthetic preservatives. Among different approaches for using essential oil in edible films, nano-formulations may provide many advantages, including homogenous and clear films, long time antibacterial activity and improved mechanical properties. A number of studies have shown the possibility of using essential oils and/or some of their components in food systems to prevent the growth of foodborne bacteria and to extend the shelf life of the food. In this study we utilized *Satureja Khuzestanica* essential oil (SKEO) containing 85% carvacrol as a bioactive monoterpenoid for delivering one or more antimicrobial agents. Oil in water nanoemulsions containing PVA were prepared by ultrasonication method and then characterized by particle size analysis (Nanophox, DLS). HPMC was used as a packaging polymer and loaded with SKEO nanoemulsion in different concentrations with an optimum percent of PEG as a plasticizer. Finally 1.25%, 2.5%, 3.75%, 5% and 7.5% essential oil were loaded in edible films and their antimicrobial activity against *E. coli* (ATCC 25922), *Salmonella typhi* (PTCC1609), *Shigella flexneri* (PTCC 1234) and *S. aureus* (ATCC25923) were studied by disk diffusion method. Our results showed that nanoemulsions containing 10% and 20% essential oil had a mean particle diameter of  $329.16 \pm 0.47$  nm and  $332.72 \pm 10.97$  nm, respectively. Film formation solutions were prepared by using 0.5% PEG, different polymer and essential oil concentrations. Antimicrobial activity of edible films against *S. aureus* was higher than other strains with zone of inhibitions 37 mm (5% SKEO) and 41.7 mm (7.5% SKEO) for 6 mm disks. Overall this study showed that increasing essential oil concentration could improve antimicrobial activity.

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**EFFECT OF ESSENTIAL OILS OF THREE PLANT SPECIES IN CONTROLLING OF GRAPE FRUIT ROT FUNGI IN VITRO**

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One of the most recent methods for plant diseases management is to protect the plants from pathogenic microorganism via application of essential oil based compounds. In this study, at first, some post-harvest pathogenic fungi of grape were isolated in Arak and *Botrytis cinerea* was identified as the dominant species. To evaluate the antifungal effect of essential oils, effect of different concentrations of essential oils of plants including: thyme oil (*Zataria multiflora*, 10 to 350 ppm), pennyroyal oil (*Mentha pulegium*, 75 to 1000 ppm), cumin oil (*Cuminum cyminum*, 75 to 500 ppm), on radial growth of *B.cinerea*. Experiments were performed using the macro dilution causal agents method and the minimum inhibitory concentration (MIC) was determined. The results showed that the thyme and cumin were able to prevent the growth of the pathogen *in vitro* at very low concentration (125 and 350 ppm), with 100% inhibition of radial growth of the fungus. In all essential oils, with increasing concentration, the inhibition on mycelial growth of fungi increases. The lowest MIC belonged to thyme and cumin, and mentha respectively. As a result these products can be used to make suitable formulations as natural fungicides that can be replaced with synthetic fungicides [1,2].

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## CLOVES, THE FORGOTTEN FOOD SEASONING; COMPARATIVE STUDY OF TRADITIONAL AND CONVENTIONAL MEDICINE

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Clove that its scientific name is *Syzygium aromaticum* or *Eugenia caryophyllata* has several properties including antimicrobial, anti-thrombotic, anti-viral, analgesic, anti-inflammatory, hepatoprotective, neuroprotective and anti-mutagenic effects. From the perspective of traditional medicine, cloves, promotes the function of the heart, liver, brain, stomach and kidney. Clove has been used in the past as a food seasoning. In some past period, clove, sometimes is bought and sold at the price of gold. The study was performed as a Libraries; with a search of key words including clove, qaranfol, abazir, tavabel, afavieh, stuffing (chashni) in authentic books of traditional medicine (Qanon of medicine, Makhzan-al-advieh, Tohfe-al-Moemenin, Alabnieh an haghayegh-al-advieh, Al-Shamel fi-al-Tebb, Al-Aghraz-al-tebbieh written by Wise Sayyed Esmail Jurjani), PDR and scientific information Database (SID) as well as clove and seasoning in PubMed and Google Scholar. Clove was used as food seasoning, rectifier of food disadvantages, food flavoring and for relieving cold nature from foods and also increasing the digestibility of the food in past centuries. These benefits of cloves have been proven in today's papers and documents. Today's lifestyle is such that the risk of heart and liver diseases (fatty liver) is too much. Adding clove as a seasoning for foods and as spices commonly used in the past decades; because of beneficial effects to relieve heart and hepatic diseases, were an important scheme. Clove bud with standard dose and low levels can be used as spice and to boost function of the heart and liver.

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SCREENING FOR NOVEL ANTITYROSINASE COMPOUND OF TRADITIONAL  
IRANIAN MEDICINE PLANTS

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Tyrosinase is a multi-copper enzyme widely distributed in different organisms, including plants & mammals, etc., which is responsible for pigmentations, undesired browning of fruits and vegetables. It is known to be a key enzyme in melanin biosynthesis, involved in determining the color of mammalian skin and hair. Various dermatological disorders, such as melasma, age spots and sites of actinic damage, arise from the accumulation of an excessive level of epidermal pigmentation. In addition, unfavorable enzymatic browning of plant-derived foods by tyrosinase causes a decrease in nutritional quality and economic loss of food products. Traditional depigmenting agents, such as hydroquinone, corticosteroids, and kojic acid, although highly effective, can raise several safety concerns with long-term exposure. An understanding of the benefits of natural and botanical extracts provides opportunities to develop new products to address pigmentation problems [1]. In this study we aimed to screen 52 extracts from traditional Iranian medicines which have not been investigated for their skin-whitening mechanisms. First of all, plant powders were extracted with 5ml HPLC ethanol solution at 28°C for 48h. Extraction was carried out under shaking (150 rpm). The samples centrifuged then meth filtrate extract was completely dried at 40°C and then re-dissolved with DMSO. Enzyme assay was performed using relevant methods [2] with some modification, each powdered plant extract was dissolved in dimethyl sulphoxide (DMSO) to a final concentration. Kojic acid was used as a control drug. Use L-DOPA as substrate and potassium phosphate buffer, From the screening assays we identified three medicinal herbs (fruit of *Rosa canina* by 78% inhibition, *Epilobium hirsutum* by 58% inhibition and *Achillea millefolium* by 54% inhibition Whereas, kojic acid had 84% inhibition) were further examined by testing 3 various extract include hexane, Ethyl acetate and methanol extract by sonication each one for 15 minutes, methanolic extract of *Rosa canina* showed best inhibitor for antityrosinase activity.

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**DEVELOPMENT OF MALDI-TOF METABOLOMICS FOR IRANIAN SAFFRON  
AND ITS GEOGRAPHICAL CLASSIFICATION**

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Saffron quality control and its geographical quality effects is the main concern behind it. There are growing method developments and studies for this concern. Previously developed HPLC-DAD and a newly qualified MALDI-TOF was applied for 40 samples of saffron from different regions of Iran. Crocins, Crocetin, Safranal and picrocrocins are the main constituents of Saffron in which they have responsibility for colour, odor and bitter taste respectively [1]. In this study firstly we developed matrix assisted laser desorption/ionization (MALDI)-time of flight (TOF) mass spectrometry for maximum of ionization for each saffron constituent. Secondly and according to International Committee of Harmonization (ICH) regulation for the validation of analytical methods, parameters including linearity, purity of the separated band, precision, replication, limit of detection (LOD) and limit of quantification (LOQ) were determined [2]. Our results show an exact amount of Crocins, Picrocrocin and Safranal of  $21.29 \pm 8.81$ ,  $11.75 \pm 2.59$ ,  $0.46 \pm 0.30$  respectively. Finally this work is introducing MALDI-TOF as a specific, sensitive, reliable and very fast method of saffron quality control.

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**EFFECT OF VARIOUS TREATMENTS ON SEED GERMINATION AND  
BREAKING SEED DORMANCY IN MEDICINAL HERB  
*KELUSSIA ODORATISSIMA* MOZAFF**

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*Kelussia odoratissima* Mozaff. belonging to the *Apiaceae* family, is well known for its medicinal and nutritional importance, endemic to Iran. Due to the relatively high time required for the establishment and seed production, it has been announced as an endangered species. Dormancy is a major problem present in *Kelussia odoratissima* seeds leading to low germination percentage; thus, improvement of seed germination percentage and breaking seed dormancy is important. To evaluate the effects of different treatments on seed germination of *Kelussia odoratissima*, we designed a set of comparative experiments. This study was done in a completely randomized design with six treatments and three replications. The following treatments were applied: fungal mycelium of *Piriformospora indica*, spore suspension of *P. indica*, gibberellic acid, the combination of gibberellic acid and fungal mycelium, the combination of gibberellic acid and spore suspension, and cold treatment. The results showed that gibberellic acid (80.55%) and spore suspension of *P. indica* (75%) were the most effective treatments for improvement of seed germination and germination velocity. The least coefficient of uniformity of germination (CUG) was seen in spore suspension of *P. indica* treatment. Among the treatments, spore suspension of *P. indica* treatment had the maximum index for the times for 10% germination ( $D_{10}$ ) and 90% germination ( $D_{90}$ ). Based on the current results, it seems that gibberellic acid and spore suspension of *P. indica* was more successful than cold treatment as a common method in breaking dormancy. The results will help to reduce germination time and domestication of medicinal herb *Kelussia odoratissima* Mozaff.

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**DETERMINATION OF GALLIC ACID IN TRADITIONAL MEDICINE  
FORMULATION BY VOLTAMMETRIC METHOD BASED ON A GLASSY  
CARBON ELECTRODE MODIFIED WITH MULTIWALLED  
CARBON NANOTUBES (GCE/MWCNT)**

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Gallic acid (GA) is a type of phenolic acid and plays an important role in human nutrition and possesses numerous biological properties [1]. Gallic acid, are also present as one of the main phenolic components of *Itrifal* with its individual constituents like *Emblica officinalis*, *Terminalia chebula* and *Terminalia bellerica* [2]. A new method using a glassy carbon electrode modified with multiwalled carbon nanotubes (GCE/MWCNT) was developed and validated for determination of GA. Voltammetric methods including cyclic voltammetry and differential pulse voltammetry were used. Cyclic voltammetry was used to investigate the redox properties of the GCE/MWCNT. The peak current increased linearly with the concentration of GA. The GCE/MWCNT was then successfully used to determine the concentration of GA in some traditional medicine formulation.

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**THE STUDY ON THE CHEMICAL COMPOSITION OF ESSENTIAL OILS  
(FLOWER, LEAF AND STEM), THE CONCENTRATION OF  
METAL IONS IN THE *CIRSIMUM ARVENSE* OF IRAN**

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*Cirsium arvense* is one of the herbal plants, which is classified in weeds family in agriculture. This plant is known as "kharlateh" or "kangar Sahraee" in Iran. In this study we investigated the chemical structure of essential oils in *C. arvense* through GC/Mass spectroscopy method. Each of the aerial parts of the plant such as flower, leaf and stem was investigated separately, and the following results were achieved: 19 compounds detected for the flower part (96.5%). The main compounds are  $\alpha$ -bisabolol (17.4%), hexacosane (12.6%),  $\delta$ -cadinene (9.7%). A The analysis for plant's leaf showed 12 compounds (99.7%), which include 3 main compounds:  $\alpha$ -bisabolol (34.8%),  $\delta$ -cadinene (20.7%) and  $\beta$ -selinene (15.6%). These results varied for the stem, so that 12 compounds (96.6%) were detected, including  $\alpha$ -bisabolol and  $\delta$ -cadinene with 45.8% and 23.8% respectively. Also the kind and quantity of in fact metal elements such as Cu, Mn, Ca, Fe and Pb in aerial parts were determined.



**THE EFFECTS OF HUMIC ACID ON ESSENTIAL OILS AND CERTAIN  
MORPHOLOGICAL PARAMETERS IN SUMMER SAVORY  
(*SATUREJA HORTENSIS* L.)**

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This study was conducted to examine the effects of different levels of humic acid In Summer Savory (*Satureja hortensis* L.) for determination of the levels elicitor and spray for achieving the most suitable quality and quantity of essential oils. The treatments consist: humic acid as spray in 4 levels (0, 200, 400 and 600 mg/lit). The parameters were measured, including: 1- morphological traits (leaf number per bush, high of bush, dry and wet weighs of aerial organs) and The essential oil of dried aerial parts of treated plants were isolated and analyzed with GC/MS. The results showed humic acid, applying was effective on essential oils and morphological traits, including: leaf number per bush, dry and wet weighs of aeial organs under humic acid treatment were significant 1% level. The main essential oil compounds were determined as carvacrol (56.26%) and  $\gamma$ -terpinene (33.28%) in control plants. Finally, it's recommended to use humic acid with 600 mg/lit for increase of quantity and quality.



**THE CORRECTION BETWEEN AMINO ACIDS, CARBOHYDRATES AND  
PHENOLIC COMPOUNDS WITH PHENYLETHANOID GLYCOSIDES  
BIOSYNTHETIC PATHWAY IN CELL CULTURE OF  
*SCROPHULARIA STRIATA* B.**

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*Scrophularia striata* Boiss. is a native medicinal plant in Iran which have phenylethanoid glycosides (PeGs). PeGs are a class of polyphenols found in some plants that have pharmaceutical effects as anti-inflammatories and anti-oxidants. Biosynthesis of these compounds is complex and expensive [1]. Biotechnological tools such as plant cell and tissue cultures are important for multiplication and genetic enhancement of the medicinal plants by adopting techniques such as *in-vitro* regeneration. It can also be harnessed for production of secondary metabolites using plants [2]. The present study, we optimized phenylethanoid glycoside production from shake flasks to bioreactor using a cell culture of *S. striata* and the relations between the biosynthesis of these compounds were investigated with the biosynthesis of amino acids, carbohydrates and phenolic compounds. The results showed that amino acid content in plant cell culture of *S. striata* was different in shake flasks and bioreactor while, acteoside content in bioreactor were 3 fold higher than in the shake-flask. Furthermore, phenylalanine and tyrosine content had a direct connection with acteoside accumulation. The pattern of consumption of carbohydrate in shake-flasks and bioreactor was almost the same. Rhamnose and sucrose content was reduced during cell growth and observed the glucose and caffeic acid content in cells has reverse correlation with acteoside. Furthermore, the results showed that the flavonoids do not product in the shake flask as same as in bioreactor. Therefore, we resulted that phenylalanine and tyrosine are precursor in PeGs biosynthetic pathways and have positive correlation with them and glucose have positive correlation with echinacoside while the negative correlation with acteoside.

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THE PHYTOCHEMICAL STUDY OF *CHENOPODIUMBOTRYS* L. INDIGENOUS  
OF SOUTH KHORASAN

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*Chenopodium botrys* L. has been found in Azerbaijan, Hamedan, Khorasan, Mazandaran, Sistan and Bluchestan and Tehran provinces of Iran [1]. This plant is an annual or biennial herb [2]. In this research, phytochemical properties, using ethanolic extract of the *Chenopodium botrys* L. From *Chenopodiaceae* family [3], is investigated. For this purpose, this plant was collected from Birjand in the different periods of time. All chemical reagents used in the experiment were purchased from various commercial suppliers and were of the highestpurity available. Reference compounds of gallic acid, 2,2-diphenyl-1-picryl-hydrazyl (DPPH), werepurchased from Sigma–Aldrich. Folin–Ciocalteu reagent and pvp were purchased frommerck. To study total phenolic compounds, flavonoids and flavonols, ethanolic extract of plant were done by Ultrasonic waves using 80% ethanol as a solvent, followed the extraction by different solvents. Total phenolic, flavonoid and anthocyanin contents were measured spectrophotometrically. The antioxidant capacity of the extract were assessed by DPPH (2,2-diphenyl-1- picrylhydrazyl) radical-scavenging activity. The extracts of *Chenopodium botrys* L. Contained significant amounts of phenols and flavonoids, which play a major regulatory role in oxidation.

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**RESEARCH AND INTRODUCE 5 ENDEMIC ANTICANCER MEDICINAL  
PLANTS IN IRAN**

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The abundant usage from medicinal plants and products show the place and role of this plants in modern communities. Identify plants for treatment (herbal remedy) the special disease and compatibility scientific name with original plants will be important. The main objective of this project is Introduced and identified medicinal plants which used in cancer remedy. Cancer should be noted that abnormalities in cell proliferation and differentiation speed that can occur in any tissue of the body and at any age [1,2]. Many people die of cancer Annually. The most important factors in causing cancer is, physical and chemical factors, genetic factors, viral, geographical area, feeding, the cultural and economic status. The most important plant families that have this property are Lamiaceae, Rosaceae Umbelliferae, Brassicaceae and Cruciferae. In this research, scientific name, propagation, botanical characteristics, chemical constituents of 5 endemic and effective medicinal plants in cancer have been studied.

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**IMPACT OF ZERO-VALENT IRON NANOPARTICLES ON SEED GERMINATION AND EARLY SEEDLING GROWTH OF *DATURA STRAMONIUM* L.**

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With the rapid development of nanotechnology, iron nanoparticles have been used widely in multiple industrial, commercial, and biomedical applications to benefit society. Because of their high reactivity and magnetic property, iron nanoparticles have also been suggested as high-efficiency remediation agents for environmental applications [1], but its impacts on plants are still not very clear. In this research, the influence of different concentrations (0, 50, 100, 200, 400 and 800 µg/mL) of zero-valent iron nanoparticles (nZVI) on seed germination parameters including germination percentage (GP %), mean germination time (MGT), germination rate (GR), germination index (GI) and seedling vigor index (SVI) were evaluated under *in vitro* conditions. Results showed that significant ( $p < 0.05$ ) differences in examined traits were observed among the employed nZVI concentrations. The highest (92.4%) and the lowest (56.8%) GR were observed in seeds exposed to 50 and 800 µg/mL nZVI concentrations, respectively. The minimum MGT (2.25 day) was observed in seeds treated with 200 µg/mL nZVI concentration. Moreover, application of nZVI at high doses (400 and 800 µg/mL) significantly ( $p < 0.05$ ) diminished the root and shoot lengths by 46.8% and 52.3% in comparison to the control, respectively. Also, the highest GI value (6.14) was found at 100 µg/mL nZVI. Moreover, the highest SVI (752.3) was observed at 200 µg/mL of the reference treatment. In conclusion, application of appropriate levels of nZVI stimulates the seed germination attributes of *D. stramonium*. The mechanisms by which nanomaterials facilitate seed germination are not fully understood yet. However, it has been suggested that they can penetrate seed coats and create new pores, which subsequently allow the entry of water, oxygen, nutrients and external molecules in the germinating seeds. Such pores behave as scarification process at the microscopic scale. In another mechanism assumed that nanotubes affect the water channel (cell to cell path or aquaporins) in the seed coats [2].

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**COMPARATIVE STUDY OF PHENOLIC CONTENT IN THREE KINDS OF EXTRACTS BELONGS TO LEAVES AND STEM OF *SALVIA TEBESANA* BUNG**

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*Salvia tebsana* is an endemic plant of 'Khorasan' and a member of the family Lamiaceae. Due to the medicinal properties of other species of *Salvia* spp., it's probable that this species has high medicinal properties. These properties could be derived from its phenolic compounds. The objective of the present study was to compare the total phenolic content (TPC) of ethanol, methanol and aqueous extract of stems and leaves in *S. tebesana* in order to getting the best sample with the high internal phenolics. TPC was estimated spectrophotometrically using Folin Ciocalteu method in 765 nm wavelength. The gallic acid was used as the standard substance. The results showed the ethanol extract of leaves was the richest source of phenolics (TPC: 313.7 mg GAE/g) and the lowest phenolic content was in aqueous extract of stem (TPC: 117.2 mg GAE/g). Analyzed data showed that among three kinds of extract, the highest of phenolic content was significantly in ethanol extract. In conclusion, *S. tebesana* could be regarded as promising plant species for natural plant sources of antioxidants with high potential value for drug preparation [2].

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**THYME EFFECT ON PERFORMANCE AND SOME BLOOD PARAMETERS  
IN LAMBS OF DIFFERENT AGES**

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Since few studies have been done on the effects of thyme on ruminants [1, 2], this study aimed to investigate the effect of thyme on performance and some blood parameters were determined in lambs of different ages. This factorial experiment in a completely randomized design with two factors, each with two levels is the age and value of thyme was implemented. In this study, 20 male lambs Farahani for 4 groups of 5 animals at an average initial weight of  $35/02 \pm 20$  in two different age with an average of 5.5 months and a year were used. The study for 2 months in research stations Arak University Department of Animal Science. The treatments consisted of: 1- 5/5 month-old lamb diets, no powder, thyme, 2- diet containing 20 grams of dried thyme 5/5 months for lambs; 3- Annual lamb diets, lack of thyme powder; 4- Diet with 20 grams of dried thyme for lambs one year. The results showed that use of the herb thyme significant effect on growth performance and blood biochemical parameters were Farahani male lambs ( $p > 0/05$ ).

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## MEDICINAL SMOKES IMPROVED RETAIN PLACENTA IN DAIRY CATTLE

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In the cow, retention of the fetal membranes for more than six to eight hours post-partum is one of the commonest diseases in the postpartum period. It can lead not only to the persistence of putrefying tissue but also to reduced milk yield, an increased incidence and severity of endometritis and poorer fertility. Treatment should therefore be aimed at reducing these effects and removing the retained placenta (RP). The therapy of RP has been a controversial subject for many years. Manual removal of fetal membranes and an intra-uterine antibiotic treatment are common in veterinary practice. The aim of this study were use smoke of *Peganum harmala* L seeds and Donkey excrement on retain placenta in dairy cattle. Two dairy cattle were used in this study. In first cow was used mixed smoke of *Peganum harmala* L seeds and Donkey excrement and second cow was used smoke of *Peganum harmala* L seeds. Results showed that retained placenta in two dairy cattle were improved. In this work, the medicinal smokes containing effective ingredients could prevent the growth of infection and may be used as an available source for medicinal purposes.



**EFFECTS OF SMOKE OF PEGANUM HARMALA L SEEDS AND DONKEY EXCREMENT ON FMD IN CALFS**

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Foot and mouth disease (FMD) is a highly contagious viral disease of ruminant which causes fever and postule on mouth, hoof and teat [1, 2]. The disease is causing heavy economic losses to the dairy industry. The purpose of this paper is to study of the control of FMD infection in dairy calf on Markazi province (Farahan section) with smoke of Peganum harmala L seeds and Donkey excrement. In this study dairy calves divided to 3 group: Normal (healthy) calves (control), Calves in the early stages of the disease (G1) and Calves with advanced disease (G2). In G3 we used smoke of Peganum harmala L. seeds and Donkey excrement and Gentamicin and FlunixinMeglumin. In G2 and control used only smoke of Peganum harmala L seeds and Donkey excrement. Results showed that in tree group calves were improved.

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**EVALUATION OF VARIOUS DRYING METHODS ON CHEMICAL  
COMPOSITION OF MOUNTAINOUS CELERY  
(*KELUSSIA ODORATISSIMA MOZAFF.*)**

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Due to side effects of chemical drugs, special attention is given to pharmaceutical plants recently. Mountainous celery with scientific name of *Kelussia odoratissima Mozzaf.*, is one of the valuable pharmaceutical plants which is used in Iran seriously and is exposed to danger of extinction. This plant is indigenous of central Zagros Mountains (especially Chahar Mahal Bakhtiari province) and only has been observed in Iran [1]. First, in order to consider effect of four drying methods including shade, sun, 50 and 70 oven on the chemical constituents of this plant and discover its pharmaceutical characteristics, Delik ecotype have been harvested. The Delik ecotype contained Delik mountain and sample were in 200 meter transect. The extract (obtained by rotary) of mountainous celery were analysed by High performance liquid chromatography (HPLC) and the components was characterized. 9, 11, 9 and 8 compounds were identified in the samples of shade, sun, 50 and 70 oven, respectively, which indicated 50, 61, 50 and 44 percent of total extract. In the investigation confirmed flavonoides, antioxidant and phenolic compounds. Comparison of extract compositions showed the major compounds in drying methods in study were Catechin and Hesperedin. Catechin and Hesperedin type of natural phenol antioxidant [2]. Also the results of this research showed that drying-shadow method has the most rate of these two important substance in *Kelussia odoratissima* and is the best method of drying for extraction and essence-extracting.

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**EFFECT OF DRYING MEHTODS ON PHENOLIC AND ATIOXIDANT CONTENT OF MOUNTAINOUS CELERY (*KELUSSIA ODORATISSIMA MOZAFF.*) EXTRACT**

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*Kelussia odoratissima Mozaff.* is a plant belonging to the Apiaceae family which has got high nutrition and medicinal value and is extensively used for treatment several diseases [1]. Phenolic compounds are useful ingredients of of mountainous celery and usually exert high antioxidant activity. Antioxidants are compounds that protect the body against damage caused by oxidative stress [2]. This study evaluated the penolic and antioxiadant properties of mountainous celery in Zaravard ecotype (Yasuj). The aim of present study was to investigate the effect of drying mehtods (shade, sun, 50 , 70 oven) on total phenolic content and antioxidant activity of mountainous celery extract by using the Folin–Ciocalteau and DPPH reagents, respectively. Variance analyze results showed that twotraits of anti-oxidant and total phenol has statically significant difference. The drying methods 50 oven and sunhad the highest and lowest amount of total phenol respectively. Also, The drying methods 70 oven and shade (non-significnt with sun) had the highest and lowest amount of antioxidant respectively. The results of this study clearly show that the antioxidant activity of this plant directly related to the amount of phenolic compounds.

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**FUNCTIONAL BREAD FORMULATION WITH  
*ELAEAGNUS ANGUSTIFOLIA* FLOUR**

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Within the recent decades, remarkable changes are observed in perception of the role of foods in promotion of human health level. Food technology moves toward production of high quality foods with great nutritional value. Bread is the major important and highly-consumed bakery product. *Elaeagnus angustifolia* is a member of the Elaeagnaceae family which is used because of its well-known medical properties. The aim of this research was to evaluate the effect of addition *Elaeagnus angustifolia* fruit flour at different levels 2.5, 5, 7.5 and 10% on organoleptic and physicochemical characteristics of bread (LAVASH). Fruit was collected from the gardens around Sufian (a city in East Azerbaijan) from mid-September to October 15, and after several processes *E. angustifolia* flour was produced and used in the formula of raw material to bake Lavash Bread. The physicochemical and organoleptic properties of control and treated samples were investigated and measured using standard methods. There sultsrepresent that moisture and protein content of treated bread decreased while ash, acidity, glucose, fructose, total sugar, fat content and water activity had been increased compared to control bread. Organoleptic characteristics of treated bread were approved by the evaluators. The addition of this flour increased the sweetness of treated samples. According on the sensory evaluation and technological problems addition of *E. angustifolia* flour up to 7.5% was more acceptable.

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**THE IMPACT OF PROBIOTICS, PROPHYT AND PHYTOBIOTIC ON  
BIOCHEMICAL PARAMETERS AND IMMUNE SYSTEMS OF BROILERS**

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In this study, the effect of probiotics, prophyt and phytobiotic on biochemical parameters and immune system of broilers was investigated. Three hundred and thirty six day old broiler chicks (Ross 308) were distributed in a completely randomized design with 6 treatments, 4 replicates and 14 birds in each unit and reared for 42 days on floor system. The treatments consisted of 1) basal diet + probiotic Hayprozym, 2) basal diet + Bactocell, 3) basal diet + thyme + Hayprozym (Prophyt), 4) basal diet + thyme + licorice (phytobiotic), 5) and 6) basal diet + antibiotic. The experimental diets were fed from day one to day 42. Feed intake and body weight of chickens were measured weekly. At the end of the experiment period (day 42), two chicks from each replicate were euthanized and the concentration of blood parameters such as creatinine, AST, ALT and LDH were measured. To evaluate the humoral immunity, sheep red blood cells (SRBC) were injected intramuscularly in breast of broilers of the treatment groups, twice (28 and 35 days) and antibody titers were measured 7 days after each injection. Statistical analysis of the results showed significant difference ( $P \leq 0.05$ ) of serum cholesterol in Bactocell group compared to control group. Addition of Haprzymto basal diet significantly increased ( $P \leq 0.05$ ) the total protein and triglyceride levels compared to control group. Serum globulin was statistically significant higher ( $P \leq 0.05$ ) in treatments 1, 3 and 4 compared to control group. The highest antibody titer ( $P \leq 0.05$ ) was seen in Bactocell group compared to control group. In conclusion, it can be stated that the use of resources such as Hayprozym, Prophyt and phytobiotic can be introduced as antibiotics alternatives in poultry production.



**THE IMPACT OF PROBIOTICS, THYME AND LICORICE ON PERFORMANCE  
AND CARCASS CHARACTERISTICS OF BROILER CHICKENS**

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In this study the effect of probiotics, thyme and licorice on the performance of broilers was investigated. Three hundred and thirty six day old broiler chicks (Ross 308) were housed in a completely randomized design with 6 treatments, 4 replicates and 14 birds in each experimental and reared for 42 days on litter. The treatments consisted of 1) basal diet + probiotic Hayprozym, 2) basal diet + Bactocell, 3) basal diet + thyme + Hayprozym + licorice, 4) basal diet + thyme + licorice, 5) control and 6) basal diet + antibiotic. The experimental diets were fed from day one until end of the experiment (day 42). Feed intake and body weight of chickens were measured on a weekly bases. At the end of the experiment (day 42) two chicks from each replicate were sacrificed and carcass characteristics measured. Statistical analysis of data showed significant difference ( $P \leq 0.05$ ) of FCR in probiotic Hayprozym group ratio compared to the control group. Feed consumption was lowest ( $P \leq 0.05$ ) in treatment 1 compared to others. The treatments had no significant effect on carcass characteristics. The highest relative weight of gizzard was belonged to treatment 1 which was ( $P \leq 0.05$ ). The relative weight of bursa Fabricius in antibiotic supplemented group was significantly different with treatment 3 ( $P \leq 0.05$ ). In conclusion it can be stated that the use of resources such as Hayprozym and thyme and liquorice can be introduced antibiotic alternative in broiler production.



**EVALUATION OF ANTIFUNGAL ACTIVITY OF *FERULAGO ANGULATA*  
AERIAL PART ESSENTIAL OILS**

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The genus *Ferulago* belongs to Apiaceae family. *Ferulago* species are used in folk medicine for their sedative, tonic, digestive and anti-parasitic effects. Antibacterial and antifungal activities have been previously investigated in some *Ferulago* species. The *F. angulata* have two subspecies; subsp. *Angulata* (Schlecht) that is wide spread in Turkey, Iraq and Iran, and subsp. *Carduchorum* which is endemic to the Shahoo Mountains of west Iran. The aim of this study was to evaluate antifungal effects of essential oils obtained from aerial parts of *F. angulate*. The essential oil of the plants was extracted by distillation with water and Clevenger. Chemical composition of the essential oils was analyzed by the Gas Chromatography-mass spectrometry (GC-MS). The antifungal activity of essential oils was evaluated against *Aspergillus niger*, *penicillium expansum*, *beauveria bassiana*, *metarhizium anisopliae* and *is aria fumosorosea* by poisoning culture medium method. The ANOVA result showed that in lower concentrations of essential oil (200, 400, 600 and 800 ppm) mycelium growth or spore germination were not affected. But at higher concentrations (1000, 2000 and 3000 ppm), the essential oils have notable effects against mycelium growth and spore germination and there were statistically significant differences between control and treatment. At 3000 ppm, the mycelium growth and spore germination was completely inhibited.

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**STUDY OF SOME PHYTOCHEMICAL CHARACTERISTICS OF *SAMBUCUS EBULUS* FRUIT**

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Four species of the *Sambucus* genus are growing in Iran. Elderberry is one of the medicinal plants from genus of *sambucus* and Caprifoliaceae family with different medicinal properties that is widely found in Iran. *S. ebulus* has been prescribed in traditional medicines for the treatment of inflammatory reactions, such as hemorrhoid, bites and sore-throat. In addition, *S. ebulus* has recently been shown to have anti-inflammatory, antinociceptive, anti-cancer, anti-angiogenic and anti-oxidative activities. In this investigation some phytochemical properties of *S. ebulus* fruit were measured. After species identification, extraction of samples was conducted using ultrasonic in excess of 120 hertz (Elmasonic). Total phenolic content, total flavonoid content, total carotenoid and chlorophyll and Antioxidant capacity were determined by using Folin–Ciocalteu assays, Aluminium chloride method, Lichtentaler method, FRAP and DPPH assay, respectively. The evaluation of phytochemical compounds showed that total phenolic and flavonoid compound contents were 1.67 mg GAE/g DW and 0.096 mg QUE/g DW respectively. Chlorophyll a and b and total carotenoid contents in acetonic extract of *S. ebulus* fruits were 8.4, 6.48 and 561.73 mg/g DW respectively. In addition antioxidant activity in DPPH and FRAP assay were found 49.78% and 2.88  $\mu\text{mol Fe}^{++}/\text{g DW}$  respectively. These results showed that phytochemical characteristics of elderberry are promising sources of natural antioxidants and bioactive compounds beneficial to be used in the food or the pharmaceutical industries [1, 2].

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**MORPHOLOGICAL CHARACTERISTICS AND BIOCHEMICAL CONTENT OF  
*ROSA DAMASCENA* FRUIT FROM URMIA**

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*Rosa damascena* known as Gole Mohammadi in Iran is one of the most important species of Rosaceae family. This plant has several therapeutic effects such as treatment of menstrual bleeding, digestive problems, anti-inflammatory, the analgesic, anticonvulsant, antitussive, and bronchodilatory effects. This study carried out in order to evaluate some biochemical and morphological characteristics of *R. damascena* fruit in Northwest of Iran. Spectrophotometer used for determination of phytochemical content (such as total soluble carbohydrate, total anthocyanin, total flavonoid, total carotenoid,  $\beta$ -carotene, TA, pH, TSS, antioxidant activity by DPPH, total phenol, chlorophyll a and chlorophyll b) and measured morphological characteristics (such as fruit length, fruit diameter, fruit weight, fruit flesh weight, fruit color parameters, flesh weight to seed ratio, fruit length to diameter ratio, fruit flesh thickness, seed thousand weight and seed number) by carriage scales and digital caliper. The amount of total soluble carbohydrate, total anthocyanin, and total flavonoid were measured as 6.30 mg/g, 5.08 mg/L and 1.90 mg/g, respectively. The total carotenoid content,  $\beta$ -carotene, TA, pH, TSS were founded as 10.12  $\mu$ g/g, 0.86  $\mu$ g/g, 0.07%, 4.28 and 15 ( $^{\circ}$ Brix), respectively. The antioxidant activity, total phenol content, chlorophyll a and chlorophyll b were founded as 47.69 %, 6.66 mg/g, 0.04  $\mu$ g/g and 0.007  $\mu$ g/g, respectively. The mean of morphological (fruit length, fruit diameter, fruit weight and fruit flesh weight) and color parameters ( $a^*$ ,  $b^*$ ,  $L^*$ , hue and chroma) were measured as 19.48 mm, 9.12 mm, 0.85 g, 0.79 %, 29.39, 32.78, 14.28, 23.56 and 35.76, respectively. The amount of fruit flesh weight to seed ratio and fruit length to diameter ratio, fruit flesh thickness, seed thousand weight and seed number were measured as 12.13, 2.15 and 2.11 mm, 32.68 g and 1, respectively.

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## CYTOTOXIC EFFECTS OF CROCIN ON MCF7 CELL LINE

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Crocin (CRO) is a water soluble carotenoids which are found in the stigmas of *Crocus sativus* Linne and fruits of *Gardenia jasminoides* Ellis. This natural compound has several pharmacological actions including anti-inflammatory, antitumor activity, anti-hyperlipidemic, free radical scavenging, anti-atherosclerotic, antioxidant activity and protective action on DNA damage. Human breast adenocarcinoma MCF7 cell lines used to evaluate the antitumor activities of CRO. Cells were cultured in RPMI-1640 medium with 10% fetal-calf serum at 37 °C humidified with 10% CO<sub>2</sub> and then cells were seeded into 96-well plates at a starting density of 5000 cells/well and cultured overnight. The cells were then exposed to a series of concentrations of CRO (25, 50 and 100 µg/ml) and doxorubicin (0.1, 0.5, 1, 5, 10 µg/ml). Doxorubicin and RPMI-1640 was used as positive and negative controls respectively. At the end of study, MTT was added into the wells and incubated for 6 hours then absorbance was read using a 96-well plate ELISA reader at 550 nm. All experiments were run in 3 parallels. Results from MTT assay revealed that doxorubicin produced cell toxicity dose-dependently and CRO only at dose 100 µg/ml showed some toxicity. This experimental result indicates that CRO exhibited mild cytotoxic effects on MCF7 cell lines and may serve as a co-treatment agent in chemotherapy regimens.





**GREEN SYNTHESIS OF IRON NANOPARTICLES USING EXTRACT OF  
*MENTHA LONGIFOLIA***

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Nanoparticles with small particle size and high surface to volume ratio show new and unique properties [1]. Among green synthesis methods, the use of plant extracts for nanoparticles synthesis could be advantageous over other methods (2). *Mentha longifolia* is known to contain polyphenols that are as reducing and capping agent. The anti-oxidant compounds of *M. longifolia* can reduce iron (III) ions and produce zero-valent iron [3]. In this study, the important parameters (temperature, time, and salt: extract volume ratio) were investigated in order to achieve the optimum nanoparticle size. Water extract of *M. Longifolia* was prepared by percolation method and used to the synthesis of iron nanoparticles. The formation of yellow to the dark brown color indicated the formation of nanoparticles. Synthesized nanoparticles were characterized using the UV-visible spectrophotometer and scanning electron microscope (SEM) method. The particles that were synthesized, were so small as 29 nm. This fact was confirmed by SEM scanning image.

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THE VOLATILE CONSTITUENT ANALYSIS OF *PAEONIA WENDLBOI*  
FROM IRAN

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*Paeonia wendlboi* is a species of flowering plant in the genus *Paeonia*, in the family Paeoniaceae, native and wide spread throughout most of temperate Europe and Asia [1]. *Paeonia wendlboi* is an herbaceous permanent plant. There is some report in which some biological activity was appeared from essential oils of other species of this plant. Then analysis of essential oil of this plant could lead to introduction of new source. In this study we investigate essential oil composition of aerial parts (including Rhizome, Capsul and Leaves) of this plant. The essential oil was obtained by hydro-distillation method for 3 hours and their chemical components of essential oil were identified and then compared by GC/MS. Our results lead to identification of 40, 51, and 88 components in the essential oil obtained from leaves, Capsul and Rhizome respectively. They are constituting approximately more than 95% of the oil. Based on the GC/MS data, the main components of oil from leaves, Rhizome and Capsul were hexadecane, epi- $\alpha$ -Cadinol and  $\gamma$ -Terpinene.

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**BIOASSAY-GUIDED FRACTIONATION OF CYTOTOXIC CONSTITUENTS FROM  
*SALVIA SPINOSA* ROOTS**

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Bioassay-guided is a straight forward method for isolation and purification of bioactive compounds from natural sources. The bioassay-guided fractionation of the roots extract of *Salvia spinosa* resulted in isolation of its cytotoxic constituents against human cancer cells. The hexane, dichloromethane and ethyl acetate extracts of the air-dried roots of *S. spinosa* were tested against human breast adenocarcinoma (MCF-7) cell lines using MTT assay. Among the tested extracts, the dichloromethane extract with highest cytotoxic activity ( $IC_{50} = 18.97 \mu\text{g/ml}$ ) was selected for further isolation and purification by a combination of open column chromatography and preparative HPLC. Three active abietane diterpenoids: ferruginol, taxodone and taxodione with significant cytotoxicity against different human cancerous cell lines were isolated and their structures were elucidated by interpretation of their <sup>1</sup>H and <sup>13</sup>C NMR and EI-mass spectra.



**RELATIONSHIPS AMONG MORPHO-PHYSIOLOGICAL TRAITS OF BLACK CUMIN UNDER NORMAL AND DROUGHT STRESS CONDITIONS**

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Black cumin (*Nigella sativa* L.) is one of the important and valuable medicinal plants which are cultivated in different parts of Iran. Production and potential yield of black cumin can be affected by drought stress [1, 2]. In order to study the genetic relationships among morpho-physiological traits of 10 black cumin genotypes this research was conducted as two separate experiments (Drought stress and non-stress conditions) in Abadeh city of Fars Province in 2014. Each experiment carried out using randomized complete block design with three replications. Phenotypic and genotypic correlations were calculated for some important traits including oil and grain yields. Results showed that for the most of traits phenotypic coefficient correlations were so different from genotypic coefficient correlations indicating the high effects of environment factors on these traits. In normal condition grain yield showed positive and significant correlation with number of follicles per plant ( $r=0.368^*$ ), number of grains per follicle ( $r=0.423^*$ ), plant height ( $0.549^*$ ), number of lateral branches ( $r=0.90^{**}$ ), oil yield ( $r=0.863^{**}$ ) and negative and significant correlation with total soluble sugars ( $r=-0.604^{**}$ ). Also oil percentage content had positive and significant correlation coefficients with number of seeds per follicle ( $r=0.372^*$ ), plant height ( $0.413^*$ ), number of lateral branches ( $r=0.436^{**}$ ), oil yield ( $r=0.622^{**}$ ) and proline content ( $r=0.783^{**}$ ) but, its correlation with leaf potassium content ( $r=-0.929^{**}$ ) and total soluble sugars ( $r=-0.523^{**}$ ) was negative and significant. In drought stress condition grain yield had positive and significant correlations with all traits except for oil percentage and leaf potassium and proline content. Oil percentage content showed positive and significant correlations with all the measured traits except with number of grain per plant, 1000 grain weight and leaf potassium and proline content. Both grain yield and oil percentage showed negative and significant correlation with leaf proline content. These results can be used in indirect selection breeding programs. There was no significant correlation between grain yield and oil percentage content indicating that unlike with other plants breeding for improvement of grain yield and oil percentage can be done simultaneously.

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**DETERMINATION OF CROP COEFFICIENTS OF BASIL  
(*OCIMUM BASILICUM* L.) IN DIFFERENT STAGES OF GROWTH  
(CASE STUDY: BIRJAND)**

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To determine the crop coefficient is needed for different growth stage of crops and also estimation of evaporation and evapotranspiration of plant is important for development programs and efficient and awarded management four growth phase (initial, development, middle and final) of crop coefficient [1]. But determination of water requirements Basil as vegetable crop didn't studied in Birjand. so, in the event of increased accuracy daily estimates crop water requirement its necessary, crop coefficient and evapotranspiration daily estimated cause in this study, determine the crop coefficient based on growing stage and estimate daily evapotranspiration of basil, in arid areas of Birjand [2]. To experimented this test, an experiment was conducted during growth season in faculty of agriculture, university of Birjand by using three lysimeters with 14 cm diameter and 16 cm height; and cumulative water requirement was calculated using water balance method. To calculate potential evapotranspiration, grass (Japanese Tropical grass. *Zoysia* spp) with 8 cm height was used as the reference plant. Finally at the end of growth season, values of Basil crop coefficients at different growth stages including early stage, development stage, middle and final stages, were obtained 0.34, 0.47, 0.74 and 0.47, respectively. Using these values as Basil crop coefficients, estimation of water requirement and irrigation management will be possible for this plant.

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**FORMULATION DEVELOPMENT OF ANTIMICROBIAL MOUTH GEL FROM  
HYDRO-ALCOHOLIC EXTRACT OF *HYSSOPUS ANGUSTIFOLIUS* FOR ORAL  
THRUSH CANDIDIASIS**

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Oral thrush is a fungal infection in the mouth that is particularly common in babies and young children. It is usually harmless and easily treatable and caused by a yeast germ called *Candida albicans*. Two drug class include of azole (Miconazole) and Poly-N (Nystatin) are the main ways to control this infection, but related to drug-resistance and toxicity associated with long-term treatment with both antifungal drugs, search for new drugs to treat oral candidiasis is ongoing. Considering the increasing resistance of microorganisms to chemical synthetic drugs and their side effects, researchers are becoming interested in finding alternative herbal medications. The aim of the present study was to develop an oral anti-fungal gel containing hydro-alcoholic-extract of *Hyssopus angustifolius* will cure/protect from thrush-candidiasis and evaluate its efficacy in compare to Miconazole and Nystatin. In this *in vitro* study, *H.angustifolius* extract was prepared using powdered petals and water-ethanol solvent. *Candida albicans* was isolated from the saliva samples collected from children with severe early childhood caries. Screening of antimicrobial activity was carried out with the help of well-plate method and the zone of inhibition was determined after incubation. Minimum inhibitory concentration (MIC) for preparing mouth gel was carried out by microdilution in a concentration range from 0.8 to 400 µg/ml. Gel was formulated by dried extract of *H.angustifolius*. Gels were evaluated on various parameters and standardization of the formulation was performed. To select the best gel formulation, one general formula was considered and then corrected by changing the polymer ratio. Gel formulations were characterized for monotonousness, probiotic extract content, pH determination, viscosity measurement, stability and antifungal activity in comparison to Miconazole and Nystatin. The data were statistically analyzed using SPSS software. Results were encouraging. Formulation with 2% gelling agent and 1% *H.angustifolius* extract had optimal characteristics as well as, had pleasant appearance, fragrance, texture, stability and viscosity. The selected gel formulation also showed significant antifungal activity when compared to marketed preparations, as the inhibition zone from highest to lowest, respectively, was related to the prepared mouth gel (16/3 mm), Nystatin and Miconazole (P <0.05). MIC indicated that prepared gel has more inhibitory effect than Miconazole (P<0.01) but no differences was seen with Nystatine (P=0.602). The findings revealed that Hyssopus-extract had the anti-candidiasis effect significantly and the developed mouth gel could control oral candidiasis and used as a natural and safe drug. However, clinical studies are required to achieve definite results.

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**STUDY OF TOTAL PHENOL AND FLAVONOID CONTENTS OF DIFFERENT  
ORGANS OF 3 SPECIES OF *CHENOPODIUM***

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As natural antioxidants, phenolic compounds are found abundantly in plant food and beverages, which play vital parts in health and parts in health [1]. Many studies have reported the advantages of phenolic compounds, such as anti-aging, anti-inflammatory, antioxidant and anti-proliferative agents [2]. *Chenopodium* is a herb belonging to the Chenopodiaceae family, consisted of phenolic compounds which can act as antioxidant. The objective of this research was to study of phenolic and flavonoid compounds of three organs (leaf, stems and fruit) of 3 species of *Chenopodium* in Sistan region. Phenolic and flavonoid contents were measured by Folin-Ciocalteu and Aluminum chloride methods, respectively. The results showed that the highest phenol and flavonoids content was observed in leaf species of *Ch. ficifolium*. *Chenopodium*, particularly the *Ch. ficifolium* leaf, can be a useful source of natural antioxidants.

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**EFFECT OF FOLIAR SPRAYS OF GLUTAMINE, CITRIC ACID AND MALIC ACID ON MORPHOLOGICAL TRAITS OF LICORICE (*GLYCYRRHIZA GLABRA*)**

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Licorice is one of the oldest medicinal plants that is commonly used in various industries such as pharmaceutical, food, beverages and confectionery products. In order to evaluate the effect of foliar application of amino acids (glutamine) and organic acids (citric acid and malic acid) on growth and quality of the seed grown licorice, this study was performed in the spring and summer of 2017 in the greenhouse of College of Agriculture, Islamic Azad University, Karaj Branch. Glutamine (3, 6 and 9 mM), malic acid (6, 9 and 15 mM) and citric acid (3, 9 and 15 mM) and control distilled water were sprayed in a completely randomized design with three replications. Foliar application of treatments were done in different steps and the first spraying were done in two leaves stage and the next steps of spraying were carried out each week on the leaves. From first to last spraying was 140 days. The main traits examined in this study included: fresh and dry weight of shoot and root, branches count, main and lateral root length and root to shoot weight ratio. The results showed that foliar sprays of various concentrations of glutamine, malic acid, citric acid, significantly increased licorice root and shoot growth and yield as compared to the control. In malic acid 15 mM shoot fresh and dry weight increased 505 and 409 % respectively, as compared to the control. Also, the highest licorice root fresh and dry weight was in glutamine 3 mM that was increased 1124 and 1497 % respectively, when compared to the control treatment. Therefore, we conclude that long-term application of appropriate levels of malic acid, citric acid and glutamine can improve the adaptation, yield, and quality of seedlings licorice.

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**DETERMINATION OF TOTAL PHENOLICS, FLAVONOIDS CONTENTS AND ANTIOXIDANT ACTIVITY IN THE SPRING LEAVES, AUTUMN LEAVES AND ROOTS OF *ERYNGIUM CAUCASICUM* TRAUTV. FROM IRAN**

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The genus *Eryngium* as a medical herb mentioned in some of the traditional Persian medicine books by the name "*Qarasaneh*" or "*Erin Jim*". In these books said that different parts of the plant, including leaves and roots have significant and important actions "*Afaal*" and properties, such as "*Taryaayat*" (antidote) and "*tahlile maghs va ryiah*" (Decomposition of the bloats and stomach pains) [1,2]. Also in Folk medicine the plant is used as an aid in treatment of hyperglycemia. To evaluate the effects mentioned in traditional medicine and confirm them with the findings of modern science, the level of total flavonoids, total phenols (Folin-Ciocalteu method) and total antioxidant activity (FRAP method) were measured in a methanol extract (80%) of spring leaves, autumn leaves and roots of *E. caucasicum* collected from Gilan province. Result showed that total amount of flavonoids based on catechin as a standard in spring leaves, autumn leaves and roots respectively were 2.59 (mg / g), 2.10 (mg/g) and 3.28 (mg / g). Moreover, the amount of total phenol based on gallic acid as a standard in spring leaves, autumn leaves and roots was 1.27, 1.19 and 1.77 (mg/g) respectively. Furthermore the total amount of antioxidants in spring leaves, autumn leaves and roots respectively were 49.08, 44.91 and 45.55 ( $\mu\text{mol/g}$ ). These results demonstrated that both leaves and roots contain high level of phenolic and flavonoid compounds also have a good antioxidant activity. Consequently, this plant can be used in the prevention and treatment or reduction of the adverse effects of oxidative stress-related diseases such as diabetes.



**PREPARATION OF *EUPHORBIA* EXTRACT-LOADED CHITOSAN NANOPARTICLES AND ASSESSMENT OF ITS ANTIBACTERIAL ACTIVITY AGAINST PLANKTONIC AND BIOFILM OF PATHOGENIC BACTERIA**

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Plant extracts with anti-microbial agents can be used against planktonic form and biofilm of pathogenic bacteria. *Euphorbia* plant extract has anti-microbial and bioactivity properties. But this extract is sensitive to environmental factors such as temperature, light and oxygen as well as its poor solubility in water. The aims of this study was to investigate the antimicrobial effect of chitosan nanoparticles loaded with *Euphorbia* extract. *Euphorbia* plant extracts were prepared by maceration method. The fabrication of *Euphorbia*-loaded chitosan nanoparticles was achieved by ionic gelation of chitosan with penta sodium tripolyphosphate (TPP). Nanoparticle size and zeta potential were determined using a DLS instrument. The results showed that *Euphorbia* extract-loaded chitosan nanoparticles exhibited spherical shapes with an average diameter of 180 nm. The morphology of the nanoparticles was studied by SEM (EM3200). The suspensions were obtained with high stability and the zeta potential of nanoparticles was measured 29mv. The yield of nanoparticles and encapsulation efficiency (EE) of the extract was obtained as 67% and 56%, respectively. Three strains of Gram positive bacteria including (*Staphylococcus aureus*, *Streptococcus pneumoniae*, *Bacillus cereus*) and three strains of Gram negative including (*Escherichia coli*, *klebsiella pneumoniae*, *Pseudomonas aeruginosa*) were exposed to nanoparticle in planktonic and biofilm form of growth. Results showed that the nanoparticles loaded with extract of *Euphorbia* had significant impact on planktonic form and biofilm pathogenic bacteria. The *Euphorbia* extract encapsulated in chitosan nanoparticles exhibited the highest antibacterial activities compared to the free extract against planktonic and biofilm of pathogenic bacteria.

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**PREPARATION OF *TAMARIX HISPIDA* EXTRACT-LOADED CHITOSAN NANOPARTICLES AND ASSESSMENT OF ITS ANTIBACTERIAL ACTIVITY AGAINST PLANKTONIC AND BIOFILM OF PATHOGENIC BACTERIA**

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Plants Extract are a rich source of biologically active compounds with antibacterial and anti-fungal activities. However the main problem of using plant extract is sensitivity of them to oxidation and environmental factors. In this study *Tamarix hispida* extract was obtained and encapsulated in chitosan nanoparticle by emulsion-ionic gelation with penta sodium tripolyphosphat (TPP) as crosslinkers. The nanoparticles were analyzed by scanning electron microscopy (SEM) and Dynamic light scattering (DLS). The particle size was obtained 190 nm. The results of SEM showed that the nanoparticles have uniform dispersion. Also the nanoparticles were spherical in shape. The yield of the nanoparticles and the encapsulation efficiency (EE) were obtained 70% and 54%, respectively. Three strains of gram positive bacteria including (*Staphylococcus aureus*, *Streptococcus pneumoniae*, *Bacillus cereus*) and three strains of gram negative including (*Escherichia coli*, *klebsiella pneumoniae*, *Pseudomonas aeruginosa*) were exposed to nanoparticle in planktonic and biofilm form of growth. The *Tamarix hispida* extract encapsulated in chitosan nanoparticles exhibited the highest antibacterial activities compared to the free extract against both planktonic and biofilm of pathogenic bacteria.

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**THE SURVEY ON DISTRIBUTION AND CLIMATIC CHARACTERISTICS AND  
HABITAT FOR FIVE SPECIES OF MEDICINAL PLANTS IN  
NORTH KHORASAN PROVINCE OF IRAN**

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In order to manage areas of natural resources requires understanding the climatic and ecological characteristics of habitats of medicinal plants, as well as understanding the distribution characteristics of medicinal plants in these areas. In order to characterize the climate and habitat conditions for five species of medicinal plants in Maneh and Samalqan region of North khorasan province including 1- Ferula (*Ferula gomusa*), 2- Khorassani Thyme (*Thymus transcaspicus*), 3- Savory (*Satureja mutica*), 4- wormwood (*Artemisia absintium*) and 5-yarrow (*Achillea millefolium*) an experimental research was conducted in 2013-2015. According to surveys results, the specifications of distribution points of studied species included habitat-species code, collecting region, collecting location height, direction and slope of collection points, latitude and longitude of distribution locations were determined and recorded in the corresponding tables. Also the distribution status of medicinal species, including the freshness and density, frequency (abundance) of the species, seed production status, species trends and important companion species were studied and recorded. The results of research showed that most studied medicinal plants species had great freshness and density, frequency (abundance) in the region but the tendency of many species that are exploited such as galbanum, was a little decreasingly.

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**DOMESTICATION AND CULTIVATION OF FIVE SPECIES OF MEDICINAL PLANTS IN BOJNOURD REGION OF IRAN**

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To meet the growing needs of herbal medicines, medicinal plants should be domestication and cultivation. In addition to ensuring adequate sources of Pharmaceutical Industries raw materials, cultivation of medicinal plants cause uniform quality and optimal characteristics of Pharmaceutical raw materials. To study the domestication and cultivation of medicinal plant species including five species 1-Ferula (*Ferulago musa*), 2- Khorassani Thyme (*Thymus transcaspicus*), 3- Savory (*Satureja mutica*), 4- wormwood (*Artemisia absintium*) and 5-yarrow (*Achillea millefolium*) a randomized complete block design with three replications was conducted in 2013-2015 at the Agriculture and natural resources research station of Bojnourd in North Khorasan Province of Iran. The seeds of the medicinal plants species planted in the green house and seedlings were transplanted to field in the second half of March. During the growing season, watering and weeding operations and survey of phenological stages were examined. The extraction operation was conducted in the laboratory by Clevenger apparatus. Experimental results showed good compatibility of medicinal plants species with local conditions of Bojnourd and are arable in this area conditions. Changes in essential oils amounts were significant at different stages of growth and were higher at flowering stage.

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**THE REGULATORY EFFECT OF MELATONIN ON SECONDARY METABOLITES OF STRESSED MOLDAVIAN BALM (*DRACOCEPHALUM MOLDAVICA*) A MEDICINAL PLANT**

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In recent years, melatonin has emerged as a research highlight in plant studies. Melatonin is a strong antioxidant acting both directly and indirectly through triggering the accumulation of secondary metabolites including carotenoids, total phenols, flavonoids and anthocyanine content. In the present study, the possible role of exogenous application of melatonin on moldavian balm (*Dracocephalum moldavica*, an important medicinal plant) to drought stress was investigated by evaluating a number of phenotypical indices related to drought adaptation. To evaluate the effects of foliar application of melatonin on some secondary metabolites and phenolics of moldavian balm under drought stress, an experiment conducted as a completely randomized design in a factorial arrangement with four replicates. Experimental treatments included melatonin at four levels (0 (distilled water), 50, 100 and 150  $\mu$ M) and drought stress at 100, 80, 60 and 40 % FC. In the current work, carotenoids, total phenols, flavonoids and anthocyanines reduced by drought stress. The results also showed that spraying melatonin increased carotenoids, polyphenol compounds, flavonoids and anthocyanine content under stress condition. At the high level of drought stress (40% FC), foliar application of 100  $\mu$ M melatonin caused an increase of 63%, 13.42%, 7.28% and 8.51% in carotenoids, total phenol, flavonoids and anthocyanine compared to control respectively. This increase in carotenoids composition is possibly linked to the antioxidant function of this molecule and increment of phenolic compounds (include phenolic acid, anthocyanin, and flavonoids), as it is well known that melatonin interacts directly with hydroxyl radical, hydrogen peroxide, superoxide anion and singlet oxygen. It could be concluded from the results that the application of exogenous melatonin as a biostimulator could be a good, feasible and cost-effective method to increase moldavian tolerance against drought stress possibly via its regulatory effects on the content of secondary metabolites [1,2].

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**OSMOTIC STRESS MITIGATION BY SEED PRIMING WITH MELATONIN IN  
MOLDAVIAN BALM (*DRACOCEPHALUM MOLDAVICA*) SEEDLINGS**

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Seed priming accelerate seed germination and seedling establishment under both normal and stressful environments. There is no information about the effects of melatonin (Mel) pretreatment on germination and early growth stage of moldavian balm (*Dracocephalum moldavica*) under osmotic stress. The current research carried out to evaluate effects of Mel on germination and initial growth properties of moldavian balm when confronted with osmotic stress. The experimental treatments included: hydro-priming (control), hormonal priming (5, 10, 50 and 100  $\mu\text{molMel}$ ) and osmotic stress induced by poly ethylene glycol at five levels (0, -0.2, -0.4, -0.6 and -0.8 MPa) with three replicates. Results showed that final germination percentage, rate and seed vigor index as well as seedling growth, photosynthetic pigments and protein content were considerably reduced with the rise of osmotic stress. Melatonin improved germination indices and increased photosynthetic pigments and protein content. The seeds which were primed with 100  $\mu\text{mol Mel}$  produced a higher root and shoot length, root and shoot dry weight, total biomass and seed vigor index. No germination was recorded in hydro-primed seeds at -0.6 and -0.8 MPa. At the levels of -0.4 MPa osmotic stress, seed priming with 100  $\mu\text{molMel}$  caused an increase of 52.5% and 61.8 % in germination percentage and rate compared to control respectively. Seed soaking could mitigate osmotic stress-induced reduction in total biomass and seed vigor index. The greatest increase in shoot and root length, shoot and root dry weight was observed in the concentration of 100  $\mu\text{mol Mel}$  as 22%, 43.6%, 33.21% and 54.8% compared to non-primed seedlings. Mel ameliorated the negative effects of osmotic stress on chlorophyll a, b, total chlorophyll, carotenoids and protein content [1,2].

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**THE EFFECT OF SALYCILIC ACID ON CHEMICAL CONSTITUENTS OF  
*RUBUS ANATOLICUS* (ASTERACEAE)**

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The genus *Rubus* comprises almost 700 species, making it to be the largest genus of the Rosaceae family and one of the most diverse of the plant kingdom [1]. The leaves of *Rubus* plants are known to contain astringent, antibacterial and antifungal agents, recommended internally in diarrhea and in inflammation of the gastrointestinal tract. Leaves infusion are also used externally for skin lesions and ulcers, and as a rinse in infections of the oral cavity and throat. This use of leaves of *Rubus* species relies on their high content of hydrolyzing and condensed tannins, and numerous other polyphenols including flavonoids, anthocyanins and phenolic acids, particularly gallic and ellagic acid. *Rubus anatolicus* (Focke) Hasskn., commonly known as Elmleaf blackberry, is widely found in Europe, Turkey and Iran. The plant is widely growing in the North and North West of Iran especially at Azerbaijan, Gilan, and Mazandaran Provinces. The plant fruits are traditionally used as an anti-inflammatory and strong antiseptic. In the present study, the effect of salicylic acid (100mM) on total phenolics and carotenoids of *R. anatolicus* leaves was studied. Total phenolic contents were determined using a spectrophotometric technique, based on the Folin-Ciocalteu reagent and calculated as gallic acid equivalents GAE/g dw. The results revealed that total phenolic content and carotenoids were 0.036 and 0.647 GAE/g dw, respectively. *R. anatolicus* can be considered as a valuable antioxidant additive for pharmaceutical and food industries.

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**GERMINATION IMPROVEMENT OF *KOELREUTERIA PANICULATA* SEEDS  
BY WASHING, SCARIFICATION AND PLANT GROWTH REGULATOR**

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Golden rain (*Koelreuteria paniculata* Laxm.) is a saponaceous tree belonging to family Sapindaceae, native to Eastern Asia especially China and Korea [1], where the local people use its seeds and leaves as insecticides and antimicrobial agents [2]. The plant contains gallate derivatives, cyanolipids and flavonoids as well as natural rare saponins such as triterpenoidsaponins (TS) named Paniculatosoid (A–C) which showed antibacterial, antifungal, antimalarial and antileishmanial activities [3,4]. *K. Paniculata* is wide spread as an ornamental and medicinal tree but the propagation is difficult because of pronounced seed dormancy. Unscarified seeds of the plant failed to germinate after any pre-treatments. Similarly, seeds soaked or soaked and re-dried without chilling were unable to germinate. In the present work, the effect of washing (24 h), scarification with sulphuric acid treatment (0, 50 and 80% in 15 min), and gibberellic acid (0, 75 and 100 mg/l) in a complete randomized design (CRD) with four replications were studied. The best germination percentage (32.5) were obtained when the seeds were placed in moistened filter paper for 30 d after treatment with 50% concentration sulphuric acid for 15 min, and then treated with either GA<sub>3</sub> 75mg. L<sup>-1</sup>. These results could be applied to rapid generation and mass propagation of this species in the future.

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**PROTECTIVE EFFECT OF *URTICA DIOICA* ON ACUTE KIDNEY INJURY  
INDUCED BY GENTAMYCIN IN MALE RAT**

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Aminoglycosides are often used in combination with beta-lactam antibiotics and have a rapid bactericidal effect, and are available at an affordable cost and have less incidence of resistance, making them a drug of choice for treatment of several life-threatening infections. In the other hand nephrotoxic effects of aminoglycosides caused that can't use them for long time. Using of herbal extracts in order to decrease injuries of injurious materials was considered. The present study shows the protective effects of nettle (*Urtica dioica*) extract against kidney injuries in gentamicin induced. Forty five male Wistar rats were divided into 9 groups. 1-Simple control group, 2- Sham group that maintained tween 20, 3- Patient control group that maintained just gentamicin 100 mg/kg, 4-6 groups maintained nettle (*Urtica Dioica*) extract 50, 100 and 200 mg/kg and 7-9 groups along with nettle (*Urtica Dioica*) extract, maintained gentamicin 100 mg/kg. In the end of experiment (28 days), blood samples were obtained, and the kidneys were removed for histopathology investigations. Results showed that Gentamicin alone increased the serum levels of creatinine and urea, and tissue damage ( $P < 0.05$ ). However, administration of nettle extract accompanied with gentamicin decreased these markers significantly ( $P < 0.05$ ). Also histologic results showed that rat's tissue structures recovered during the treatment with nettle (*Urtica dioica*) extract. It is concluded that nettle could ameliorate nephrotoxicity induced by gentamicin.



**STUDY OF ANTI-ANXIETY EFFECT OF AQUEOUS EXTRACT OF  
*MYRTUS COMMUNIS* LEAVES USING ELEVATED PLUS MAZE**

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Anxiety is a growing medical problem in modern societies. There are different medical treatments in the market for controlling anxiety disorders. However, the current treatments have numerous adverse effects. *Myrtus communis* L. (Myrtaceae), called common Myrtle, has been used for treatment of inflammatory and respiratory diseases in Iranian traditional medicine. The sedative-hypnotic, anti-nociceptive, antibacterial, anti-inflammatory, and antioxidant effects of the aqueous and ethanolic extracts of this plant have been reported in previous studies [1]. In this study we evaluated the anti-anxiety effect of the aqueous extract of Myrtle's leaves by using behavioral setup in male NMRI mice. Elevated plus maze was used for evaluation of the anxiety-like behavior in this study. The extract at doses of 100 and 200 mg/kg was able to increase the time spent in the open arm and also increased the proportion of entries into the open arms to closed arms compared to the control group. Flumazenil (10 mg/kg) failed to reverse the anti-anxiety effects of the extract. Our findings revealed that the aqueous extract of *Myrtus communis* has anti-anxiety effect in mice and has potential use for treatment of anxiety in human. It has been reported that leaves of Myrtle have terpenoids and they may be involved in the anti-anxiety of the extract. Our findings also indicated that the benzodiazepine receptors are not responsible for the anti-anxiety effects of the extract. For determination of exact mechanism of action and the active components of the aqueous extract. Further studies are necessary to evaluate the toxicity and the exact mechanism of action of the extract.

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**COMPARISON OF ANTIOXIDANT ACTIVITY OF MULLEIN FLOWER  
(*VERBASCUM THAPSUS*) IN DIFFERENT REGIONS OF ESFARAYEN CITY**

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Mullein (*verbascum Thapsus*) belongs to scrophulariaceae family. This medicinal plant has different kinds of secondary metabolites such as mucilage, saponin and flavonoids (hesperidin and verbascoside). The aim of this study was investigation of antioxidant activity differences in two different regions (with different altitude) in mullein flower. This research was done as complete randomized design in 3 replications in two national park of Salouk and Sarigol in Esfarayen city. Antioxidant activity were measured by using spectrophotometer with DPPH reactor after making methanol extract with 80% methanol. The result showed that altitudes and different regions had significant effect on antioxidant features of mullein flower in 1% probability level. According to means comparison The highest amount of antioxidants at an altitude of 1500 (41/2 percent) antioxidants at an altitude of 1900 meters and the lowest rate (6/7 percent) was produced. We understood that antioxidant activity reduced with height increasing.

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**EFFECT OF FERTILIZER AND HARVESTING TIME ON SOME QUANTITY AND QUALITY TRAITS OF *MENTHA PIPERITA***

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The cultivation of aromatic and medicinal plants has a special role in agricultural systems. Medicinal plants have been used widely for thousands of years in traditional herbal medicine systems all over the world and have considerable importance in international trade today. Peppermint is a medicinal plant which have multiple pharmacological effects. The use of these plants in various forms of pharmaceutical, food and health is the advantage of this plant to other plants. It could be irritable bowel syndrome drug use, carminative, treatment of cough, anti-bacterial and anti-fungal properties. To study the effects of fertilizers and harvest time on essence of the Peppermint, a factorial pot experiment based on randomized complete block design with five replications was done in Urmia University during 2013. The first factor consisted of five types of fertilizers (chemical fertilizer, manure, bio fertilizer, manure combined with biological, and the control). The second factor consisted of three harvest times (pre-flowering, flowering, and post-flowering). Results showed that the effect of fertilizers on plant dry matter was significant. The highest dry matter per plant was 17.54 g for the integrated treatment of manure and bio-fertilizer. The maximum fresh weight of leaves (25.93 g per plant) and maximum fresh weight of shoot (14.07 g per plant) was belong to the bio-fertilizer treatment. The lowest dry matter per plant (5.32 g) and lowest shoot fresh weight (6.04 g) was for the control. The effects of harvest time on shoot dry weight was significant. There was significant interaction between application and harvest time on the percentage of essential oil and essential oil yield. So the highest amounts of essential oil percent and yield (0.4 % and 10.1 g per plant) were obtained from plant that placed in integrated treatment of manure and bio-fertilizer plots in flowering and before flowering stages. Generally, a combination treatment with manure and biofertilizer, with the harvest time after flowering creates greatest effects on the quantity and quality properties of peppermint.

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**THE EFFECTS OF THYMOL ON THE CLINICAL ASPECTS AND IMMUNITY RESPONSES IN RHEUMATOID ARTHRITIS (RA) INDUCED IN WISTAR RAT.**

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Thymol is one of the major components of thyme oil with a phenolic structure. It has been credited with a series of pharmacological including antimicrobial, antitussive and antioxidant benefits [1,2]. On the other hand, anti-inflammatory capacities of Thymol have been documented in some previous studies [3]. This survey was designed to investigate the potential effects of Thymol for the treatment and controlling inflammation in animal model of rheumatoid arthritis (RA). To develop a rat model of RA, rats were injected with 0.1 ml suspension of complete Freund's adjuvant containing 10 mg/ml of Mycobacterium tuberculosis. Therapies were initiated at day 12 post immunization and continued throughout the study until the day 33 when animals were sacrificed. Rats in the treatment groups received Thymol (100 mg/kg PO) or Prednisolone (10 mg/kg PO), daily. At the end, the rats were sacrificed and the disease activity index, the levels of myeloperoxidase and nitric oxide were assessed in the sera of rats. The results showed that both therapies with Thymol and Prednisolone could regress the arthritis index, hind paw volume and ankle joint diameter of adjuvant arthritic rats compared to control adjuvant arthritic rats. However, these benefits significantly were more prominent in RA rats received Thymol compared to RA rats received Prednisolone. In this regard, the levels of myeloperoxidase and nitric oxide were down-regulated in the sera of Thymol treated rats more than Prednisolone groups. Collectively, these data suggest that the Thymol may be used as a natural source to alleviate the signs of rat model of RA.

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**EVALUATIONS OF SEDATIVE-HYPNOTIC EFFECTS OF *TILIA PLATYPHYLLOS*  
ETHANOL EXTRACT USING EXPERIMENTAL MODELS**

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There are several effective medications for treatment or control of insomnia. However, most of these medications have limited efficacy and show unwanted effects and complications such as psychomotor impairment, tolerance, amnesia, and rebound insomnia [1]. Investigation for new medications, especially natural products, can be helpful to find better medications. In this study we investigated the sedative-hypnotic effects of ethanolic extract of *Tilia platyphyllos*, using open field and pentobarbital induced sleep tests. The ethanolic extract of the aerial part of the plant was prepared by infusion method and then administered at different doses (100-400 mg/kg) intra-peritoneally to three groups of mice. The effect of different doses of the extract was compared to the control group. This study was conducted on male NMRI mice (18-25 gr). Pentobarbital induced loss of righting reflex was considered a hypnotic effect of the extract and open field test was done to evaluate locomotor activity of mice. The plant extract at doses of 200 and 400 mg/kg increased the sleeping time compared to the control group in pentobarbital test. There was no significant difference between 200 and 400 mg/kg doses of this plant. *Tilia platyphyllos* has flavonoids and it has been shown that flavonoids have sedative-hypnotic effects [2]. The extract in different doses has no effect on locomotor activity of mice and significantly increased the percentage of time spent in central zone of open field area. This finding shows an anti-anxiety effect of the extract. Further studies are necessary to find the main mechanism of this effect.

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**ELECTROCHEMICAL METHOD SUITABLE FOR CHARACTERIZING  
ANTIOXIDANT PROPERTIES OF SYNORHODON**

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We have investigated the electrochemical oxidation of a natural Synorhodon using cyclic voltammetry. The antioxidant properties of these compounds were also studied. The effects of pH and temperature on antioxidative activities of Synorhodon, metallic ions ( $\text{Al}^{3+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Cr}^{3+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{k}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Na}^+$ , and  $\text{Zn}^{2+}$ ) on antioxidative activities of (-)-epigallocatechin gallate (egcg) were studied by an oxygen electrode method. The kinetic data were extracted from cyclic voltammograms with the help of digital simulation. The homogeneous and heterogeneous rate constants were estimated by comparing the experimental cyclic voltammetric responses with the digital simulated results.

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**EFFECTS OF PH, METAL IONS AND ON THE ANTIOXIDATIVE  
ACTIVITIES OF ASTRAGALS**

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The Effects of pH on antioxidative activities of Astragal and effects of metal ions ( $Al^{3+}$ ,  $Ca^{2+}$ ,  $Cd^{2+}$ ,  $Co^{2+}$ ,  $Cr^{3+}$ ,  $Cu^{2+}$ ,  $Fe^{2+}$ ,  $Fe^{3+}$ ) on antioxidative activities of Astragal were studied by an glassy carbon electrode method. Digital simulation analyses based on different oxidation mechanisms have been performed for the cyclic voltammograms obtained on the surface of GC electrode. The kinetic data were extracted from cyclic voltammograms with the help of digital simulation. The homogeneous and heterogeneous rate constants were estimated by comparing the experimental cyclic voltammetric responses with the digital simulated results [1-3].

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**INVESTIGATING THE EFFECT OF MULTIWALL CARBON NANOTUBES ON  
THE PROPERTIES OF GERMINATION AND GROWTH OF CASTOR SEEDS  
(*RICINUS COMMUNIS* L.)**

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Carbon nanotubes act as regulator of germination and growth of plant; and are able to change the morphology and physiology of plant cell. The castor plant (*Ricinus communis*) belongs to the Euphorbiaceae family and is a very important medicinal plant. The aim of this study is to investigate the effect of 10 different concentrations of multiwall carbon nanotubes (MWCNTs) (2, 5, 10, 20, 50, 75, 100, 125, 250 and 500 µg/mL) alongside the control under laboratory conditions on the germination and growth of castor seedling. The results demonstrated that the maximum percentage of germination (96.7%) and the percentage of relative germination (100%) were found in the concentrations of 50 and 100 µg/mL respectively and the highest rate of germination (53.3) and the mean time of germination (4.6) was seen in the concentration of 75 µg/mL. However, no statistical significant difference was found between the different concentrations in any of germination factors. In the concentration of 100 µg/mL, there was a significant increase in seedling vigor index (400) when compared with the concentrations of 5 and 10 µg/mL. The maximum seedling index (11.3) was found in the concentration of 100 µg/mL which had a significant difference with the control and all applied concentrations. The length of rootlet in the 100 and 125 µg/mL concentrations had a significant increase when compared with the control and the concentrations of 10 and 50 µg/mL. The maximum seedling length (4.6 cm) was seen in the concentration of 100 µg/mL; where there was a significant increase with 10 µg/mL concentration. Moreover, in the 100 µg/mL concentration, the largest number of rootlet (8.6) was seen and when compared with control and concentrations of 5, 10 and 50 µg/mL, there was a statistically significant increase. The maximum wet weight (0.3 g) and dry weight (0.1 g) of seedlings were obtained in the concentration of 100 µg/mL; and when compared with the control, there was a significant increase. In investigating response index, it was found that in all factors related to the growth of seedlings, the concentrations of 10 and 50 MWCNTs had the inhibitory effect. As a whole, the MWCNTs concentration of 100 µg/mL was considered as the optimum concentration in the growth stage of castor seedlings.



**THE TREND OF ACCUMULATION AND TRANSPORTATION OF NICKEL, LEAD AND CADMIUM IN VARIOUS PARTS OF SAFFRON**

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The aim of this study was to evaluate the accumulation and transportation of nickel, lead and cadmium in the soil, corm and saffron leaves. This research was applied by factorial experiment in completely randomized design, with 4 levels of contamination vis 0, 25, 50 and 100 mg/kg of nickel, lead and cadmium at 3 replications. 8 kg of soil was poured in each plastic box and then 6 corms (weighing at least 10g) were planted in year of 2014 and kept at the field of Faculty of Agriculture, University of Birjand. At the end of the first year, half of the plants of each treatment were picked randomly and final sampling done in the end of second year. Soil, saffron leaves and corms samples dried in the oven at 70°C for 48h and passed through sieve (1mm). After acid digestion, the total nickel, lead and cadmium concentrations were measured by atomic absorption. The results of statistical analysis demonstrated that there is a statistically significant difference between the initial concentrations in soil treatments ( $P \text{ value} \leq 0.001$ ). The results showed that the concentration of nickel, lead and cadmium in saffron leaves and corm at all treatments in the second year were higher than the first year. Additionally With increasing the level of heavy metals in soils, the concentrations of nickel, lead and cadmium in saffron corms and leaves were increased, therefore, the highest concentrations of nickel, lead and cadmium in the corm ( $9.65 \pm 37$ ;  $8.15 \pm 39.28$ ;  $10.24 \pm 27.21$  mg/kg respectively) and leaves ( $17.11 \pm 45.88$ ;  $19.73 \pm 45.55$ ;  $17.06 \pm 58.08$  mg/kg respectively) of saffron were obtained at the second years in highest concentration of heavy metals. This study showed that the concentration of heavy metals in the leaves were always higher than the corm. At the first year transfer factors for nickel, lead and cadmium between soil-corm (with an average 0.37, 0.39 and 0.46 respectively) and soil-leaves (with an average of 0.36, 0.37, and 0.21 respectively) in all treatments was less than 1, whereas the transfer factors between the corm and leaves always were greater than 1 with an average 1.03, 1.06, and 1.99 respectively. In the second year transfer factor between soil-corm (with an average 0.70, 0.57 and 0.69 respectively) and soil-leaves (with an average of 0.56, 0.49, 0.36 respectively) in all treatments also were less than 1, whereas the transfer factors of corm-leaves were more than 1 with an average 1.25, 1.13 and 1.72 respectively. It can be concluded with passing time the heavy metals accumulation in different parts of saffron increased; therefore the plant's ability to tolerate of heavy metals reduced. The saffron plant haven't tends to uptake of heavy metals from soil, however, according to the transfer and accumulation of heavy metals in aerial part, it is suggested that the saffron plant is cultivated in fields with less amounts of heavy metals.

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**A STUDY OF CATALASE AND PEROXIDASE ACTIVITY IN *ALOE VERA* L.  
UNDER SALINITY STRESS**

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*Aloe Vera* is a perennial plant, which is belong to liliaceae family. *Aloevera* is well-known to an immortal plant because of its medical characteristic [1]. One of the most important tension in arid and semiarid area is salinity in the soil or water and it could be limited growth and product so much [2]. Catalase EC:1.11.1.6 and peroxidase EC:1.11.1.7 are from oxido reductase family and they found in all organism like plant, animal and aerobic micro organism cells. These two enzymes are very important antioxidant that catalyze H<sub>2</sub>O<sub>2</sub> to H<sub>2</sub>O and Oxygen which is reducing amount of hydrogen peroxidase. In this project some biochemical characteristic of catalase and peroxidase enzymes in *Aloevera* plant under the salinity tension were tested, which were totally random with four level of salinity (0- 50- 100- 150 – mili molar), and it was performed with sodium chloride and four time repetition. For evaluation of catalase and peroxidase activity, it used *Aloevera* gel extract with phosphate buffer 0.01 M in pH,7.2. Evaluation of catalase enzyme was from Chauve et al., method in 1997 and peroxidase evaluation was from wothington method in 1988. Evaluation of catalase and peroxidase activity at different pH values suggested that catalase enzyme has two optimum pH values of 9 and 10, and peroxidase has pH value of 4. And these results were confirmed by native electrophoresis (with out SDS). Further study on the effect of temperature on catalase activity revealed that with the temperature of 35 °C in the optimum value of pH was 7, this value for the temperature at 30 °C this value was calculated as 9 and The peroxidase enzyme at the temperature of 40 °C showed a pH value of 4. In this research study, the evaluation of catalase and peroxidase activity was performed based on unit/mg protein. Results showed that catalase and peroxidase activity at optimum pH and temperature were more than enzymes activity in just optimum pH (with out counting the temperature), also these two enzymes have more activity in salinity tension.

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**PROTECTIVE EFFECTS OF ANTHOCYANIN FRACTION OF  
*BERBERIS INTEGERRIMA BUNGE* FRUITS AGAINST OXIDATIVE  
DAMAGES INDUCED BY H<sub>2</sub>O<sub>2</sub> IN HEPG2**

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Several evidences confirm the critical role of reactive oxygen species (ROS) in pathology of many diseases. Therefore, antioxidant can reduce these side effects by scavenging different free radicals mechanism [1]. Anthocyanins are phenolic compounds, known as natural pigments with wide color ranges and several biological effects [2]. *Berberis integerrima* Bunge belongs to Berberidaceae with therapeutic effects such as antioxidant activity [3]. The aim of this study is evaluation of cytoprotective effects of anthocyanin of *Berberis integerrima* Bunge fruits against H<sub>2</sub>O<sub>2</sub> in HepG2 cell line. In this study, fruits of *Berberis integerrima* Bunge were extracted by ethanol. Then, it was partitioned between ethyl acetate and 0.3% TFA. The aquatic fraction was loaded on amberlite column as a stationary phase. Fraction eluted with 0.3% TFA in methanol was collected as a rich source of anthocyanin and analyzed by HPLC-UV. Quantity of anthocyanin was measured by pH-differential method. In propose to define the cytotoxic effects of anthocyanin fraction on HepG2 cells, MTT assay was performed. To determine the minimum concentration and exposure time of H<sub>2</sub>O<sub>2</sub> on HepG2 cells, the cells were incubated with different H<sub>2</sub>O<sub>2</sub> concentrations. In Co-treatment evaluation, the cells were incubated with different nontoxic concentrations of anthocyanin (25-200 µg/mL) and H<sub>2</sub>O<sub>2</sub> simultaneously, after 2h incubation, cell viability was determined. The results showed anthocyanin concentration more than 800 µg/ml was significant cytotoxic. The IC<sub>50</sub> for H<sub>2</sub>O<sub>2</sub> with 2h incubation was 200 µM. In Co-treatment assay, anthocyanin able to increase viability of cells from 30 to 60% in all concentrations. According to previous report, anthocyanin are powerful antioxidant so these results point to that anthocyanin scavenging radicals and reduced cellular damage, by hydrogen donating or modulate cell signaling pathways [4]. These results consist with results of previous investigation, which showed they increase resistance of endothelial cells against damages of ROS.

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**MORPHO-PHYSIOLOGICAL RESPONSES OF LEMON BALM  
(*MELISSA OFFICINALIS* L.) TO COLCHICINE**

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The induction of polyploidy using mutagenic chemicals is one of medicinal plant breeding methods to enhance the production of secondary metabolites [1]. In the current research to induce polyploidy in Lemon balm plants, the seeds were grown on MS medium. The internodes at the 4 to 6 leave stages were separated from cultivated plant and were then treated with different concentrations of colchicine with 4 levels (0, 25, 125, 250 mg/L) in three different exposure times (24, 48, and 72). In this regard, a factorial experiment was carried out based on randomized complete block design with two factors; colchicine concentrations with four levels (control, 0.05%, 0.1% and 0.2%) and exposure times with three levels (24, 48 and 72 h) and three replicates. The obtained plants from treated internodes were evaluated in terms of morphological and physiological traits. Analysis of variance indicated that the different concentration of colchicine had significant effect on some traits such as plant height, number of internodes, number of branches, average leaf length and leaf width, distance of internodes, chlorophyll a, chlorophyll b, carotenoids, polyphenols, flavonoids, rosmarinic acid, and increasing in colchicine concentration in the treated plants, some traits such as phenol (at a concentration of 25 mg/L), flavonoids (at a concentration of 125 mg/L), fresh and dry weight of roots, fresh and dry weight of shoots, and leaves (at a concentration of 250 mg /L) significantly increased in comparison to the control. The results showed that the exposure times of colchicine was significant on plant height (at 24 h), number of internodes (at 24 h), number of branches (at 48 h), chlorophyll a, chlorophyll b and carotenoids (at 48 h), polyphenols (at 24 h), flavonoids (at 48 h), and rosmarinic acid (at 24 h). Therefore, according to the gramineous produced internodes in the media culture and destructive effects of long-term treatment on internode tissue, different concentrations of colchicine treatment is not recommended for 72 hours and the concentration of 250 mg/L for 48 hours due to better performance production in comparison to the control and other treatments is recommended.

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**INFLUENCE OF SILICON AND NANO-SIZED SILICON ON SEED GERMINATION AND EARLY GROWTH OF MARIGOLD (*CALENDULA OFFICINALIS* L.)**

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Marigold (*Calendula officinalis* L.), or Calendula, is an annual plant belonging to the family Asteraceae, has been used historically for medicinal purposes [1]. Seed oil from calendula contains 59-65% calendic acid, which has value in cosmetic, paint, and coating industries. Developing the best management practices for the production of calendula is necessary for optimized yield and profit for growers. Nanoscience coupled with nanotechnology is one of the most important emerging tools which can complement modern agriculture by providing new agrochemical agents and new delivery mechanisms to improve crop productivity. Silicon (Si) is the second most abundant element in the soil; however, it is not considered an essential element. Silicon nanoparticles have been implicated in crop improvement s. The seed germination is an important stage in the higher plant life cycle with respect to its survival. In this research, the influence of different concentrations (0, 0.5, 1.0, 1.5 and 2.0 mg/L) of silicon (source: sodium metasilicate) and silicon nanoparticles (0, 50, 100, 200, and 500 mg/L) on seed germination parameters including germination percentage (GP), mean germination time (MGT), germination rate (GR), root length (RL), shoot length (SL), and seedling vigor index (SVI) of *C. officinalis* were evaluated under *in vitro* conditions in a factorial experiment based on completely randomized design with four replications. Based on the ANOVA and analysis of mean (ANOM), seeds exposed to nano-sized silicon showed maximum GP and GI at 50 mg/L. However, the highest RL was obtained at 100 mg/L nano silicon treatment. There were no significant effects among the other examined traits. Moreover, application of silicon (at 0.5 mg/L) caused increase in RL and SL parameters, whereas the maximum GI was observed at 2.0 mg/L silicon exposure. Our findings revealed that seed priming with silicon and nanosilicon at low concentrations may improve germination features of *C. officinalis*. Nanomaterials can penetrate seed coats and create new pores, allowing the entry of water, oxygen, nutrients and external molecules in the germinating seeds.

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**ANTIMUTATION AND ANTICANCER ACTIVITIES OF TWO SPECIES *LIPPIA CITRIODORA* AND *LIPPIA NODIFLORA* (VERBENACEAE).**

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Plants of *Verbenaceae* have varied metabolic, are important in traditional medicine and use in treatment of gastrointestinal and respiratory disorders and anti inflammatory and antipyretic activities. The aim of this research is to compare antimutation and anticancer activities of two species *Lippia citriodora* and *Lippia nodiflora* by reversal mutation in Ames test. two plants were collected from khoozestan(Iran) and obtained methanolic extract of Leaves and Flower by percolation method separately. power of antimutation was studied by ames method with use of reversal mutation of the mutant Bacteria, *Salmonella tiphymorium* (TA100) in presence sodium azid and extracts. Also were tested anticancer activity by addition microsoms of mouse liver extract. there were in each of test, positive control (sodium azid) and negative control (sterile water).each test repeated 3 times then counted grown clones and average of them calculated by Ong formula .the results indicate powerfull activity in antimutation and anticancer activities about two plants extracts.The highest percentage of inhibition of mutation was seen in Leaves extract of *Lippia nodiflora* and the lowest percentage of inhibition of mutation was seen in flower extract of *Lippia nodiflora*. Both Leaves and Flowers extracts of *Lippia citriodora* indicated high activity but the activity of it,s leaves was higher. Then the development of productive meristems and flowers, affect these activities in two plants. It seems flavonoids have effective role in these activities.





**HPLC APPLICATION FOR COLUMN CHROMATOGRAPHY OF  
CHRYSOPHANOL FROM *RHEUM RIBES* ROOTS EXTRACT**

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Chrysophanol is a member of the anthraquinone natural compounds family. Chrysophanol and its derivatives have shown biologically activities including anti-inflammatory, anti-bacterial and anti-viral [1-3]. In this Study, the roots of *Rheum ribes* were extracted by methanol. The obtained extract partitioned between water and ethyl acetate by LLE method. Then, the ethyl acetate fraction was introduced to HPLC analysis for identification and quantification of chrysophanol. After that, the column chromatography techniques were applied to isolate of chrysophanol. In this way, HPLC analysis results were used for monitoring of obtained fractions. Finally, the identified fraction as chrysophanol was introduced to H-NMR analysis for confirming of its structure.

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**COMPARATIVE STUDY ON PHENYLETHANOID GLYCOSIDES PRODUCTION UNDER *FUSARIUM GRAMINEARUM* AND *PIRIFORMOSPORA INDICA* IN CELL SUSPENSION OF *SCROPHULARIA STRIATA* B.**

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*Scrophularia striata* Boiss. is an endemic species in Iran which has valuable compounds such as phenylethanoide glycosides [1]. Phenylethanoide glycosides are a major group of secondary metabolites with a wide range of biological activities including antioxidant, anti-inflammatory, Analgesic and anti-tumor [2]. Recently, finding ways to enhance these compounds for the construction of semi-synthetic drugs has important. Plant cell culture techniques and the usage of different elicitors are a successful strategy in producing the secondary metabolites. The aim of this study was the comparison of two biotic elicitors; *Fusarium graminearum* and *Piriformospora indica* culture filtrated on the accumulation of medicinal phenyl ethanoide glycosides [Echinacoside (ECH) and Acteoside (ACT)] in cell suspension cultures of *S.striata*. To investigate the accumulation of phenyl ethanoide glycosides, different concentrations [0, 0.5, 1, 2 and 4% (v/v)] of *P. indica* and *F. graminearum* cultures filtrated were given to 8 old-days of *S. striata* cell cultures over a time course of 120 h. Moreover, ECH and ACT production was determined by HPLC. The results indicated that the cell growth was improved in the treated cells with 1% culture filtrated of *P.indica*; 0.87-fold over the controls. Also a significant enhancement in ACT and ECH were observed with 1% culture filtrated of *P.indica* treatment; 1.25-fold (32.78  $\mu\text{g g}^{-1}$  FW) and 1.75-fold (32  $\mu\text{g g}^{-1}$  FW) respectively. Although a significant increase in ACT was induced in treated cells with 0.5% culture filtrated of *F.graminearum*; 2.24-fold (58.8  $\mu\text{g g}^{-1}$  FW), but the growth inhibition was detected under this treatment. Our observations express that low concentrations of *P.indica* culture filtrated can improve growth and phenylethanoide glycosides accumulations in *S. striata* cell cultures.

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**EFFECT OF GLYCINE BETAINE TREATMENT ON QUALITY AND BIOACTIVE COMPOUNDS OF HAWTHORN FRUIT DURING COLD STORAGE**

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Hawthorn (*Crataegus aronia*) belongs to the Rosaceae family and are rich sources of micronutrients and phytochemicals such as phenols, flavonoids, anthocyanins and ascorbic acid [1]. Therefore, the objective of this study was to investigate the exogenous glycine betaine (GB) treatment on quality and antioxidant potential of hawthorn fruit during cold storage. The experiment was conducted using a factorial design with glycine betaine treatment and storage times as the two factors with three replications. Fruits were dipped in different concentrations of aqueous solutions of 0, 2.5, 5 and 10 mM of GB for 10 min. The treated fruit were then air dried for approximately 60 min and stored at 1 °C and 90% RH for 20 days. At 5-day intervals, 30 fruit from each replicate were sampled, stored for a further 24 h at 20 °C and subjected to physicochemical analysis. The results indicated that significant higher content of ascorbic acid, total soluble solids, phenolic acids and flavonoids were found in fruits treated with GB. Despite consistent decrease in firmness of all treatments during the storage period but still all GB concentrations helped in retaining higher fruit firmness when compared with control. Amongst treated fruits, GB at the concentration of 2.5 mM was recorded with highest fruit firmness, ascorbic acid, total soluble solids, phenolic acids and flavonoids content during storage period. Thus it may be concluded that the GB treatments may aid in delaying the softening process, enhancing the keeping quality while retaining the nutritional quality of hawthorn during cold storage.

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**BIOLOGICAL SYNTHESIS OF AG-CL NANOPARTICLES BY ROOT OF ROSA PERSIA MICHX. EX JUSS.**

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Nanoparticles have gained significant attention in recent years. Ag-Cl nanoparticles have attribute specific physical and chemical, therefore have prolific in industry and medicine. A variety of methods have been investigated for synthesis of nanoparticles among which we are study nanoparticles biological synthesis by root of *Rosa persica* extract. The synthesized nanoparticles have been investigated by methods spectroscopy, UV-Vis spectral analysis, Electron microscopy (TEM) and X-ray diffraction (XRD). X-ray diffraction pattern and transmission electron microscopy revealed that 1 mM of AgNO<sub>3</sub> produced mostly spherical nanoparticles in a range of 6-8 nm. Accessory showed that root of *Rosa persica* can produce silver nanoparticles that addition is an environmentally friendly and cost effective method [1, 2].

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**CINNAMIC ACID ACCUMULATION IN *LITHOSPERMUM OFFICINALE* L. CALLUS**

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Cinnamic acid (CA) is a natural compound found in many plants and medicinal herbs. CA is the key intermediate in the biosynthesis of important phenolic acids such as p-coumaric acid, caffeic acid, chlorogenic acid and rosmarinic acid [1]. In this study, accumulation of CA during a 40-day subculture of *Lithospermum officinale* callus was examined. *L. officinale* is one of the native plants to Iran Flora and belongs to the Boraginaceae [2]. *L. officinale* callus was subcultured on Murashige-Skoog (MS) medium supplemented with 2,4-D as auxin (0.2 mg L<sup>-1</sup>) and kinetin (2 mg L<sup>-1</sup>) as cytokinin. Both methanolic and aqueous extracts of the callus at different intervals of a 40-day subculture were subjected to HPLC analysis using authentic samples of CA and phenolic acids as the standards. Repeatability of the results was also examined in parallel experiments. The results indicated that the biosynthesis of phenolic acids was active in *L. officinale* callus causing accumulation of p-coumaric acid and caffeic acid as the main constituents of the methanolic extract. However, by aging the subculture, CA showed up. The advent of CA from day 28 of the subculture assumingly implies the gradual declination of the biosynthesis of phenolic acids in *L. officinale* cells due to the aging.

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**PROTECTIVE EFFECT OF GARLIC EXTRACT AGAINST THE OXIDATIVE STRESS INDUCED BY METHOTREXATE ON SERUM LEVELS OF FUNCTION RENAL MARKERS AND OXIDATIVE STRESS PARAMETERS IN RENAL TISSUE IN RATS**

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Methotrexate (MTX), a chemotherapeutic and immunosuppressant drug, is generally well-tolerated by most patients. However, its cytotoxic nature contributes to life-threatening side effects including nephrotoxicity, etc. This study was carried out to determine whether garlic extract has a protective effect against MTX-induced nephrotoxicity. Thirty rats were divided randomly into six groups: a control group, garlic extract (500 mg/kg once for 11 days) group, MTX (20 mg/kg, once intraperitoneal) group, MTX+garlic extract (20 mg/kg+ 100 mg/kg once for 11 days) group, MTX + garlic extract (20 mg/kg+250 mg/kg once for 11 days) group and a MTX+garlic extract (20 mg/kg +500 mg/kg/day once for 11 days) group. At the end of the experiment blood samples were collected to investigate serum levels of BUN and creatinine (Cr). The renal of each rat was excised, cleaned, weighed, rinsed in Phosphate buffer saline (PBS) and homogenized for assessment malondialdehyde (MDA) level and superoxide dismutase (SOD). Histological examination was also carried out. MTX caused nephrotoxicity as evidenced biochemically by significant increase in serum levels of BUN and Cr, respectively as well as by histopathological changes. Such effects were associated with significant changes in oxidative stress markers MDA and SOD, in renal tissue. garlic extract - pretreated rats revealed significant decrease in serum levels of BUN and Cr induced by MTX administration. Furthermore, garlic extract significantly ( $p < 0.05$ ) ameliorated MTX -induced increase in MDA level and decrease SOD activities in renal tissue homogenates. Additionally, histopathological examinations revealed markedly ameliorated MTX-induced toxicity renal structure. Garlic treatment has a reversible biochemical and histological effect upon MTX-induced nephrotoxicity.



**POSSIBILITY OF USING MICROALGAE *SPIRULINA PLATENSIS* POWDER  
IN PRODUCTION OF FUNCTIONAL PASTA**

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*Spirulina platensis* blue-green microalgae with unique nutrient content and numerous nutritional and therapeutic effects in various food products enrichment is employed. Information about fortifying wheat flour with powdered *spirulinaplantensis* microalgae to produce pasta is very low. Dozens of studies of human medicine so harmful effect of the supplement *spirulina* is not provided. Food and Drug Administration (FDA) word GRAS (generally recognized as safe and healthy) has awarded to *spirulina* prepared in two US companies. In this study, we evaluated the effect of *Spirulina* microalgae powder to the pasta and nutritional characteristics make it. The effect of *Spirulina platensis* microalgae powder at a level (% W/W), 0.0, 0.25, 0.5, 0.75 and 1 %, on the amount of protein and iron, respectively, were measured by micro-Kjeldahl method and atomic absorption method. Microbiological testing of the samples, according to the National Institute of Standards and Industrial Research Issue 2393 provided by Iran. As well as product sensory evaluation was conducted by 60 panelists non-specialized hedonic method. The results showed that different levels of *Spirulina* microalgae powder had a significant effect on chemical parameters of pasta ( $P < 0.05$ ). Also interaction of microalgae powder on microbial features of pasta was not significant ( $P > 0.05$ ). Sensory evaluation test indicated greater acceptability pasta fortified with *Spirulina* microalgae powder at a concentration of 0.25%, as compared to the control sample. With the addition of 0.25% of *Spirulina platensis* microalgae powder to pasta, while reaching enriched product, nutritional value and sensory characteristics of pasta and a functional food will be available to the community.

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**CYTOTOXIC ACTIVITY OF *POSTIA PUBERULA* HYDROALCHOLIC EXTRACT  
ON AGS AND 4T<sub>1</sub> CELL LINE**

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Medicinal plants have been investigated for possible anti-cancer effects. The aim of this present study was to examine the cytotoxic activity of *Postia puberula* hydroalcoholic extract on different cell lines. The small genus *Postia* (tribe Inuleae) with four species, distributed over Syria and Iran, was previously placed in the subtribe Bupthalthinae next to *Anisopappus*. The hydroalcoholic extracts of *P. puberula* were prepared and their cytotoxic effects on two human cancer cell lines (4T<sub>1</sub>, human Prostate Cancer; AGS, human gastric cancer; were examined using the MTT assay. *P. puberula* demonstrated the significant cytotoxicity with IC<sub>50</sub> of 34.52 µg.mL<sup>-1</sup> against AGS and 77.7 µg.mL<sup>-1</sup> against 4T<sub>1</sub>. For some of the plants, their traditional use was correlated with the cytotoxic results. The high cytotoxic effect of *P. puberula* could be considered as potential of anticancer compounds.

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**THE EFFECT OF LAVENDER ESSENCE ON PAIN SEVERITY AFTER  
CESAREAN SECTION UNDER SPINAL ANESTHESIA**

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Caesarean operation is one of the most common midwifery operations in the world. and nearly 40% of all child deliveries in Iran are through caesarean. Caesarean operation Cesarean section is one of the most common midwifery operations in the world and nearly 40% of all child deliveries in Iran are through caesarean. while this statistics in the world ranges from 15 to 25 percent. Keeping in mind the importance of looking after the mother in the early hours of child delivery and her calmness in order to start the breast feeding process, reducing the post-delivery pain is of significant importance. Thus, it is necessary to have a medical or non-medical intervention to kill the pain. The present research was conducted to study the effect of lavender essence on post-caesarean levels of pain. patients qualified for inclusion were selected through convenient sampling. Then, through random paired blocking (selecting two patients), 80 patients were finally selected and divided into the intervention (receiving lavender essence) and control (receiving normal saline as placebo) groups. They were not aware of the type the essence and placebo they were going to receive and the research proceeded in accordance with the principles of single-blind method. The intensity of pain was scored based on the standard tool Visual Analog Scale from 0 to 10. The expected consequence was a pain level more than three scales in VAS tool. Another expected consequence was the amount of diclofenac used. We could finally answer this question about the influence of lavender on reducing the amount of diclofenac consumed. If the scale of pain was greater than three, a 100 g rectal diclofenac suppository was issued by the doctor. A data recording sheet was used to collect information about the level of pain and other demographic characteristics. Aromatherapy by inhaling lavender's essence can be utilized as a safe and dangerless method as a complementary medicine besides medical interventions. Utilizing aromatherapy, especially inhaling lavender's essence can reduce consumption of chemical medicines among patients. The results of this research are recommended to be used for further development of researches in this field and preparing clinical guidelines to use aromatherapy in clinics.

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**EVALUATION OF CHEMICAL COMPOUNDS OF ESSENTIAL OILS FLOWER  
AND AERIAL PART OF *LAVANDULA ANGUSTIFOLIA*  
AND CLASSIFICATION BY PCA**

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*Lavandula angustifolia* is a flowering plant, native to the Mediterranean region that is well known among people as a powerful aromatic and medicinal herb. Lavender essential oil is principally used in the aromatherapy and cosmetic industries. In this study, the aerial part (flower and leaf) of plants were collected from the 12 major growing regions of Iran [1]. Dried aerial parts of plant were ground and distilled using a Clevenger apparatus that is approved by British pharmacopoeia [2, 3]. Gas chromatography (GC) analyses of acquired essential oils were carried out with Varian GC system. The results showed amount of essential oil in the flower of lavender is more than amount of essential oil in the shoot of lavender. Lavenders grown in temperate regions and with more light had more essential oil. The main components in the aerial part of lavender essential oil were linalool, 1,8 cineole, borneol while linalyl acetate, linalool, 1,8 cineole were main compounds in flower essential oil. Sample clustering of different groups is one of the main output of principal component analysis (PCA) modeling was used to classify the samples. The 2-D score plot of lavender fingerprint samples explains that all of samples can be classified in four main groups.

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**ANTITUMOR AND APOPTOSIS-INDUCING EFFECTS OF THE HEXANE  
EXTRACTS FROM THREE NATIVE EUPHORBIA PLANTS**

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Several Euphorbia plants (Euphorbiaceae) have shown antitumor activity. The present study aimed to investigate the growth inhibitory and apoptotic effects of three native Euphorbia species (*E. microciadia*, *E. heteradenia* and *E. osyridea*) on various cell lines. The hexane extract of the plants was prepared and examined for growth inhibitory effects on solid tumor and leukemia cell lines. Their apoptosis-inducing effect was determined by measuring changes in caspase-3 activity by colorimetric assay and by analysis of the expression of apoptosis-related genes by Real-time PCR. All three plants had the capacity to inhibit the growth of cells. Determination of the inhibitory concentration 50% (IC<sub>50</sub>) of the extract showed that *E. heteradenia* extract with IC<sub>50</sub> value of 26.91 μg/ml for K562 leukemia cells had a greater inhibitory impact compared to *E. microciadia* with IC<sub>50</sub> value of 39.81 μg/ml for HeLa cells and *E. osyridea* extract with IC<sub>50</sub> of 83.17 μg/ml for Fen bladder carcinoma. We conducted caspase 3 colorimetric assay and Real-time PCR to determine if the observed growth inhibitory effects of the extracts were due to apoptosis induction. The effectiveness of all Euphorbia species against tumor cell lines was found to be through caspase-dependent apoptosis. Also all of the extracts suppressed antiapoptotic Bcl-2 gene expression and increased Bax and Fas expressions. In conclusion, Euphorbia extracts can induce apoptosis in various tumor cell lines through both extrinsic and intrinsic pathways of apoptosis. Additional studies are necessary regarding their beneficial effects as potential anticancer and antileukemia agents.

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**A REVIEW OF POLYPHENOLS CHANGES IN FENUGREEK HERB CAUSED BY DROUGHT STRESS**

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Medicinal plants are a rich source in our country that there is the possibility of exporting them and Iran is one of the best places in the world in terms of climate and geographical position for medicinal plants and it has been a source of both production and consumption of medicinal plants from the past (1). Fenugreek "*Trigonella foenum-graecum*" is an herbaceous, annual plant belonging to the Papilionaceae family. Given the importance of this plant in terms of edible, medicinal, agricultural and pasture characteristics and on the other hand the spread of drought stress, the improvement of this product's performance in such a way that modify the effects of drought, is of great importance. This study was conducted to evaluate the phenolic compounds on this plant. For this purpose, a greenhouse experiment was conducted in a completely randomized design with 5 replications and 3 treatments (100%, 50% and 25% FC). According to the number of iterations and treatment (5 replicates × 3 drought treatment × 1 fenugreek population) 15 pots were prepared. After drought stress, plants were harvested, dried and then polyphenols were analyzed by using high-performance liquid chromatography (HPLC) and compounds were detected. The results showed that water stress among all the treatments for all detectable 1% levels of polyphenols were significant and Polyphenol catechins in all treatments had the highest rates. The next step was Rutin and Transsferulic acid after Rutin had the highest rate. The lowest amount of polyphenols in treatment of 50% and 100% owned by quercetin.

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**EFFECTS OF DROUGHT STRESS ON SOME MORPHOLOGICAL AND  
PHYSIOLOGICAL CHARACTERISTICS OF FENUGREEK HERB**

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Drought is one of the most important environmental stresses that affects the morphology, physiology and biochemistry of plants and has a major impact on agricultural production [1]. Identifying and planting drought-resistant plants with high yield potential is of great importance [2]. Fenugreek with the scientific name of "graecum Trigonella foenum", is an angiosperm plant of Papilionaceae species [3]. One of the best ways to deal with stress is using species and cultivars that are more tolerant to dry periods and have the ability to avoid from drought. This study aimed to evaluate the morphological and physiological effects of Fenugreek herb. For this purpose, a greenhouse experiment was conducted in a completely randomized design with 5 replications and 3 treatments (100%, 50% and 25% FC). Due to the number of iterations and treatment (5 replicates × 3 drought treatment × 1 fenugreek population) 15 pots were prepared. After drought stress, plants were transported to the laboratory and the fresh weight of roots and shoots by heat sensitive scales 001/0, also the height of roots, shoots and proline content were measured. The results showed that water stress has significant effect on morphological indexes (shoot length, shoot fresh weight, root fresh weight, shoot dry weight, plant fresh weight, plant dry weight, ratio of dry to fresh weight) [4] and on amount of proline in Trigonella foenum at 1% level for root dry weight, plant height and at 5% level for root to shoot length ratio. The results showed that amount of proline in fenugreek will rise due to increasing of water stress. According to the above mentioned tests Trigonella foenum is a drought tolerant plant.

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**EVALUATION OF EXTRACTION SOLVENTS ON TOTAL PHENOLIC AND FLAVONOID CONTENT FROM *CLEMATIS ORIENTALIS***

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*Clematis orientalis* L. belongs to the Ranunculaceae family and have a wild distribution in Iran. This genus is a well-known plant in Chinese ethno-medicine due to its different therapeutic effects. This species is recognized by woody climbing habit in compare with other species in Iran [1]. The aim of this study describes various solvent extracts of *Clematis orientalis* and it is the first report of comparison of total phenolic and flavonoid content of aerial parts in this plant. The extracts were obtained by hydrolyses extraction method using different solvent polarities consist of Hexane, Chloroform, Ethyl-Acetate, Butanol and Water [2,3]. The highest amount of phenolic content was found in The Ethyl-Acetate extracts ( $9.83 \pm 0.75$  mg gallic acid equivalent/g DW) followed by Butanol ( $6.74 \pm 1.23$ ), Chloroform ( $5.8 \pm 0.83$ ), Hexane ( $4.45 \pm 1.12$ ) and Water ( $4.37 \pm 1.56$ ) extracts respectively. While total flavonoid contents of Ethyl-Acetate solvent ( $4.40 \pm 1.25$  mg rutin equivalent/g DW) was found significantly higher than other solvents consist of  $3.20 \pm 1.33$ ,  $2.66 \pm 0.63$ ,  $1.95 \pm 1.18$  and  $1.85 \pm 0.42$  for Chloroform, Butanol, Hexane and Water extracts respectively. Data from present study revealed that *Clematis orientalis* is a rich natural source of phenolic and flavonoid compounds and it can be regarded as the main reason of the wild traditional usages in ethno-medicine of different countries. But the extraction solvent is more affective on the extracted compound amounts.

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A COMPARITIVE STUDY OF ANTIOXIDANT ACTICITY IN DIFFERENT  
EXTRACTS OF *CLEMATIS ISPAHANICA*

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*Clematis ispahanica* is an endemic medicinal plant of Iran which is recorded for the first time in central regions of the country. This species is distributed in different parts of Iran plateau nowadays [1]. *Clematis* is well-known plant in traditional medicine because of its effects in treatment of rheumatic pains, fever, infections and many other human diseases [2]. The aim of this study was to evaluate and comparison in antioxidant activity of the different extract of *Clematis ispahanica* using two different methods of DPPH radical scavenging activity and FRAP (Ferric-Reducing-Antioxidant power). The potential of the extracts for the first method was determined as described earlier by Gulcin et al. [3]. Also the ferric reducing property of extracts was determined by described assay by Yen and Chen [4]. The result showed that the DPPH values for investigated species extracts were 63.46% for chloroform, 60.57 % for hexane, 57.04 % for ethylacetate, 53.11 % for butanol and 48.53 % for water extract. Also the reductive potential *C. ispahanica* extracts at a concentration of 300 µg/mL was found to be in the ascending order 62.5% in chloroform, 59.13% in hexane, 55.66% in ethyl acetate, 50.11% in butanol and 45.36% in water extracts respectively. The results showed that the chloroform extract of *C. ispahanica* showed the highest antioxidant activity in both evaluated methods and so it is concluded that the major effective phytochemical agents of this activity are extracted using chloroform solvent. Therefore, further comprehensive investigation is required for determination of phytochemical properties of *C. ispahanica*.

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**SYNERGISM EFFECTS OF *URTICA DIOICA* AND *PIOGLITAZONE* AGAINST PERIPHERAL NEUROPATHY BY ALLEVIATING OXIDATIVE STRESS AND MITOCHONDRIAL PROTECTION IN STREPTOZOCIN-INDUCED DIABETIC MICE**

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Diabetes mellitus is one of the serious problems worldwide. Uncontrolled chronic hyperglycemia could result in various complications, including neuropathy. *Urtica dioica* L. (UD) is known for its hypoglycemic and antioxidant effects. In this study we evaluated the efficacy of UD and pioglitazone (PIO) in reduction of oxidative stress in streptozocin-induced diabetic mice [1-3]. Male mice were divided into seven groups: control, diabetic, DMSO-treated control, PIO-treated, UD-treated, UD-PIO-treated and Vitamin E-treated. For induction of diabetes, Streptozocin was injected in a single dose (65 mg/kg, ip). All treatments were performed for five weeks. After 24 h, animals were killed, brain tissue was separated and the mitochondrial fraction was isolated with different centrifuge technique, and Oxidative stress markers (ROS, lipid peroxidation, protein carbonyl, glutathione and mitochondrial function) were measured in brain and brain isolated mitochondria [4, 5]. Elevation of oxidative stress markers and mitochondrial damage were observed in diabetic mice compared to control group. Administration of PIO and UD ameliorated the oxidative stress ( $p < 0.05$ ) in diabetic mice. Also increase in pain score was shown in diabetic mice that treatment with UD and PIO diminished elevation of pain score in diabetic mice. Interestingly, simultaneous administration of PIO and UD showed synergism effect in attenuation of oxidative stress and hyperalgesia. UD showed a therapeutic potential for the attenuation of oxidative stress and diabetes-induced hyperalgesia that can be considered as co-treatment in treatment of diabetic neuropathy.

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**EFFECTS OF ENDOPHYTIC FUNGUS PIRIFORMOSPORA INDICA ON SOME  
PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES IN SILYBUM MARIANUM**

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The activity of antioxidant enzymes and plant hormones significantly will change due to physiological status, age, nutrient availability or existence of a response to the initial tension. In this respect, Piriformospora indica as a root endophytic has desirable effect on the growth of various plants and increase their resistance to abiotic stresses. Due to increased use of medicinal plants to treat patients, studies for improving growth and tolerance of these herbs is ongoing. One of the herbs that grow in large areas of Iran is Milk thistle (*Silybum marianum*). This plant contains high levels of compounds Flavonoids, most notably Silymarin and its derivatives, which constitute about 1.5% to 3% of the content of the fruit that it accumulates mainly in the outer shell. Environmental biotic and abiotic stresses cause tissue damage, which is mainly caused by the accumulation of reactive oxygen compounds (ROS) that leads to the oxidation of cells. These compounds protect cells against important tasks antioxidant system of plants. The enzymatic and non-enzymatic antioxidant activity will change significantly due to physiological status, age, or the availability of nutrients as a primary stress response. In this paper the effect of *P. indica* fungi inoculated with *Silybum marianum* on its Physiological parameters such as growth or content of antioxidant capacity will be studied. Experiment was conducted in completely randomized block design with three replications and with two levels of *p.indica*-inoculated and non-*p.indica*-inoculated *Silybum marianum*. Our study demonstrated *P.indica* significantly increased shoot, leaf and root biomass length and weight. Activities of antioxidant enzymes in leaf such as catalase (CAT), superoxide dismutase (SOD), Chlorophyll-a and Chlorophyll-b decrease but peroxidase (POD) increase, in addition the length of leaf have no significant changes. In root section superoxide dismutase and peroxidase increase but catalase decrease in *p.indica*-inoculated than non-*p.indica*-inoculated *Silybum marianum*.

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**MITOCHONDRIAL OXIDATIVE DAMAGE OF PARAQUAT: PROTECTION  
BY RESVERATROL**

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Paraquat could exert its toxic effects via induction of oxidative stress and mitochondrial dysfunction. We examined the ability of resveratrol, a natural antioxidant to prevent paraquat-induced mitochondrial oxidative damage using rat-isolated brain mitochondria. Mitochondria were isolated from brain of wistar rats by different centrifuge technique. After exposure of isolated brain mitochondria with paraquat (3 mM) and different concentration of resveratrol (50, 100 and 200  $\mu$ M), several factors including reactive oxygen species (ROS) formation, lipid peroxidation (LPO), glutathione (GSH) content and mitochondrial swelling was evaluated. Resveratrol attenuated paraquat-induced mitochondrial ROS formation, LPO and GSH oxidation. Resveratrol also prevented the mitochondrial swelling following the paraquat treatment in isolated brain mitochondria. Our results showed that resveratrol may be mitochondria-targeted antioxidant and suggested this compound as a possible candidate for prevention and treatment against Paraquat – induced toxicity.

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**GENE EXPRESSION ANALYSIS OF CYP82Y1, SDRI AND PSMT1 INVOLVED IN NOSCAPINE BIOSYNTHESIS PATHWAY IN SOME OPIUM POPPY ECOTYPES PLANTS (*PAPAVER SOMNIFERUM* L.)**

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Opium poppy (*Papaver somniferum* L.) is one of the ancient medical crops and produces several important alkaloids such as morphine, noscapine, sanguinarine and codeine. Noscapine is a benzylisoquinoline alkaloid produced in opium poppy (*Papaver somniferum*) and other members of the *Papaveraceae*. The biosynthesis pathway of noscapine in opium poppy has been developed in recent years. In this study, some ecotypes of opium poppy have collected from regions of Iran. Then expression analysis of three key genes (cyp82y1, SDR1 and PsMT1) were quantified by qRT-PCR. Results illustrate a difference expression between studied plants in transcription level. CYP82Y1 and SDR1 were more expressed in sample No. of 12 than other samples. This difference of expression may effect on noscapine content in studied tissue.



**PHYTOCHEMICAL AND BIOLOGICAL EVALUATION OF *ZERAVSCHANIA MEMBRANACEA* ESSENTIAL OIL AND EXTRACTS**

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Essential oils of various species of edible and medicinal plants have been extensively used in folk medicine, food flavoring, and perfumery, cosmetic and pharmaceutical industries (1,2). *In vitro* antimicrobial activity and volatile compositions of *Zeravschania membranacea* essential oil and extracts were investigated. The essential oil of air-dried plant material was isolated by hydrodistillation for 3 h, using a Clevenger-type apparatus. The volatile composition of essential oil were analyzed by GC/Mass spectroscopy. The dried and powdered aerial parts of the plant was extracted with methanol for 48 hours. The methanol extract (M) was dissolved in water and fractionated with chloroform and ethyl acetate, respectively to give a chloroform fraction of methanolic extract (C-M), ethyl acetate fraction of methanolic extract (E-M) and water fraction of methanolic extract (W-M). Essential oil and different extracts were tested by disc diffusion assay for their *in vitro* antimicrobial activity. The most important compounds of essential oil were monoterpene compounds. The essential oils and the extracts were tested individually against a range of 11 microorganisms, including 9 bacteria and 2 fungi species. The most sensitive microorganism was *Bacillus cereus* with inhibition zones of 20 mm for ethyl acetate fraction of methanolic extract and essential oil. The results of antimicrobial activity of the essential oil according to the disc diffusion method indicated that the essential oil showed moderate to high inhibitory activity against the tested bacteria, except for *Pseudomonas aeruginosa*. The results indicated that the extracts had high inhibitory activity against the *Bacillus cereus* and *Staphylococcus epidermidis*. Ethyl acetate fraction of methanolic extract and water fraction of methanolic extract demonstrated significant activity against *Bacillus cereus* strain inhibition zones of 20 mm.

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**EFFECT OF DIFFERENT *AGROBACTERIUM* STRAINS AND VARIOUS INFECTION METHODS ON HAIRY ROOT INDUCTION IN COMMON MULLEIN (*VERBASCUM THAPSUS*)**

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Common mullein (*Verbascum thapsus* L.) is a biennial, or rarely an annual plant belongs to the family of Scropholariaceae with a deep tap root. The plant is native to Europe and Asia where it has been introduced as medicinal herb. Since ancient times, *V. thapsus* has been used to relieve chest pains and a remedy for spasmodic coughs and diarrhea, asthma, and migraine headaches and has also been reported to possess antiviral activity against influenza in chicken embryos. *V. thapsus* contains polysaccharides; iridoid glycosides including harpagoside; harpagide and aucubin (especially in the leaf); flavonoids, including 3'-methylguercitin, hesperedin and verbascoside; saponins and volatile oils. Some of the most precious of these secondary metabolites (SMs) accumulate in the plant roots. The development of an efficient protocol for successful hairy root (HR) induction by *Agrobacterium rhizogenes* is the key step toward an *in vitro* culturing method for the mass production of SMs. The selection of an effective *Agrobacterium* strain for the production of HRs is highly plant species dependent and must be determined empirically. The objective of the present study was to investigate the transformation efficiency of different *A. Rhizogenes* strains and infection methods for the induction of transgenic HRs in *V. thapsus*. Wild-type *A. Rhizogenes* ATCC15834, LBA9402, and A4 were used to infect the plant leaf through needle and sonication-assisted *A. rhizogenes*-mediated transformation (SAArT) [4]. The results showed that using needle infection enhanced frequency of HR induction by up to 80%. Used strains exhibited varied infection efficiency patterns, emerging time (ET), and HRs formation rates. ET in ATCC15834 and A4 was 4 days earlier than LBA9402. Among the *A. rhizogenes* strains ATCC15834, a 100% infection efficiency was observed. Whereas, the strain A4 and LBA 9404 had comparatively lower efficiency (65 and 75%). With respect to the HR number, the strain ATCC15834 (average, 8) was superior, followed by A4 and LBA 9404. Finally, it can be proposed that ATCC15834 is the best *A. rhizogenes* strain for HR induction in *V. thapsus*. These induced HRs provided a useful material for further biotechnological strategies like HRs cultures for enhanced production of valuable *V. Thapsus* compounds on a large scale.

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**BITTER CUCUMBER CONSUMPTION IN TRADITIONAL MEDICINE  
CITY MIYANDOAB**

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Bitter Cucumber (*Citrullus Colocynthis*) is one of the herbs that human society has always been used to treat various diseases. The aim of this study was to investigate the indications and traditional consumption of Bitter cucumber among the Miyandoab city, which can be a step towards preserving traditional knowledge area and guide interested people to use of medicinal plants. The different parts of the city Miyandoab through geographic map of the city from official sources (Department of Environment) was prepared respectively. Then, in each section of the questionnaire to collect information on the traditional use of Bitter cucumber from groceries, pharmacies and elderly and experienced was started. In this study medicinal properties, methods, and how to use traditional herbal Bitter cucumber and the awareness of this plant were examined, that the investigation was carried out in different parts of the city Miyandoab. Different from that in consuming and there indications and the biggest difference is in how to use the plant. Similar research conducted can be preserved Indigenous Knowledge and information and by introducing the possible effects of Bitter cucumber plants like the proper use of medicinal plants among the people promoted.



**SYNTHESIS OF SILVER NANOPARTICLE BY USING MULLEIN  
(*VERBASCUM THAPSUS*) EXTRACTS**

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Nowadays, nanotechnology consider as an interesting research field because of production of nanoparticles in different size, shape, chemical composition, distribution and their applications for human. Although the production of nanoparticles is done in different ways but the purpose of this study was to produce bio-nanoparticles as an antibacterial. Because these bio-nanoparticles don't require to energy and they are environmentally friendly. This study, was done as a complete randomized design in three replications. Herbal samples were collected from national park of Salouk and Sarigol in Esfrayen city. Plant flowers were dried and then aqueous extract was prepared. Silver nitrate was added to plant extract for biosynthesis of nanoparticles. After a few minutes the color changed from yellow to brown that it caused reduction of silver ion to metallic ion (form of nanoparticles). In addition to ultra-violet spectrophotometer for detecting of nanoparticles, scanning electron microscopy, X-ray diffraction and infrared spectroscopy were used. Soluble that containing silver nanoparticles have maximum optical density at a wavelength of 410 nm. The presence of silver nanoparticles was confirmed by X-ray diffraction. Scanning electron micrographs showed that spherical nanoparticles with a size of about 50 nm.

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**EVALUATION OF SEDATIVE-HYPNOTIC EFFECTS OF AQUEOUS EXTRACT  
OF *HAPLOPHYLLUM ACUTIFOLIUM* IN MICE**

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Insomnia and sleep disorders are problems of modern life. Currently available sedative-hypnotic medicines can cause unwanted effects such as tolerance, dependency, amnesia, and rebound insomnia. The use of medical plants has increased in recent years because of their less undesirable effects compared to chemical drugs. The present study was designed to investigate the sedative-hypnotic effects of *Haplophyllum acutifolium* (Rutaceae). The effects of aqueous extract of *Haplophyllum acutifolium* were evaluated by pentobarbital and open field tests in male NMRI mice. Each test was an experimental study on 32 mice which were randomly divided into 4 groups including saline (control), and 3 test groups. In the test groups, the animals received 50, 100, and 200 mg/kg of aqueous extract of *Haplophyllum acutifolium*. In the pentobarbital test, all the test compounds were injected intraperitoneally (IP) 30 minutes before pentobarbital administration. Duration of pentobarbital-induced loss of righting reflex was recorded and was considered as sleeping time. In the open field test, similar to the pentobarbital test, the animals were placed in the open field arena 30 minutes after IP administration of compounds or saline and videotaped for 10 minutes. The videos were analyzed by Ethovision software and total distance moved by mouse during 10-minute period was measured. Aqueous extract of *Haplophyllum acutifolium* increased the duration of pentobarbital-induced sleep at doses of 50, 100, and 200 mg/kg. Similarly, the extract at doses of 50, 100, and 200 mg/kg decreased the total distance moved. The present data demonstrated that *Haplophyllum acutifolium* potentiates sleeping behaviors and also has sedative effects. Several alkaloids have been extracted from aerial part of the plant [1]. Further studies are necessary to find the active component (s) responsible for the sedative-hypnotic effects of the extract.

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**ISOLATION OF GLYCYRRHIZIC ACID-PRODUCING ENDOPHYTIC FUNGI  
FROM LICORICE (*GLYCYRRHIZA GLABRA* L.)**

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*Glycyrrhiza glabra* L. (Fabaceae), a herbaceous perennial plant with large roots, is one of the most well-known medicinal plants that have been used by human beings. Glycyrrhizic acid (GA), a rich content triterpenoid saponin, is the most important pharmacologically active component in the plant roots. GA have significant effects similar to adrenal cortical hormone and can be used in clinical for anti-inflammatory, anti-aging, decompression, enhancing body immunity, improving physiological function, and restraining cancer cells growth, showing really curative effect. However, natural sources of wild licorice are very limited because of the low bud ratio of the seeds and destructive exploitation of people. Endophytic fungi (EF) have been considered to be untapped sources of natural products and should be included in the search for new and innovative biologically active compounds such as GA. In the present study, a total of 45 EF were isolated from *G. glabra* roots collected from different natural habitats of Iran *i.e.* Khorasan, Kerman, Fars, Lorestan, Khuzestan, Esfahan and Hamedan. The isolates were then cultured in liquid media (Potato Dextrose Broth) for 20 days. MeOH and Ethyl acetate were used as the organic solvents to extract GA from both mycelia and broth media, respectively. The ability of isolated EF to produce GA was evaluated using high performance liquid chromatography (HPLC). Subsequently, isolates capable of producing GA were considered to be identified according to their morphological features and Internal Transcribed Spacer (ITS) region.

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**STUDY OF TOTAL PHENOL AND FLAVONOID CONTENTS OF DIFFERENT  
ORGANS OF 2 SPECIES OF *TAMARIX***

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Plants are almost rich sources for phenolic compounds such as flavonoids, tannins and anthocyanins, which are the most important natural antioxidants. Free radicals are the source of many diseases such as cancer. Phenolic compounds are plant secondary metabolites that have a high antioxidant power. Natural phenolic compounds play an important role in cancer prevention and treatment. *Tamarix* is an herb belonging to the *Tamaricaceae* family, consisting of phenolic compounds which can act as antioxidants. The objective of this research was to study of phenolic and flavonoid compounds of three organs (leaf, stems and Flower) of 2 species of *Tamarix* in Sistan region. Phenolic and flavonoid contents were measured by Folin-Ciocalteu and Aluminum chloride methods, respectively. The results showed that the highest phenol and flavonoids content was observed in Flower species of *T. dioica*. *Tamarix*, particularly the *T. dioica* Flower, can be a useful source of natural antioxidants.



**ALLELOPATHIC POTENTIAL OF *DAPHNE MUCRONATA* ROYLE**

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Allelopathy is an important mechanism of plant interference mediated by the addition of plant-produced phytotoxins to the plant environment and is a competitive strategy of plants [1]. The aim of the present study was to investigate the potential allelopathic effects of hydro-alcoholic extract (ethanol-water) from leaves of *Daphne mucronata* (Thymelaceae) on the germination of a weed (*Amaranthus retroflexus*) and a crop (*Lipidium sativum*) under laboratory conditions. The full expanded leaves of *D. mucronata* from Fars province, Margoon region were collected at spring. The prepared extract concentrations were 0.2, 0.4, 0.6, 0.8, and 1% along with a control. The total phenols of the extracts were measured by Epoch Microplate Spectrophotometer instrument. The maximum allelopathic effect (90 % inhibition effect) for both species was observed by application of the extract at 1%. The results indicated that the plant extract contains high levels of phenolic compounds, with worthy allelopathic potential.

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**THE EFFECT OF SALINITY ON THE ACTIVITY OF ANTIOXIDANT ENZYMES  
AND THYMOL IN THYME (*THYMUS VULGARIS* L. *VARICO III*)**

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Due to the increasing saline lands and the lack of suitable lands for agriculture, identification of salt tolerant plants is very important. Thyme is one of the most important medicinal plants which should be evaluated for planting in different saline soils. In this research the effect of salinity on the activity of antioxidant enzymes and the amount of thymol in thyme. The study was conducted in the Institute of Medicinal Plants (SID) in a randomized complete block design with 4 levels of salinity treatments (control, 50, 100 and 150 mM NaCl) in 3 replications. The result showed that salinity increased the activity of ascorbate peroxidase, and catalase. Analysis of variance and mean comparison result showed that most traits were affected by salinity stress. The main components of essential oil are thymol and carvacrol which increased by increasing the level of salinity (100 mM sodium chloride).

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QUANTITATIVE DETERMINATION OF BETULINIC, OLEANOLIC AND  
URSOLIC ACID IN DIFFERENT PLANT PARTS OF  
*ROSMARINUS OFFICINALIS* L.

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Rosemary (*Rosmarinus officinalis* L.) is an aromatic plant belonging to Lamiaceae family which is native to the Mediterranean region but it can grow throughout the world. The plant is a rich source of pharmacologically active substances including di- and triterpenoids, phenolic acids, and flavonoids. The plant aerial part is interesting as a source of lupane-, oleanane-, and ursane triterpenoids *i.e.* betulinic acid (BA), oleanolic acid (OA) and ursolic acid (UA) derived from a squalene precursor [1]. BA, OA and UA display various pharmacological effects including anti-inflammatory, antimicrobial, hepatoprotective, anti-HIV, anti-cancer anti-ulcer, gastroprotective, hypoglycemic, and antihyperlipidemic [2,3]. In this study, the content of BA, OA and UA as pentacycliterpenoids (PTs) in different plant parts of *R. officinalis* (leaves, stems, flowers, and roots) was determined using RP-HPLC. Analysis was carried out using Waters' symmetry C-18 column with methanol: phosphoric acid: water (87:0.05:12.95) as isocratic elution mode with UV detection ( $\lambda=210$  nm). HPLC analysis indicated that BA is the main PT in all organs ranging from 1.6 to 11.2 mg/g dry weight (DW), followed by UA (0.95-4.7 mg/g) and OA (0.6-4.5 mg/g). Our results show that the total content of PTs in *R. officinalis* was in order of: leaves (20.43 mg/g DW) > flower (16.12 mg/g DW) > stem (13.97 mg/g DW) > root (3.16 mg/g DW).

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**EFFECT OF FOLIAR APPLICATION OF PROLINE ON PLANT GROWTH CHARACTERISTICS OF *STEVIA REBAUDIANA* (BERT.)**

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*Stevia rebaudiana* (Bert.) is a herbaceous perennial plant of the Asteraceae family, native to Paraguay. Leaves of stevia produce diterpene glycosides (stevioside and rebaudiosides), non-caloric, high-potency sweeteners and may substitute sucrose as well as other synthetic sweeteners, being 300 times sweeter than sucrose. In addition to its sweetening properties, it has several medicinal applications [1]. Limiting factors for production of this plant are including sensitivity to short day length promoting flowering, low resistance to drought, cold and salt sensitivity [2]. Proline accumulates in many plant species in response to environmental stresses leading to better adaptation and resistance to stress conditions [3]. In this study effect of foliar application of proline on growth characteristics of stevia plant was investigated. After the establishment of the plants in the field, various concentrations of proline (0, 1, 2 mM) were applied three times with 10 days intervals. Factors including plant height, number of nodes, number of branches, number of leaves, total fresh and dry weight were studied. Results showed that proline applications significantly influenced on above mentioned characteristics. The highest average values including plant height (48.33cm), number of branches (9.0), number of nodes (22.33), number of leaves (1073.67), total fresh weight (215.07 g) and total dry weight (51.16 g) was recorded in 2 mM proline treatment and the lowest values was observed in the control treatment. Collectively, the results showed that treatment with proline improves vegetative characteristics and yield in Stevia.

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**EFFECT OF PHENYLALANINE ON PLANT GROWTH CHARACTERISTICS AND PRODUCTION OF *CITRULLUS COLOCYNTHIS* L.**

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*Citrullus colocynthis* L. is an important medicinal plant belonging to Cucurbitaceae family. Different parts of the plant is utilized including seeds, fruit, root, stem, and leaves as either aqueous or oil extracts [1]. Studies have shown that amino acids directly or indirectly affect on plant physiology and developmental processes [2]. Phenylalanine is considered as an important biosynthetic precursor for production of secondary metabolites in medicinal plants as well as for human nutrition and health [3]. In this study effect of foliar application of phenylalanine on growth characteristics, fresh and dry weight of foliage and root, plant length and fruit yield was investigated. Various concentrations of phenylalanine (0, 0.5, 1, 2 mM) applied on the foliage three times starting from about 5 to 6 true leaf stage with 10 days intervals. Results showed that phenylalanine treatments significantly affected growth indices and yield of colocynth compared to the control. The results showed that highest plant length (197.66 cm), fresh weight (10097.2 kg/ha) and dry weight (2333.3 kg/ha) of foliage at the concentration of 2 mM were obtained. The yield of fruit significantly influenced by phenylalanine treatments and the highest yield of fruit (19542 kg/ha) were recorded in the concentration of 0.5 mM phenylalanine compared to control (15601 kg/ha).

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**EFFECT OF EXOGENOUS GAMMA-AMINOBUTYRIC ACID ON ANTIOXIDANT STATUS AND OXIDATIVE STRESS IN SQUASH EXPOSED TO TRIFLURALIN HERBICIDE STRESS**

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This study was designed to assess the antioxidant status and oxidative stress under greenhouse conditions in squash (*Cucurbita pepo*) due to different concentrations of trifluralin herbicide (0, 5, 15, and 25 ppm) in absence and simultaneous application by 1.5mg.L<sup>-1</sup> gamma amino butyric acid (GABA). Seedlings were planted in 24 plastic pots containing a mixture of sterilized soil: sand (1:2) and then randomly allotted into 8 equal groups of 3 pots each (3 replicates). All pots were irrigated every other day with Hoagland's solution and distilled water. All experiment plants were allowed to grow trifoliolate stage and were exposed to Trifluralin treatments. Three days after Trifluralin application, plants were also sprinkled by 1.5mg.L<sup>-1</sup> Gamma amino butyric acid (GABA). The activities of antioxidant enzymes such as ascorbate peroxidase (APX), superoxide dismutase (SOD), catalase (CAT) and guaiacol peroxidase (GPX), proline and malondialdehyde (MDA) were determined. Compared to control, the activities of APX, SOD, CAT and GPX showed a significant increase ( $P < 0.05$ ). In addition, as the trifluralin concentrations increased, significantly increased ( $P < 0.05$ ) level of malondialdehyde (MDA) and proline content was also recorded. GABA treated plants whereas, showed higher antioxidant enzymes activity and proline content versus decreased level of MDA. GABA can alleviate oxidative damage caused by trifluralin herbicide stress in squash (*Cucurbita pepo*) by activating antioxidant defense responses.

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**INDUCTION OF HAIRY ROOTS IN DIFFERENT TISSUES OF  
*TRIGONELLA FOENUM-GRÆCUM* BY INFECTION OF  
SOME *A. RHIZOGENES* STRAINS**

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Throughout history, the usage of herbal plants have been considered. The fenugreek, *Trigonella foenum-græcum*, is a valuable herb which contains some natural compounds. Due to mass-production of high-valuable secondary metabolites, hairy root culture is considered as a stable source to production of these agents. In the present study, the effect of four strain of agrobacterium rhizogenes ,i.e. ATCC15834,1724, K599 and A4, three different culture of media and three type of fenugreek's explants were used in order to induction of hairy roots in this plant. After infection of explants, hairy roots established and we confirmed the accuracy by using PCR assay. We realized that the difference in strain and explant could influence the appearance of observed roots and the appearance time was between 15 to 45 days.

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**THE INTERACTION EFFECT OF GIBBERELIC ACID AND POTASSIUM  
NITRATE ON GROWTH CHARACTERISTICS AND  
PHOTOSYNTHETIC PIGMENTS OF MARIGOLD**

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In order to investigate the interaction effect of gibberellic acid and potassium nitrate on growth characteristics and photosynthetic pigments of marigold, an experiment as a completely randomized design with three replications in 2017 was conducted. The applied factors were gibberellic acid at four levels zero, 250, 500 and 750 Mm and potassium nitrate at 4 levels zero (control), 0.1, 0.2 and 0.3 gr per m. The measured traits were shoot dry weight, root and flowers, chlorophyll a, chlorophyll b and total chlorophyll. The results showed that the using of gibberellic acid increased the shoot dry weight, root, flowers and chlorophyll. Also the most positive effect was observed at 500 mM gibberellic acid. As well as potassium nitrate to enhance growth characteristics and photosynthetic pigments of marigold was useful. Potassium nitrate increased shoot dry weight, root and flower and photosynthetic pigments, so that the most positive effect was obtained in 0.2 gr per m of potassium nitrate. According to the obtained results in connection with the interaction effect of gibberellic acid and potassium nitrate can be concluded that the using of gibberellic acid with potassium nitrate, especially in combination with gibberellic acid with 0.2 gr per m of potassium nitrate was improved the growth traits and photosynthetic pigments of marigold.

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**THE EFFECTS OF MEDICINAL PLANTS FOR INDUCTION OF ANESTHESIA  
AND RECOVERY TIME FROM ANESTHESIA IN FISH ZEBRA CICHLIDS  
(*LOBOCHILOTESB LABIATUS*)**

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The use of different fish species for aquaculture and research and is indicated for sedation and anesthesia in sampling, testing various aquaculture industry is an important issue. Effect of various medicinal herbs to cure Aquatic effective Products important is unknown. In this study, 210 zebra cichlids fish (*Lobochilotesb labiatus*) with weight range  $0.5 \pm 10$  g and  $0.2 \pm 3.5$  cm length after the election and during the period in vitro adaptation with the same biochemical factors (oxygen, nitrate, nitrite, water hardness,  $CO_2$ , Ph, temperature) were maintained. 15 fish were randomly assigned to experimental and control groups, each group was evaluated with three replications. Group evaluated with aqueous extract of medicinal plants clove, saffron, Lemon balm and cinnamon individually and combined with chemical drugs ketamine and xylazine evaluated in order to achieve anesthesia (anesthesia signs of stage 3). During the review for prediction of glucose and the stress of commercial kits were used to measure glucose. The results indicate the maximum duration of anesthesia for the third plan to achieve a plant extract of saffron and Combine cloves and lemon balm extract maximum shelf life of the third stage of anesthesia (anesthesia effective) combination of cloves and saffron and lemon balm and lemon balm combined has the most remaining duration of the third stage of anesthesia and lowest was associated with cinnamon. Most shelf life of anesthesia is with chemicals such as ketamine and xylazine while very low dose ketamine was more effective and lowest remaining duration of effective anesthesia related to xylazine. The glucose test results suggest that excessive rise of blood glucose with a combination of ketamine and xylazine drugs and lowest blood glucose levels related to Lemon balm aqueous extract.



**THE EFFECT OF SALICYLIC ACID ON BASIL MORPHOLOGICAL TRAITS  
AND ESSENTIAL OIL CONTENT AFFECTED BY SALINITY STRESS**

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In order to investigate the effect of salicylic acid and salinity stress on morphological traits and essential oil content of Basil, an experiment as a completely randomized design with three replications in 2016 was conducted. The applied factors were salicylic acid at levels of no-using (control), 0.5, 1, and 1.5, as well as salinity at no-using (control), 30, 60 and 90 mg per liter. The measured traits were shoot height, root length, shoot dry weight and root, leaf area and essential oil content. Salinity stress decreased shoot height, root length, shoot and root dry weight, leaf area. Generally, the most negative effect at salinity level of 90 mg per liter was observed. Also, the 30 and 60 mg per liter of salinity by increasing Basil essential oil content was related but by increasing salinity levels to 90 mg per liter of essential oil was decreased that this reduction was not significant. Salicylic acid increased shoot height, root length, shoot dry weight and root level, but had no significant effect on oil percent. In general, the using of salicylic acid in the presence of salinity stress could amend the negative effects induced by salinity stress, so that level 1 mM salicylic acid had the most significant effect at reducing the negative effects of salinity stress.

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**EFFECTS OF GAMMA IRRADIATION ON INDUCE DIVERSITY AND GROWTH CHARACTERISTICS OF PURSLANE (*PORTULACA OLERACEA*.)**

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Purslane (*Portulaca oleracea* L.) is a valuable medicinal plant, containing different kinds of active ingredients. Purslane seed has several properties: it is anti-thirst, dry cough, asthma [1] and blood purifier [2]. Induced mutation can efficiently be used to create new variations as a basis for plant breeding. This study was conducted to evaluate the effect of gamma rays (doses of 0, 200, 300, 400, 500 Gray) in a completely randomized design with five replications on root length, shoot length, plant height and lateral shoot number of Purslane and also to determine the suitable dose of gamma rays for mutation induction. On the basis of multiple variance analysis using Hotelling test, significant differences were observed among different gamma treatments for evaluated traits (root length, shoot length, plant height and lateral shoot number) ( $P < 0.01$ ). By simple variance analysis, significant difference was observed for all traits ( $P < 0.01$ ). The maximum of root length, shoot length, plant height and lateral shoot number was observed in 400 Gray. Correlations among different traits were significant ( $P < 0.01$ ) and maximum correlations ( $r = 0.918^{**}$ ) was obtained between shoot length and root length.

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**ANALYSIS ANTIOXIDANT PROPERTIES OF PURSLANE  
(*PORTULACAOLERACEA*)**

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The purpose of this test was to evaluate the antioxidant properties of purslane growth stage. Purslane in growth stage of South Khorasan province city Arian city from early summer to late this season collected and dried in the open air and was then ground. Measuring the antioxidant properties of this plant were investigated by evaluating the free radical scavenging Diphenyl-1-picrylhydrazyl (DPPH) that in this method, the amount of antioxidant plant extract by methanol extraction was determined 56.7%. The results showed that Purslane has the ability to neutralize free radicals, inhibiting potential cardiovascular disease, cancer and infectious diseases due to the high antioxidant properties and its use can reduce the rate of oxidation of low density lipoprotein (LDL) as an important factor in atherosclerosis.



**STUDYING ANTICANCER EFFECTS OF PARTHENOLIDE ON HUMAN  
LEUKEMIA/LYMPHOMA CELLS *IN VITRO***

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Parthenolide is a sesquiterpene lactone isolated from feverfew plant (*Tanacetum parthenium*) with broad-spectrum anticancer and antiproliferative activities. Adult T-cell leukemia/lymphoma (ATLL) is a peripheral T-cell lymphoma caused by human T-cell leukemia/lymphoma virus type 1 (HTLV-1). HTLV-1 infects approximately 5–10 million people worldwide, and Iran especially Khorasan province are known as endemic regions for this virus. Despite advances in therapy and management of ATLL, the average survival rate of this malignancy is low. Since identification of new and more effective anticancer agents is necessary for ATLL treatment, we aimed to investigate cytotoxic effects of parthenolide on ATLL cells in the present study. To do so, MT-2 cells were treated with increasing concentrations of parthenolide for 24, 48 and 72 hours. Then, viability of cells was evaluated using WST-1 detection kit, according to the manufacturer's instruction. Results of current study revealed that 2.5 and 5 µg/ml parthenolide had no significant toxic effects on MT-2 cells after 24 and 48 hours. Nevertheless, 10 µg/ml parthenolide induced considerable toxic effects after 72 hours, as more than 50% of the cells were dead comparing with relevant control treatment (0.8% DMSO). Since antiproliferative effects of parthenolide were observed in present study, and also its anticancer activities have been reported in a wide range of human cancer cells, it seems that this natural terpenoid derivative could be used, alone or in combination with drugs prescribed for ATLL, in future *in vitro* and *in vivo* studies.



**THE EFFECT OF DROUGHT AND SALINITY STRESS ON SEED GERMINATION  
CHARACTERISTIC AND SEEDLING GROWTH OF MEDICINAL PLANTS  
(*HYSSOPUS OFFICINALIS* L.) AND (*MELISSA OFFICINALIS*)**

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In arid and semi-arid regions such Birjand, the productivity of farming systems is limited by many climatic constraints. Among them, both poor *germination* and crop establishment due to *water stress* and salinity are the most important limitations for crop production. In order to study the effects of water and salinity stress on germination and seedling growth of two medicinal plants, two experiments were conducted at Seed Technology Laboratory of University of Birjand as a completely randomized design with threereplications. In these experiments, the seed germination of two medicinal plants, including hyssop (*Hyssopus officinalis* L.) and lemon balm (*Melissa officinalis* L.) was studied under water and salinity stresses. Experimental treatments included five levels PEG6000-induced drought stress (0, -4, -6, -8, -10 bar) and five levels of NaCl-induced salinity stress imposed by (0, -2, -4, -8, -10 bar). Results showed that water and salinity stress affected on all studied germination traits of both plants. In both types of stress, no seeds of both plants was germinated at the -10 bar. By increasing the severity of water stress, root lengths of hyssop and lemon balm were increased and decreased, respectively. Plumule length showed a decreasing trend at the higher water stress levels in both plants; however it seems hyssop is more sensitive to dehydration. Salinity stress also reduced germination percentage and root and plumule lengths in both studied plants. Totally, the results of this experiment showed that germination and seedling growth indices of hyssop were better than lemon balm under drought and salinity stress condition.





**PROTECTIVE EFFECTS OF HYDRO ALCOHOLIC EXTRACT OF POLYGONUM HYRCANICUM AND GENISTEIN AGAINST RENAL TOXICITY INDUCED BY CISPLATIN IN MICE**

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Cisplatin is a chemotherapeutic agents and use to treat various type of tumors. Cisplatin could induce renal toxicity via oxidative stress. Genistein derived from soybean and is a polyphenolic nonsteroidal isoflavonoid and it has a free radical scavenger effect. *Polygonum hyrcanicum* (polygonaceae) which grows in north parts of Iran. This plant has hepatoprotective effects and  $\alpha$ -glucosidase inhibitory activity. So the aim of this study is protective effects of hydro-alcoholic extract of *Polygonum hyrcanicum* and Genistein on acute renal toxicity induced by Cisplatin in mice. In this study, rats were randomly divided into eleven groups (n=6) including, control group, Cisplatin (7.5 mg/kg, i.p), and the third to fifth group received hydro-alcoholic extract of *Polygonum hyrcanicum* (50,100,200 mg/kg, i.p), sixth to eighth group received Genistein (100,200,400 mg/kg, s.c), ninth group to eleventh received different doses of both of hydro-alcoholic extract of *Polygonum hyrcanicum* and Genistein for 7 days. One hour after last injection, Cisplatin was injected intraperitoneal to mice and 24 h later, all the animals were killed and levels of BUN and Cr in serum and glutathione content in kidney tissue were evaluated. The results showed that Cisplatin increased kidney damage markers and also decreased GSH level in kidney tissue. On the other hand, administration of *Polygonum hyrcanicum* and Genistein significantly decreased the kidney damage markers and also increased GSH level in kidney tissue compared to Cisplatin group. Our results showed that *Polygonum hyrcanicum* and Genistein have protective effects against acute Nephrotoxicity induced by Cisplatin.

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**THE STUDY OF PHARMACOLOGICAL COMPOUND IN TOBACCO RESIN  
BY GC/MS METHOD**

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BASMA is the most important variety of tobacco for flavor in cigarette. In this study, the pharmacological compound in BASMA tobacco resin was extracted with HEXAN and purification by Solid Phase Extraction (SPE) by ethyl ether. Then extracted solution compounds were identified via Gas chromatography– mass spectroscopy (GC/MS) by following program: Column Oven Temp: 60.0 °C, Injection Temp : 250.33 °C, Injection Mode: Split, Flow Control Mode: Linear Velocity, Pressure: 40.6 Kpa, Total Flow: 11.8 ml/min, Column Flow: 0.80 ml/min, Linear velocity : 32.6 cm/sec, Purge Flow : 3.0 ml/min, Split Ratio: 10.0, Ion Source Temp : 200.00 °C, Interface Temp : 270.00 °C, Solvent Cut Time: 3.00 min, Detector, Gain : 0.00 Kv, Oven Temp Program, Rate Temperature(°C) Hold Time(min)-60.- 0.50- 5.0- 250.0- 20.00-15.0-280.0-7.00. Result showed maximum range of some important pharmacological compounds that were contained: Nicotine, Adenine, 1-Imidazol-1-yl-3-methylbut-2-en-1-one, Benzene, 1-methyl-4-(1-methylethyl), Benzo [g] pteridine-2,4 (3H,10H)-dione, 10-ethyl-8-hydroxy-7-methyl, 2-butyl-3,5-dimethylpyrazine, Desmethyldoxepin.

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**EFFECT OF HYDRO ALCOHOLIC EXTRACT OF *OPUNTIA HUMIFUSA* ON  
LEAD INDUCED SMALL INTESTINE INJURY  
HISTOPATHOLOGICAL FINDINGS**

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Lead is a natural compound of the earth's crust, but when it was mined and transformed into man made products, it becomes highly toxic and it can produce acute, sub-acute, and chronic occupational lead poisoning. Even lead poisoning can be result of emissions by lead smelting plants, exhausts by motors running on ethyl fuel, and through soil via food or drinking water etc. The danger to public health from lead and its compounds in the environment still is a matter of concern, for subtle effects of the element on intelligence quotient and blood pressure is potentially significance. Lead poisoning can directly cause neuropathy and chronic renal diseases. The cardiovascular system, spleen, gastrointestinal tract and lung tissues can also be affected. It is also well known that Pb poisoning may cause anemia. *Opuntia humifusa* is a member of the Cactaceae family and it known as an anti-inflammation product. The pharmacological profile in *Opuntia* spp., it reported in some researches the total phenols in an ethanolic extract from South Korean *O. ficus-indica* var. *saboten* were responsible for the radical scavenging activity caused by super oxide and hydroxyl anions. Acclimation period rats were divided into three groups of 6 rats in each one. The first group lead group was treated with 0.01% lead in the drinking water in 30 days, the other group control group serving just distilled water and the third group served 100mg/kg of hydroalcoholic extract of OH by oral gavage. At the end of the experimental period rats were sacrificed and the samples of gastrointestinal tract were fixed in formalin and transferred to lab for histopathological evaluation. Lead group: showed villus shortening, variable degrees of fusion and epithelial atrophy and cell loss and lose of crypt integrity this fact suggests that lead induce pathomorphology, dysfunctions and structural changes in the small intestine.while these changes was not observed in control group. Histopathological evaluation of samples showed reduction in toxicity signs in treated group revealing that treatment of rats with OH hydroalcoholic extract has significantly reduced the frequency of structural dysfunction in treated rats. Some researches have shown the total phenolic profile of this fruit is responsible for its radical scavenging activity that was induced by super oxide and hydroxyl anions.in this research our evaluation showed that administration of this extract reduced the structural changes of small intestine that were induced by lead in wistar rats.

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**INCREASED CYTOTOXICITY OF ARSENIC IN MT-2 LEUKEMIA CELLS BY  
COMBINATION WITH UMBELLIPRENIN**

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Plants belong to the genus *Ferula* (*Apiaceae*), which are endemic in central Asia, are widely used in Iranian traditional medicine. Umbelliprenin is a natural coumarin extracted from dried roots of *Ferula szwitsiana* with wide range anticancer effects. Adult T-cell leukemia/lymphoma (ATLL) is a T-cell neoplasm caused by human T-lymphotrophic virus type 1 (HTLV-1). Although several clinical options are available for ATL patients, the survival rate of this disease is still very low. To investigate whether umbelliprenin could enhance the efficacy of chemical drugs prescribed for ATL, such as arsenic, we used MT-2 cells in present attempt and defined cytotoxicity of combinatorial treatments *in vitro*. In this regard, after the IC<sub>50</sub> value of arsenic was determined in MT-2 cells during 24, 48 and 72 h, cells were treated with combination of umbelliprenin (12.5 and 25 µg/ml) and arsenic (16 and 32 µg/ml) for three consecutive days. Then, viability of cells was assessed by WST-1 kit. Since umbelliprenin crystals were dissolved in dimethyl sulfoxide (DMSO), relevant DMSO treatments were considered as control. Obtained results indicated that 25 µg/ml umbelliprenin increased the toxicity of 32 µg/ml arsenic up 36%. According to current findings, it is worth to study synergic effects of umbelliprenin on other anticancer drugs, as well as more ATL cell lines.



ANTICANCER AND ANTIOXIDANT ACTIVITIES OF *ALSTONIA SCHOLARIS*  
AND *ALSTONIA VENENATA*

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Cancer is one of the leading causes of human death. The discovery of new generations of low-cost anticancer drugs with high efficacy and low toxicity is necessary, and is only possible by screening medicinal plants with prior knowledge. In this study, the bioactivities of three medicinal plants from India, including *Alstonia scholaris*, *Alstonia venenata*, and *Moringa oleifera*, were investigated. From each plant, hexane, benzene, isopropanol, methanol, and water extracts were prepared. Cytotoxicity assays were determined by Trypan blue exclusion, MTT, and apoptotic methods. Antioxidant activities were assayed by superoxide scavenging, hydroxyl radical scavenging, and lipid peroxidation. Among the extracts tested for cytotoxicity on DLA cells, the most active extracts from *A. scholaris* and *A. venenata* were selected (extracts from *M. oleifera* did not show 100% cytotoxicity even at a dose of 500 µg/mL, so it was not considered for determining EC50 value), and their EC50 values were determined. Among the extracts of *A. scholaris*, hexane extract of stem bark showed an EC50 value of 68.75 µg/mL, while n-hexane extract of the leaves showed a higher EC50 value of 118.75 µg/mL. *A. venenata* showed significant in vitro superoxide scavenging activity, superior to that of quercetin. *A. venenata* showed less superoxide scavenging activity. The IC50 values of hexane extract (*A. scholaris*), isopropanol extract (*A. venenata*), and quercetin were 90.5±6.2, 7.5±1.2, and 31.5±2.5 µg/mL, respectively. The hexane extract of stem bark from *A. scholaris* and isopropanol extract of leaves from *A. venenata* are candidate materials for the discovery of a new generation of anticancer drugs to combat diseases such as lymphoma and leukemia. These can also be used as antioxidants in dietary supplements.

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**ANTICANCER EFFECTS OF AURAPTENE ON HUMAN  
LEUKEMIA/LYMPHOMA CELLS**

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Auraptene is a natural prenyloxycoumarin mainly synthesized by *Citrus* plants. It possessed a wide range of pharmacological properties including antioxidant, anti-inflammatory, antimicrobial and anticancer effects. Adult T cell leukemia/lymphoma (ATL) is an aggressive malignancy of mature activated T cells caused by HTLV-1. ATL is endemic in several regions of the world where HTLV-1 is prevalent in particular southwestern Japan, the Caribbean basin, part of central Africa and north eastern of Iran. In spite of improvement in therapy and management of ATLL, the average survival rate of this malignancy is low. Due to the urgent need for new and effective anticancer drugs against ATL, our goal was to determine the anticancer effects of auraptene against ATL cells. To do so, MT-2 cells were treated with increasing concentrations of auraptene for 24, 48 and 72 hours, and then viability of cells was evaluated using WST-1 reagent. Result of our study indicated that 10 and 20 µg/ml auraptene had no significant toxic effects on MT-2 cells after 24, 48 and 72 hours, while the IC<sub>50</sub> of auraptene was determined as 40 µg/ml after 72 hour. To note, cells treated with 0.4% dimethyl sulfoxide (DMSO) were considered as control treatment, as auraptene crystals were dissolved in DMSO. Since anticancer and synergic activity of auraptene has been reported in several studies, this coumarin could be used as a suitable agent in future *in vitro* and *in vivo* studies.



ANTI-METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* ACTIVITY OF  
RUBIACEAE, FABACEAE AND POACEAE PLANTS

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In this study, we evaluated the effects of the extracts of the leaves of species from the Rubiaceae (*Galium aparine* L. and *Asperula arvensis* L.), Fabaceae (*Lathyrus aphaca* L. and *Vicia narbonensis* L.) and Poaceae (*Digitaria sanguinalis* (L.) Scop. and *Hordeum murinum* L.) plant families on a wide and extensive panel of isolated methicillin-resistant *Staphylococcus aureus* strains (MRSA). The effects of the methanolic leaf extracts of Rubiaceae, Fabaceae and Poaceae plants on MRSA were evaluated by the disc diffusion assay and the broth dilution method. Among a total of 177 *S. aureus* isolates, 92 (51.97%) were found to be methicillin-resistant in an antibiogram and this was confirmed by the presence of the *mecA* gene in polymerase chain reaction method. All MRSA isolates were sensitive to all extracts. There were dose-dependent inhibitions on tested microorganisms for all plant extracts which showed maximum inhibition zones at a concentration of 300 mg/L. *L. aphaca*, *G. aparine* and *H. murinum* exhibited the highest antibacterial activity on the MRSA strains compared to the positive control ( $P < 0.05$ ), as well as higher total polyphenol and flavonoid contents than other plant extracts. Minimum inhibitory concentrations on MRSA isolates ranged from  $388.4 \pm 0.2$  mg/L, in *D. sanguinalis*, to  $5.5 \pm 0.1$  mg/L, in *L. aphaca*. The methanolic extracts of *L. aphaca* (Fabaceae), *G. aparine* (Rubiaceae), and *H. murinum* (Poaceae) proved to have high antibacterial activity on MRSA isolates, thus representing promising antimicrobial agents in clinical settings.

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**ANTIBACTERIAL ACTIVITIES OF ESSENTIAL OILS FROM SEVEN IRANIAN  
MEDICINAL PLANTS ON EXTENDED-SPECTRUM B-LACTAMASE-  
PRODUCING ESCHERICHIA COLI**

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The extended-spectrum beta-lactamase (ESBL) -producing *Escherichia coli* strains can lead to various infections particularly urinary tract infections. The main objective of this investigation was to evaluate the antibacterial activities of essential oils (EOs) from different Iranian medicinal plants against TEM gene positive ESBL-producing *E. coli* strains isolated from urine samples of patients with urinary tract infections. EOs were extracted using hydrodistillation method. *E. coli* strains were isolated by different specific Medias. ESBL-producing *E. coli* strains were isolated from urine samples of patients with urinary tract infections in Shiraz hospital, Iran. Then, ESBL- producing strains were identified using double disk synergy test, phenotypic disc confirmatory test and polymerase chain reaction (PCR) for TEM gene detection. The antibacterial activity of the EOs from different plants (*Achillea wilhelmsii* C. Koch, *Echinophora platyloba* DC., *Lallemantia royleana*, *Nepeta persica* Boiss., *Pulicaria vulgaris* Gaertn., *Salvia nemorosa*, and *Satureja intermedia* C.A.Mey) and antibiotics against ESBL-producing strains was studied using the microdilution method for the evaluation of the minimum inhibitory concentration (MIC). The 103 out of 295 *E. coli* strains with 97 (90.65%) TEM gene distributions were identified as ESBL-producing strains. All of the EOs derived from different plants displayed high inhibitory effects against ESBL-producing *E. coli* strains. The results of our investigations may propose a good treatment option against resistant infectious bacteria.

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**THE RESTORATIVE EFFECT AND ANTIBACTERIAL OF AN OINTMENT PRODUCED BY MEDICINAL PLANTS: *SCROPHULARIA STRIATA*, *MATRICARIA RECUTITA L* AND *PISTACIA ATLANTICA* ON INFECTED WOUNDS OF ADULT MALE RATS AND ITS COMPARISON WITH COMMON OINTMENTS**

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Due to lack of harmful effects, herbal medicines have been used in the pharmaceutical industry. In this study, wound healing activity of hydroalcoholic extract of *Scrophularia striata*, *Matricaria recutita L* and *Pistacia atlantica* leave extract cream on infected wounds of adult male Wistar rats was investigated its comparison with common ointments. All parts of the plant were collected and dried. Hydro alcoholic extract was prepared. 40 male Wistar rats weighing  $225 \pm 25$  g were used during the study. They were divided into 8 groups: the first group was left without treatment, the second was treated with Betamethasone, in third group Alpha was used and in the other group, herbal cream in Eucerin base were administrated 2 times daily. and four groups with infected wounds (*Staphylococcus aureus*): the first group was left without treatment, the second was treated with Tetracycline, in third group Triamcinolone was used and in the other group, herbal cream in Eucerin base were administrated 2 times daily. The areas of wounds were measured daily by Motic Images 20001.2 and healing percentage during all the days was compared with one way ANOVA and Turkey. Results revealed that in experimental group compared to control group, a significant increase was seen in wound closure ( $P < 0.05$ ), These findings showed the acceleration of wound healing in the treated samples. There was a significant difference between all the treated, and control groups, but statistical studies showed that the best healing effect was from herbal cream.

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**ANTIOXIDANT CAPACITY IN DIFFERENT ORGANS OF  
RHUBARB (*RHEUM RIBES* L.)**

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Recently, due to healthier and nutritional problems of synthetic antioxidants in food processing, using of herbal medicine and its effective components as a natural resources considered recently. Different organs of rhubarb can be used in food and medicinal science due to having high content of antioxidants, flavonoids and pro-anthocyanin. This study was accomplished in order to examine the total phenolic content, total flavonoid content and antioxidant capacity of rhubarb different organs collected from East Azerbaijan-Shabestar (flower, stem and leaves). Antioxidant capacity, total flavonoid content and total phenolic content were determined using ferric-reducing antioxidant power (FRAP), aluminum chloride method and Folin–Ciocalteu assays. The amount of total phenol content was significantly ( $P<0.01$ ) different among different plant organs ranging from 9.83 to 35.18 mg GAE/g dry weight. Total phenolic content was in its highest value in the flower (35.18 mg GAE/g DW), whereas the lowest level was found in the stem (9.83 mg GAE/g DW). The amount of total flavonoid was significantly ( $P<0.01$ ) different in different plant organs ranging from 0.19 to 1.1 mg/g dry weight. Total flavonoid content was in its highest value in the flower (1.1 mg/g DW), whereas the lowest level was found in the stem (0.19 mg/g DW). The Antioxidant capacity was widely different in the both different organs of the individuals ranging from 6.39 to 35.18 mmol  $\text{Fe}^{++}$ /g DW. Antioxidant capacity was in its highest values in the flower (35.66 mmol  $\text{Fe}^{++}$ /g DW), whereas the lowest capacity was found in the stem (6.39 mmol  $\text{Fe}^{2+}$ /g DW). However, different organs rhubarb showed a high level of total phenolic content as well as antioxidant capacity. These results showed that different organs of rhubarb is as promising sources of natural antioxidants and beneficial bioactive compounds without any harmful effects to food or the pharmaceutical industries.

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**PHYTOCHEMICAL DIVERSITY OF DIFFERENT POPULATIONS OF *PRANGOS* SPP. COLLECTED FROM NORTHWEST OF IRAN**

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*Prangos* spp. is one of the most valuable genus of Apiaceae family which is used in traditional medicine for curing most of diseases. Many laboratory investigations have proved its medical characteristics. This plant is used in traditional medicine to pain relief, control of diabetes and inflammations and has antibacterial and antifungal activity. Plant is find in East and West Azarbaijan, Kurdistan, Kermanshah, Hamadan, Semnan, and Fars province [1]. In the present study, the phytochemical and antioxidant diversity of 19 wild-grown populations of *Prangos* genus collected from North-west were evaluated. Phytochemical variation within populations was study based on total phenole, flavonoid content and antioxidant activity (DPPH) [2, 3]. Extraction were done by methanol solvent and ultrasonication method. According to the results, significant differences were observed between collected populations from different areas for all evaluated traits. The highest total phenole (12.5 mg GAE/g DW) was recorded in the population of Ghoshchi located in West Azarbaijan (*P. uloptera*) and the lowest content (4.18 mg GAE/g DW) was observed in Showt sample from West Azarbaijan (*P. Ferulacea*). The highest amount of total flavonoid content (5.51mg/g DW) obtained in the population of Baneh from Kurdistan provience (*P. Ferulacea*) and the lowest amount (1.2 mg/g DW) being in Naghadeh population of West Azarbaijan (*P. asperula*). In addition, the highest and lowest antioxidant activity (DPPH%) was obtained in the Showt (*P. Ferulacea*) and Naghadeh (*P. Ferulacea*) populations respectively.

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**EFFECT OF HIGH CONCENTRATIONS OF CARBON DIOXIDE AND NITROGEN TREATMENTS ON QUALITY OF FRESH SEEDLESS BARBERRY FRUIT**

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Nowadays, more attention to small fruits such as barberry which is a rich source of various nutrients and antioxidants has increased. Fresh barberry due to the rapid growth of microorganisms and oxidation reactions has a short storage life and therefore most of harvested fruit must be dried to reduce postharvest losses. However, drying process decrease fruit quality attributes to some extent and market prefer fresh fruit as a new product than dried. Hence, this research was done to study the effects of pre-storage treatments with high concentrations of carbon dioxide and nitrogen on postharvest quality of fresh seedless barberry fruit in order to extend postharvest life and improve quality of fresh barberry fruit. Treatments were high CO<sub>2</sub> or N<sub>2</sub> shock, and air as control and duration of exposure to this pre-storage treatments (24 and 48 hours). Treated fruits were then packed in plastic bags with 0.02 mm thickness and placed in a refrigerator at 5 °C. After 4 weeks of storage, various quantitative and qualitative factors such as total soluble solids, titratable acidity, pH, color, decay and visual quality were measured. The results showed that pre-storage treatment with high carbon dioxide shock preserves the fruit redness color, as the highest and the lowest values of color observed in treated fruit with CO<sub>2</sub> for 24 hours and N<sub>2</sub> for 48 hours, respectively. Interestingly, using high concentrations of carbon dioxide pre-storage treatment significantly prevented fruit decay and maintained the quality and taste of treated fruit. Also, treated fruit for 24 hours with carbon dioxide gas was best to maintain the amount of soluble solids, titratable acidity and pH. In general, pre-storage high carbon dioxide shock in short-term has ability to maintain quantitative and qualitative characteristics of fresh barberry fruit as well as fruit decay during refrigerated storage compared to control or treated fruit with nitrogen shock.



**EVALUATION OF PHYTOCHEMICAL DIVERSITY AMONG FLOWER OF  
WILD-GROWING POPULATIONS OF RHUBARB (*RHEUM RIBES* L.) IN IRAN**

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Rhubarb (*Rheum ribes* L.) belongs to the family Polygonaceae. Flower and stem of plant is important in food and medicinal industries due to containing of flavonoids, vitamins and antioxidants. Iran is one of the main biodiversity centers of this valuable medicinal plant. In the present study flower organ of seven wild-growing genotypes of Rhubarb were evaluated phytochemically (West Azerbaijan-Oshnavieh, East Azerbaijan-Saray, Kurdistan-Saghez, Kermanshahe-Kermanshahe, Tehran-Lavasan, Zanjan-Zanjan and Markazi-Arak). Extraction were done by ultrasonic technique. Studied phytochemical indices were total phenol content, total flavonoid and antioxidant activity (DPPH and FRAP). The highest amount of total phenols and flavonoids (110.53 GAE/g DW and 1.97 mg Qu. g<sup>-1</sup> DW) recorded in Tehran and East Azerbaijan respectively. Also the lowest content of flower phenols (9.80 GAE/g DW) and flavonoids (0.33 mg Qu. g<sup>-1</sup> DW) were obtained in Kurdistan samples. Highest antioxidant activity based on DPPH and FRAP bioassays were recorded in West Azerbaijan (94.75 %) and Tehran (59.86 μmol Fe<sup>++</sup> /g DW) respectively and lowest were obtained in Kurdistan with the 68.17 % and 7.42 μmol Fe<sup>++</sup> /g DW respectively. In conclusion based on the obtained results different genotypes of rhubarb are natural sources of antioxidant. Antioxidant activities of the rhubarb flower had positive correlation with their phenolic contents that increased at stages of intermediate and premature. In conclusion, the antioxidant activity of rhubarb flower was considered as useful anti-oxidative agent in the food industries.

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INVESTIGATION OF THE ULTRASOUNDEFFECTS ON  
CHEMICALCOMPOSITION OF *DITTRICHIA GRAVEOLENS* L.ESSENTIAL OIL  
AND ANTIOXIDANT ACTIVITY EVALUATION

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*Dittrichia Graveolens* (L.) is an aromatic, annual plant [1,2]. It has been used as anti-inflammatory, anti-pathogenic, sedative and anti-infective in traditional medicine [3]. The aim of this research is presenting the effect of ultrasound on the yield and chemical composition of *Dittrichia Graveolens* (L.) GREUTER essential oil and the antioxidant activity was assessed using the DPPH test assay which is simple and highly sensitive [4]. The results of previous studies on use of ultrasound in essence extraction show the effectiveness of this method. To the best of our knowledge, ultrasound assisted extraction of *Dittrichia Graveolens* essential oil has been studied for the first time. To evaluate the performance of ultrasound-assisted hydro-distillation (UAHD), essential oil obtained from dried aerial parts of *Dittrichia Graveolens* from north of Iran. For this purpose first two parameters, ultrasound power and ultrasound time which affect the efficiency of the extraction, were studied. 7 tests were successfully designed with two parameters (Time And Power) in three various levels, obtained by the Design Expert software with Central Composite Design method (CCD). Then to demonstrate the feasibility of the method, obtained oil under optimal condition was compared quantitatively and qualitatively with that obtained by conventional hydro distillation (Clevenger) (HD). The chemical compounds of essence were identified by GC and GC-MS analysis. The major constituents of the essential oil from conventional method, among the 48 identified compounds, were delta-cadinene (32.63%), Borneol (21.61%) and Valerenol (11.70%) while 5,7. alpha.H,4,8,11.beta. H-eudesm-2-en-8,12-olide (25.82%), Naphthalene,1,2,3,4,4a,5,6,8a-octahydro-7-methyl-4-methylene-1-(1-methylethyl)-, (1.alpha.,4a.alpha.,8a.alpha.)- (22.51%) and Borneol (21.50%) were in the majority between 42 other compounds using ultrasound and it was richer in oxygenated compounds. Extraction of essential oil from *Dittrichia Graveolens* with UAHD offers important advantages over traditional HD in terms of energy saving, extraction time (15 minutes versus 5 hours), extraction yield (0.21% versus 0.09%) and antioxidant activity which has been increased.

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**HYSSOPUS OFFICINALIS ESSENTIAL OILS AN ANTI-BORDERTELLA  
PERTUSSIS BACTERIUM**

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Hyssopus officinalis is commonly used as a food ingredient (minty flavor and condiment), fragrance and for pharmaceutical purposes as a stomachic, antiseptic and against chronic bronchitis. It is also used in the treatment of rheumatic pains, asthma, wounds, bruises and blood pressure regulation. The aim of this study was to investigate the phytochemical and antibacterial effect of hyssopus essential oil on bordetella pertussis properties. Hyssopus officinalis was purchased from local shops in Amol, Mazandaran and the essential oil was extracted using Clevenger apparatus. Chemical compounds were determined by GC/MS. The most important component of the essential oil was trans 3-Pynanvn (31.16%). The disk and wells microbial testing methods were used to evaluate the anti-bordertella pertussis properties of Hyssopus officinalis essential oil. Essential oil was diluted using DMSO. The formed zone inhibition around the discs and wells indicated the antibacterial activity of essential oil. The diameter of zone inhibition for discs and wells were obtained between 10-15 mm and 35-45 mm, respectively. Considering the formed zone inhibition showed that the pure essential oil had significant effect against the bordertella pertussis bacteria.

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**EFFECTS OF SULFUR TREATMENTS ON AGRONOMICAL AND  
MORPHOLOGICAL CHARACTERISTICS OF HORSE RADISH  
(*ARMORACIA RUSTICANA*)**

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Horseradish (*Armoracia rusticana*) is a strong plant spice in world that is not native to Iran. This plant is rich in vitamins, minerals, and specially sinigrin (a glycoside). The pungent smell of this plant is due to allyl sulfide, a substance present in alliums. In addition, the sulfide compounds have beneficial effects on peripheral blood flow. These sulfure metabolites improve the elasticity of cerebral and coronary blood vessels, so development of amounts of sulfide compound is very important subject. In this research different concentrations of sulfur including (0, 15, 30, 45 g) for each pot (10 kg soil) were added with thiobacillus spp. in greenhouse conditions. Some agronomic and morphological characteristics of plant were recorded. The results showed that the number of leaves, the shape of the leaves, fresh and dry weight of the plant and etc. agricultural and morphological traits of horse radish are influenced by environmental factors such as soil fertilizers specially sulfur.





**EFFECT OF DIFFERENT SEED BED ON MORPHOLOGICAL TRAITS AND ESTABLISHMENT OF *THYMUS DAENENSIS* SUBSP. *DAENENSIS* SEEDLINGS**

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Thyme (*Thymus daenensis* subsp. *Daenensis*) is a perennial dwarf shrub growing 6–30 cm in height, belonging to Lamiaceae family [1]. Fourteen *Thymus* species grow in Iran, they are used as a medicinal herb and spice mainly due to the volatile constituents of plant. *Thymus daenensis* is an endemic species to Iran. The main volatile components of *Thymus* genus are thymol, arvacrol, p-cymene, g-terpinene, borneol, 1,8-cineol, terpinen-4-ol, a-terpineol and b-caryophyllene [2]. Most of the medicinal plants have some problems in seed germination and stand establishment in the field. Since germination and seedling establishment are critical stages in the plant life cycle, offering the solutions for improvement of seed germination and seedling establishment will help to better performance in cultivation of medicinal plants [3]. In this research, the influence of different seed bed (coconut fiber, perlite, sand, soil, disinfection fertilizer and sand, fertilizer on morphological traits including root length, lateral shoot number, shoot length, germination percentage and tolerance of plant to transplanting of thymus were evaluated under greenhouse conditions in a factorial experiment based on completely randomized design with four replications. Our findings revealed that the highest shoot length were 11cm, and germination percentage 94% were obtained from (soil+sand+coconut fiber+perlite+fertilizer, 2:2:2:1) seed beds. The most lateral shoot and the lowest germination percentage 91% was due to (soil+sand+fertilizer, 1:1:1) seed beds. Also, the most root length 14cm was found in (coconut fiber+perlite, 1:1) besides the most drying of seedlings. But (soil+sand+fertilizer, 1:1:1) indicated the best seed bed for transplanting.

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**ANTAGONISTIC EFFECTS OF *PROSOPIS FARCTA* EXTRACT AGAINST THE  
VENOM OF THE IRANIANSNAKES *VIPERAALBICORNUTA*  
AND *MONTIVIPERA LATIFII* IN MICE**

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Snake bite is one of the common health problems in several parts of the world. *Vipera albi cornuta*, locally named Zanjani viper, from North of Iran, such as Northern Zagros, Gilan, Qazvin, Zanzan, and East Azerbaijan. *Montivipera latifii* is a small venomous snake distributed mostly in the central Alborz Mountains of Iran. It has been reported that many medicinal plants have antagonistic effects on venoms or toxins. *Prosopis farcta* is a member of the Leguminosae family and a native plant in Asia, America and Africa. Due to possession of several therapeutic effects, it has been used as a medicinal plant in some parts of Iran. The aim of this study was to investigate the possible antagonistic effect of this plant against the venom of the Iranian snakes Latifi and Zanjani. 80 adult albino mice weighing  $30 \pm 5$ g were equally divided into ten groups. The main work has been done based on three protocols for Zanjani (13 mg/kg) and Latifi (7 mg/kg) venoms. In protocol A, plant extract at concentration of 120 mg/kg was administered immediately after the venom injection, in the protocol B, extract was administered 15 minutes after the injection of venom and finally in protocol C, extract and venom were incubated for 15 minutes in laboratory conditions (25 C°) before administration. In the all stages, the route of plant and venom administration was intraperitoneal (IP) route and survival time of mice were recorded and compared with control groups. 32 mice used as control, two groups of animals received Zanjani and Latifi venoms alone. The animals succumbed after 20 and 43 min respectively. The other two groups received plant extract at concentration of 120 and 180 mg/kg. They remained alive without any sign of toxicity. In protocol A, of Zanjani and Latifi, animals succumbed after 43 and 68 min respectively. In protocol B, animals succumbed after 36 and 70 min respectively and in protocol C, animals succumbed after 49 and 137 min respectively. The results of this study showed that a single dose of *Prosopis farcta* have a protective role against Zanjani and Latifi venoms at least in delaying time to death of envenomed animals. Repeated administration or higher doses of *Prosopis farcta* may be able to prevent death caused by mentioned venoms. The research still continue.

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**SELENIUM MITIGATE CADMIUM STRESS BY PROMOTING GROWTH AND NUTRIENT UPTAKE IN GARLIC (*ALLIUM SATIVUM* L.) SEEDLING**

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Garlic (*Allium sativum* L.) has a high nutritional value, and it used as a prophylactic and therapeutic medical agent. Last few decades have witnessed an enormous apprehension for the environmental pollution contributed through toxic metal accumulation in the soil and water. Cadmium (Cd) in soils present a potential threat to human health because it is incorporated in the food chain mainly by plant uptake [1]. In such condition, stress ameliorator compounds can be effective in terms of Cd stress. Selenium (Se) is considered to be an essential microelement required in trace quantities for the proper functioning of living organisms [2]. The aim of study was to examine the role of Se in ameliorating the adverse effect of cadmium at growth and nutrient uptake in garlic seedlings. Plants were grown hydroponically in greenhouse conditions with various Cd concentrations (0,  $10^{-4}$ ,  $10^{-3}$  and  $10^{-2}$  M) and each one superimposed by two levels of Se (0 and 5 mg L<sup>-1</sup>) through sodium selenate. The results showed that roots Cd contents enhanced to 6.0, 726, 2243.8 and 10149 µg/g dry weight, when the plants were treated with 0,  $10^{-4}$ ,  $10^{-3}$  and  $10^{-2}$  M Cd, respectively. Cadmium exposure, decreased the absorption of K, Ca, Mg, Mn, Zn and Cu while that of Na and Fe was increased by raising the Cd concentration in the media. Se addition in the Cd-containing medium caused remarkable reductions at Cd concentration in root and shoot of garlic. While, application of Se improved root and shoot growth at lower concentrations of Cd, but there were no significant effects at the  $10^{-2}$  M Cd concentration. Amendment of Se increased leaf and root K, Ca and Mg contents. In general, exogenous application of Se could reduce the uptake and accumulation of Cd, thereby minimizing antagonistic effects of Cd on essential mineral transportation in garlic seedlings. Addition of Se considerably balanced Fe and Na in garlic seedlings. Consequently, it can be hypothesized that the regulation of Fe levels in plants by Se may be an important mechanism behind the use of Se to reduce Cd stress. Regulation of the uptake and redistribution of some essential elements by Se is believed to be an important mechanism to re-activate the associated antioxidants, reduce the ROS levels and improve garlic plant tolerance to cadmium stress.

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**THE MORPHOLOGICAL AND PHENOLOGICAL TRAITS OF INDIGENOUS  
BARBERRIES FROM NORTHEAST OF IRAN**

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The indigenous barberries of Iran enjoy a wide range of diversity, among which some of the potential genotypes can be successfully commercialized, on the other hand the selection of these genotypes may finally result in introducing novel types [1,2]. The current study was an attempt to identify favorable traits and its evaluation for food, medicine and ornamental applications. The following research was conducted in the barberry collection garden at Research Institute of Food Science and Technology (RIFST), Mashhad in 2013 and 2014. The traits which have evaluated were included: growth habit, shrub's height, budding, blossom time, posture and length of the cluster, color changing during the ripeness, specification of the fruits such as shape, color, number of the seeds, flavor, brix, acid content, total phenolic and anthocyanin content. The period of budding to blossom was 45 to 52 days. The blossom period was varied from 7 (genotype codes 3-2, 6-2, 9-2) to 14 days (genotype codes 11-1, 13-1). The earliest of barberries blossom, were belong to genotype codes 12-1, 11-2, 13-3 and latest blossom were observed on genotype codes 3-2, 10-3, 9-2. The fruits of genotype codes 14-2 and 3-2 had earliest color changed (July 26<sup>th</sup>) and genotype codes 2-2, 1-2 and 2-3 had latest color change time (September 21<sup>st</sup>) respectively. The greatest amount of anthocyanin was assessed in genotype cods 9-3 and 14-2. In conclusion, based on the results, the barberries genotype codes were classified in to four categories, in respect to color and flavor. The genotype code 2-2 was also showed the promising type for ornamental applications.

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**EFFECT OF PRETREATMENT OF HUMIC ACID ON GERMINATION INDICES  
OF *CALENDULA OFFICINALIS* UNDER DROUGHT STRESS CONDITIONS**

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Lack of favorable plant germination and establishment is one of the problems that farmers encounter in dry areas. Seed priming has been suggested as an effective strategy for increased plant establishment, especially under adverse conditions. In order to evaluate the effect of priming with humic acid on seed germination of pot marigold (*Calendula officinalis*) under drought stress conditions, a factorial experiment was conducted based on completely randomized design with three replications at the Research Laboratory of Faculty of Agriculture, University of Birjand in 2016. The first factor included nine levels of humic acid (0 as the control, seeds treated with distilled water, 100, 150, 200, 250, 300 and 400 mg/lit), and the second factor included four levels of Drought stress (0, -4, -8, -12 bar). Pot marigold seeds were surface sterilized using sodium hypochlorite 0.5% for 30 seconds and then were washed several times with distilled water. For priming, seeds of pot marigold were soaked in mentioned concentrations of humic acid at 25 ° C for 24 hours and then, the seeds were dried out through exposing to free air. To test for germination capability, 20 seeds were placed in Petri dishes on filter paper and then 5 ml of corresponding polyethylene glycol solutions were added to each Petri dish. The Petri dishes were sealed with parafilm and placed at 25/15 ° C in the germinator. The number of germinated seeds were recorded for 14 days with the criterion of 2 mm protrusion of radicle. The length of seedlings root and shoot were measured using a ruler and then the dry weight of samples were measured after placing them in an oven set at 75 ° C for 24 hours. The results showed that drought stress significantly decreased fresh and dry weight of seedlings, germination rate, germination percentage, and seed vigour index. Both of separated and interaction effects of drought and humic acid were significant on germination percentage, germination rate, fresh and dry weight of seedlings and seed vigour index. Humic acid had a positive effect on germination and encouraged it under stress treatment. The level of 200 mg/lit of humic acid showed superiority under high drought stress levels compared to other treatments in most of the studied traits. The results showed that pretreatment of pot marigold seeds by humic acid in dry areas can alleviate the adverse impact of drought conditions on seed germination and seedling establishment of this medicinal plant.



**EFFECT OF ENDOPHYTIC FUNGUS *PIRIFORMOSPORA INDICA* ON SOME  
PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF *ZEA MAYS*  
UNDER LEADSTRESS**

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Production of major crops such as corn is faced with a variety of biotic and abiotic stresses such as heavy metals. *Piriformospora indica* root endophytic fungus has a favorable impact on the growth of various plants and increase their resistance to abiotic stresses such as heavy metals [1, 2]. The aim of the present study is to evaluate the effect of *P. indica* on Corn (*Zea mays*) under lead stress. Therefore, according to treatments designed, (mycorrhizal and non-mycorrhizal treatments of six treatment groups) some growth parameters and activity of antioxidant enzymes were measured. The average length of root and shoot, fresh weight of roots and shoots of corn was higher in mycorrhizal treatments than non-mycorrhizal treatments, but in some cases the difference was not significant. The amount of lead accumulation in root mycorrhizal treatments was higher than non-mycorrhizal treatments but leaves opposite. Catalase activity has not been a constant trend in mycorrhizal treatments than non-mycorrhizal treatments. It seems symbiotic fungus *P.indica* can prevent the adverse effects of lead on corn, relying on the increased activity of antioxidant enzymes.

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**EFFECT OF PRETREATMENT OF HUMIC ACID ON SEEDLING EMERGENCE  
OF *CALLENDULA OFFICINALIS* UNDER DROUGHT STRESS CONDITIONS**

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Excessive application of chemical fertilizers in the greenhouses is one of the most serious environmental problems which resulted in pollution of soil and water resources as well as accumulation of nitrates and heavy metals in many vegetable crops. In this context, application of bio- and organic fertilizers can be a fundamental solution to manage and diminish the use of chemical fertilizers. As an organic fertilizer with phytohormonal effects, humic acid can improve soil mineral nutrients uptake and in turn enhancing yield and quality of many crops. In order to evaluate the effect of priming with humic acid on seedling emergence of pot marigold (*Calendula officinalis*) under drought stress conditions, a factorial experiment was conducted based on completely randomized block design with three replications at the greenhouse of Faculty of Agriculture, University of Birjand in 2016. The first factor included six levels of humic acid (0 as the control, seeds treated with distilled water, 150, 200, 300 and 400 mg/lit), the second factor included three levels of moisture conditions (50, 75 and 100% of FC). Seeds of pot marigold were soaked in specified humic acid concentrations at 25 ° C for 24 hours and then the seeds were dried out by exposing to free air. For each treatment level, 10 seeds were planted in 22 cm diameter pots containing 5 kg and pots were placed in a greenhouse set at 25 / 18 ° C (light/dark). The number of emerged seedlings were counted up to 16 days. The results showed that humic acid had a positive effect on seedling emergence of pot marigold plants. The application of humic acid significantly influenced the emergence rate, emergence percentage and timing of 50 percent emergence. Humic acid levels of 200 and 300 mg/lit showed the greatest effect on emergence rate, and percentage as well as the timing of 50 percent emergence of pot marigold seedlings. In total, it can be concluded that the application of humic acid with potential effect on nutrient availability, improving soil structure and increasing root growth can be an alternative choice for chemical fertilizer in greenhouses.



**ENCAPSULATION OF AERIAL PART OF ECHINACEA PURPUREA EXTRACT  
BY SPRAY DRYING AND INVESTIGATION OF PRODUCT QUALITY**

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Echinacea purpurea is among the most widely used herbal medicines because of its supposed beneficial effects on the immune system [1]. Cichoric acid is a marker compound in this plant that is responsible of its properties. Echinacea extracts are using in different forms such as tablet, syrup, paste and so on, that spray dried of Echinacea extract has especially advantages over other kind of products. Spray drying is one of the most popular methods of drying in food and pharmacy industries. The drying time of the droplets in the spray dryer is very short and drying time depends on parameters such as flow rate, pump rate, aspiration rate and heat. The low product temperature and short drying time suggest that spray drying is appropriate method for heat sensitive product such as foods, dairy products and fruit juices [2]. Spray-dried powders reduce the storage and transport costs [3]. Spray drying improves life time of products because water content has reduced so microorganism couldn't grow in the product also by spray drying size of particles is reduced therefore solubility of products are improved, also the effective compound in dried product are protected from chemical and biological degradation. In this research spray drying and encapsulation of aerial part of Echinacea purpurea extract was performed, parameters of spraying were studied. Particle Size, shape, solubility, moisture content, ash content, structure, cichoric acid concentration, elemental analysis and thermal behaviour of dried extract were studied by implementing of different techniques such as: particle size analyzer (PSA), SEM, FT-IR, XRD, HPLC, ICP-OES and TGA. Extraction and spray drying parameters such as type of additive, solid content in extract to additive ratio, inlet temperature and flow rate were investigated. Results showed that the optimum conditions were: solid content in extract: additive (1:1), inlet temperature: 125°C, flow rate: 5 ml/min and maltodextrine was the best additive.

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INVESTIGATION OF CHEMICAL COMPOUNDS OF ESSENTIAL OIL  
OF *ZATARIA MULTIFLORA*

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The plants used in traditional medicine, because of having antimicrobial activity used in the treatment of some diseases. Problems in the treatment of infections caused by antimicrobial-resistant strains led to extensive studies on new antimicrobial drugs, including medicinal plants. The aim of this study was to investigate the chemical composition of essential oils from *Zataria multiflora*. Chemical compositions of the essential oils were analyzed by gas chromatography and spectrometry. The chemical compounds of *Z. multiflora* were  $\gamma$ -terpinethymol, carvacrol and  $\alpha$ -terpine. The results showed the chemical compounds of *Z. multiflora* were  $\gamma$ -terpinethymol, carvacrol and  $\alpha$ -terpinene respectively. Essential oil yields obtained 6.3% relative to the weight of the plant were determined and identified two major composition it includes carvacrol and Thymol.

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**DIFFERENTIAL RESPONSES OF LINSEED CULTIVARS TO SALT STRESS IN  
ANTIOXIDANT ENZYMES ACTIVITIES**

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Flax plant (*Linum usitatissimum* L.), a cool temperate annual herb with erect stems, is one of the economically important oilseed crops. The increasing demand for flax is mostly due to the high amount of  $\alpha$ -linolenic rich oil, protein, lignans and fiber. Salinity is a major problem which limits agricultural production in arid and semiarid regions and leads to delayed germination and emergence, low seedling survival, irregular crop stand and lower yield due to abnormal morphological, physiological and biochemical changes [1-3]. The present investigation was carried out to study the effects of NaCl on antioxidant enzymes activity responses in fourteen cultivars of *L. usitatissimum*. Twenty-one-day-old-plants were exposed to salt stress (0 and 150 mM) for 21 days. Results showed that salt stress caused a reduction of SOD activity in most of studied cultivars. Our data indicated different activity for APX enzyme in studied cultivars as well.

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**SALT-INDUCED BIOCHEMICAL PARAMETERS IN SIXTEEN CULTIVARS  
OF *LINUM USITATISSIMUM* L.**

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One of the major challenges in plant physiological studies is to increase the plant productivity under adverse environmental conditions. Soil salinity is one of the detrimental abiotic stresses and a complex phenotypic and physiological phenomenon in plants that results into reduced crop productivity [1]. Flax (*Linum usitatissimum*) is a member of the genus *Linum* in the family Linaceae and is grown as a food and fiber crop worldwide. Attempts have been made to grow flax in saline-alkaline soil in order to avoid competition for land with other food crops with limited success [2]. In this study, we investigate the effects of NaCl on biochemical parameters such as proline and malondialdehyde (MDA) contents in sixteen cultivars of *L. usitatissimum*. Twenty-one-day-old-plants were exposed to salt stress (0 and 150 mM) for 21 days. Results showed that salt stress increased the proline and MDA contents.

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**BRASSINOLID EALLEVIATES SALT STRESS AND INCREASES ANTIOXIDANT ENZYMES ACTIVITIES IN TWO CULTIVARS OF *LINUM USITATISSIMUM* L.**

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Linseed (*Linum usitatissimum* L.) is a cool temperate annual herb with erect stems. Linseed is cultivated commercially for its seed, oil and its fibers [1]. Salt stress is one of the major environmental stresses which limits worldwide agricultural crop yields and will continue to be of concern in future years [2]. Plant salt stress tolerance requires the activation of complex metabolic activities including anti-oxidative pathways, especially reactive oxygen species and scavenging systems within the cells which can contribute to continued growth under water stress. Brassinosteroids (BRs) are a group of naturally occurring plant steroidal compounds with wide ranging biological activity that offer the unique possibility of increasing crop yield through both changing plant metabolism and protect plants from environmental stresses [3]. The present investigation was carried out to study the role of brassinolide in enhancing tolerance of two *Linum usitatissimum* L cultivars to salt stress (NaCl). After surface sterilisation, seeds were soaked for 8 h in distilled water (control) and in 10<sup>-8</sup> concentration of brassinosteroids (BRs). Then, twenty-one-day-old-plants were exposed to salt stress (0 and 150 mM) for 21 days. Plants were divided into 4 groups including (control, 150 mM NaCl, 10<sup>-8</sup> EBL, 150 mM NaCl + 10<sup>-8</sup> EBL). Activity of superoxide dismutase (SOD), ascorbate peroxidase (APX) and peroxidase (POD) were measured. Results showed that activity of all enzymes increased in 150 mM NaCl + 10<sup>-8</sup> EBL compared to control and 150 mM NaCl treatment in TN-97-106 and TN-97-289 cultivars.

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**EFFECT OF *HYSSOPUS OFFICINALIS* L EXTRACT ON SEIZURE THRESHOLD  
IN ANIMAL MODEL**

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*Hyssopus officinalis* is used in traditional medicine that has significant antimicrobial properties, antioxidant, anti-virus and anti-inflammation effects. The anticonvulsant effects of the extract (25, 50 and 100 mg/kg, i.p.) of *Hyssopus officinalis* were assessed in pentylenetetrazol (PTZ; 60 mg/kg i.p.) induced convulsions model. Diazepam (2 mg/kg) was used as positive control. The latency time before the onset of tonic convulsions and the percentage of mortality were recorded. In addition, the effect of *Hyssopus officinalis* on learning and memory was evaluated using the Morris water maze test. This study showed that the extract of *Hyssopus officinalis* had anticonvulsant properties and improve memory in rats kindling by pentylenetetrazole. These findings support the acclaimed antiepileptic effect of *Hyssopus officinalis* in folk medicine and propose its potential use in petit mal seizure in humans.

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**EFFECTS OF NiO NANOPARTICLES ON PIGMENTS (CHLOROPHYLL A, B AND CAROTENE) CONTENTS IN *MELISSA OFFICINALIS* L.**

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Lemon balm has many beneficial effects such as anti-bacterial, sedative, spasmolytic, mnemonic improvement, and could reduce excitability, anxiety, stress, gastrointestinal disorders and sleep disturbance [1]. Today, there is a great variety of engineered nanoparticles (NPs) with numerous applications due to their favorable properties [2]. In this research biochemical effects of NiO nanoparticles on *Melissa officinalis* was investigated. Plants received NiO nanoparticles at 0, 25, 50 and 100 Mg/L for 14 days. The experiments were conducted in three replications. Data analysis showed decrease in chlorophyll a, b and carotenoids level. The data represent NiO induced oxidative stress in *Melissa officinalis* plants.

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**EFFECTS OF NiO NANOPARTICLES ON SOLUBLE PROTEIN AND SOLUBLE SUGAR CONTENT IN *MELISSA OFFICINALIS* L.**

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The essential oil of *M. officinalis* is a well-known antibacterial, antifungal and antioxidant agent [1]. Nanoparticles are released into the ecosystem inevitably and contaminate aquatic, terrestrial and atmospheric environments [2]. In this research biochemical effects of NiO nanoparticles on *Melissa officinalis* was investigated. Plants received NiO nanoparticles at 0, 25, 50 and 100 Mg/L for 14 days. The experiments were conducted in three replications. Data analysis showed decrease in soluble protein and increase in soluble sugar contents of leaves in a dose dependent manner.

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**BIO-GUIDED FRACTIONATION OF ACTIVE COMPONENT OF  
*TRAGOPOGON GRAMINIFOLIUS* WITH WOUND HEALING EFFECT**

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*Tragopogon graminifolius* (TG) is a perennial plant from Asteraceae family. This plant is native to the west of Iran and consumed as vegetable and food [1]. In Iranian traditional medicine anti-inflammatory, antiseptic, astringent, anti-hemorrhagic, ulcer and wound healing activities have been mentioned for TG [2]. Wound healing process is simply explained by hemostasis, inflammatory, proliferative and remodeling phases [3] and these stages can be affected by different natural and non-natural compounds. Development of lead compounds is an interesting field for researchers [4]. Based on these informations, the purpose of this study is to investigate bioactive compounds of TG which are responsible for wound healing properties. Aerial parts of TG were dried and grinded, and then extracted with petroleum ether (P), chloroform (C), ethyl acetate (E), and methanol (M) 80%, respectively. Scratch test applied as in vitro wound model and extracts were screened by this method. Although, MTT assay, DPPH radical scavenging assay, and total phenolic content were performed as well. Then bioactive fraction was fractionated using the flash system and after biological evaluation further fractionation was performed on silica gel column with different solvents. Biological activity of fractions were examined and the main compound in the bioactive fraction was isolated and characterized with NMR, UV, IR and MS.

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**EFFECTS OF NiO NANOPARTICLES ON FLAVONOIDS AND PHENOLIC  
CONTENT IN *MELISSA OFFICINALIS* L.**

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*Melissa. Officinalis* leaf shows high acetylcholinesterase inhibitory activity which can be recommended for the treatment of Alzheimer's disease [1]. Nowadays, nanotechnology has received an exceptional interest in consumer products [2]. This wide spread application has raised concern over the impact of nanoparticles (NPs) on the environment and on biota [3]. In this research, biochemical effects of NiO nanoparticles on *Melissa officinalis* was investigated. Plants received NiO nanoparticles at 0, 25, 50 and 100 Mg/L for 14 days. The experiments were conducted in three replications. Data analysis showed increasing in flavonoids and phenolic contents of leaves in a dose dependent manner.

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**COMPARATIVE STUDY OF COMPOUNDS OF IVY LEAF IN  
SUMMER AND WINTER**

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*Hedera helix* L. (Ivy) is an evergreen climbing plant that belongs to Araliaceae family [1]. Aqueous extract of its leaves has been used in traditional medicine for the treatment of respiratory disorders because of its expectorant effect [2]. In this study two compounds, hederacoside C and alpha hederin, of ivy leaf in two different seasons was determined using high-performance liquid chromatography with diode array detector. The chromatographic separation was performed using a Knauer HPLC Azura system. The HPLC separations were achieved on a Nucleodur 100-3 C18 column (150×4.6 mm) at 25°C. hederacoside C and alpha hederin are two main compounds in ivy leaf with amounts 1.43% and 0.18% in summer, respectively. Results showed that hederacoside C in the cold season fell sharply, while alpha hederin will not change much.

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**EVALUATION OF CELL GROWTH RATE AND THYMOQUINONE  
PRODUCTION IN CELL SUSPENSION CULTURE OF *NIGELLA SATIVA***

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Pharmaceutical monoterpenes compound production in plants has been appreciated over the years. These compounds found in the plant as secondary metabolites are characterized as compounds that are generally manufactured in the response of plants to stressful situations. *Nigella sativa* produces some valuable monoterpene such as thymoquinone. Many pharmacological effects of *Nigella sativa* is because of the presence of TQ (Schneider-Stock *et al.*, 2014) and it was released and purified from *Nigella sativa* in 1963 (Canonica *et al.*, 1963). Tissue culture and cell culture are good ways for the production of secondary metabolites from the plant and were more considered these years (Moscatiello *et al.*, 2013). The antibacterial and antifungal effect of the callus of *Nigella sativa* has been reported (Chaudhry *et al.*, 2014) and the studies show that callus cell can produce TQ more than seeds (Alemi *et al.*, 2013). We evaluated the production of TQ in callus and suspension cell of *Nigella sativa* in this study. The callus induction was from leaf explant on MS media and after several subcultures in 14 days after subculture, the cells moved into liquid media. After several subcultures of suspension cell, the cell growth rate and TQ production were measured in 7, 8 and 9 days after subculture. The cell growth rate in the 8th and 9th day were significantly different from the 7th day. TQ was measured by HPLC and based on the results, TQ production increased after three days and the amount of TQ in 7th, 8th and 9th day were respectively 21.6, 32.48 and 53.59 mg/l. The TQ of callus cells also measured in 14 days after subculture and it was 120 mg/l that shows callus cell are more available for TQ production.

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**POSTHARVEST APPLICATION OF HOT WATER TREATMENT IMPROVED  
THE QUALITY OF FRESH SEEDLESS BARBERRY FRUIT**

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In this study the effects of hot water treatment on physical and sensory properties of fresh fruit seedless barberry (*Berberis vulgaris*) were investigated. The experiment was done on a completely randomized design with four replications. Treatments were postharvest hot water dip at different temperatures (65, 75 and 85 °C). Control fruit were treated with distilled water at 20 °C for 45 seconds. Treated fruit were then wrapped in polyethylene plastic bags and held in refrigerator at 5 °C. The results showed that the color characteristics and sensory characteristics and taste of fruit affected by the type of treatment. Fruit treated with hot water at 75 and 85 °C maintained quality during cold storage period (4 weeks). Treated fruits with hot water at 75 and 85 °C had less decay and fungal contamination than control. Hot water at 75 °C had no adverse effects on quality and appearance of barberry fruit. However, using hot water at 85 °C reduced the appearance quality of fruit due to fruit wall bursting. From colorimetric parameters aspects, chroma value increased by hot water treatment. The results of this study suggesting that application of hot water at 75 °C was better postharvest treatment than other treatments to maintain the quality and reduce decay of fresh seedless barberry fruit during cold storage.



**EVALUATION OF SEDATIVE-HYPNOTIC EFFECTS OF *CAPPARIS SPINOSA*  
AQUEOUS EXTRACT USING EXPERIMENTAL MODELS**

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*Capparis spinosa* L. (Caper) is an aromatic plant growing in dry regions around the Mediterranean area. *C.spinosa* was shown to have several compounds such as tannins, sterols, alkaloids, polyphenols and flavonoids. Previous studies have shown that flavonoids have sedative and hypnotic effect [1]. The aim of this study is evaluating sedative-hypnotic effects of *C.spinosa* aqueous extract in different doses. Maceration method was used for extraction of the aerial part of the plant. All experiments conducted on male NMRI mice (18-25g) of weight. For evaluation of hypnotic effects of the extract, animals were treated with different doses of aqueous extract (50,100, and 200 mg/kg; i.p.), 30 minute later pentobarbital (50mg/kg) was injected intraperitoneally. Animals were monitored for 2 hours and the duration of lack of righting reflex was reported. Open field test was used for evaluation of sedative effect of the extract. Thirty minutes after injection of the extract (50,100, and 200 mg/kg; i.p.) the locomotoractivity of mice was calculated by measuring total distance movement in the open field arena (40x40x40 cm) during 10 minutes period. Ethovision software was used for tracking the mice in the arena. All doses of the extract decreased total distance moved of the mice in the open field test and also increased the sleep duration in pentobarbital test. Our results show that the aqueous extract of *Capparis spinosa* has sedative-hypnotic effect compared to the control group. More studies are necessary to find the exact mechanism of action of this effect.

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**ANTINOCICEPTIVE EFFECT OF *EREMOSTACHYS MACROPHYLLA* AQUEOUS EXTRACT IN MICE**

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Pain is an unpleasant subjective experience result of a complex interaction of the ascending and descending neuronal pathways. Pain can affect all aspect of human life including sleep, emotional, and daily activities. In modern medical practice several analgesic medicines are available as painkillers. However, adverse drug reactions and interpersonal differences in responding to the drugs are main challenges in the clinical application. In the recent years use of alternative medicines, particularly herbal products, have been increased dramatically because of their less adverse effect. The genus *Eremostachys* (labiatae) has been used for pain treatment in Iranian traditional medicine. As a member of *Eremostachys* family, *Eremostachys macrophylla* is a native species in the flora of Iran (kashmar). The aim of this study was to evaluate the antinociceptive properties of the extract of areal parts of *Eremostachys macrophylla*. Antinociceptive properties of total aqueous extract were analyzed using writhing reflex test in mice (20-25gr). The aqueous extracts were administered intraperitoneally (100 and 200 mg/kg) 30 minutes before the injection of acetic acid (1%). The abstract showed a significant antinociceptive activity in the writhing reflex test ( $P < 0.01$ ). *Eremostachys macrophylla* can be a useful source of natural product with antinociceptive activity in the future. It has been shown that the aqueous extract of *Eremostachys macrophylla* have triterpenoids [1]. It seems that these triterpenoids may involve in antinociceptive effect of the extract.

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**COMPARISON OF SALICYLIC ACID CONTENT IN 3 POPULATIONS OF  
*SALIXALBA* AND 3 POPULATIONS OF *S.WILHELMSIANA***

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The bark and leaves of the willow trees contain salicylic acid and its derivatives which belong to phenolic compounds. Basically, the salicylic acid is derived from the word Salyks, the scientific name of the willow tree. Traditionally these compounds have been used as an analgesic, antipyretic and anti-inflammatory products. Although synthetic salicylic acid is used in modern pharmacy today, but with the growing trend towards traditional medicine, these compounds have been considered for use in herbal medicine. Furthermore, salicylic acid, which is known as a plant growth regulator, is involved in many physiological processes. In this study, the leaves of 3 populations of *Salixalba* and 3 populations of *S. wilhelmsiana* originated from different localities, were collected each of them in three replications in May 2013. The species and populations included *S.alba* (Tehran, Shahr-e-Kord and Markazi populations) and *S.wilhelmsiana* (Uromia, Markazi & Kordestan populations). The samples were dried at room temperature and ground. Then salicylic acid contents were extracted. The extraction was performed with Soxhlet apparatus. The extracts were analyzed with HPLC. The results showed that the amounts of salicylic acid in *S.wilhelmsiana* species was much more than *Salix alba* species, so that the population of Uromia of *S.wilhelmsiana* with 1625 p.p.m salicylic acid content had the highest, while the population of Markazi of *S. alba* with 136 p.p.m salicylic acid content had the highest amounts of salicylic acid. However it is thought *S.alba* species are the best source for synthesis of phytochemicals. Our results showed that *S.wilhelmsiana* species had the remarkable amounts of salicylic acid content in Comparison of *S. alba* species.



ISOLATION, STRUCTURE ELUCIDATION AND BIOLOGICAL ACTIVITY OF  
THE CHEMICAL CONSTITUENTS FROM *MICROMERIA PERSICA*

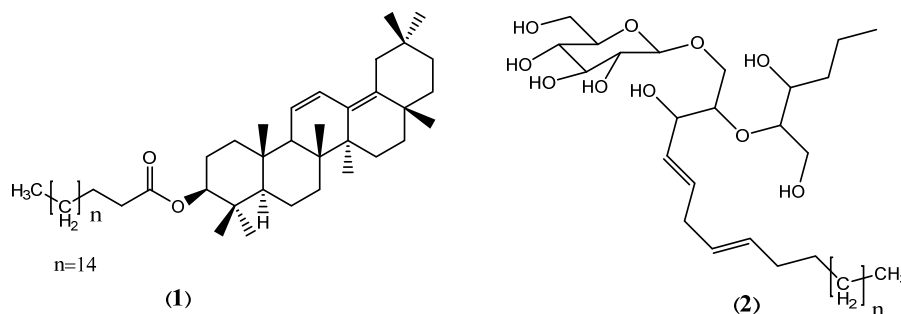
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*Micromeria* is one of the genus in the family *Lamiaceae*, some of their species are used in traditional medicine in different countries [1,2]. Little phytochemical studies conducted on the extracts of some species indicate the presence of terpenoids and phenolic compounds in this genus. *Micromeria persica* is an endemic and range restricted species which grows in the Kermanshah and Fars provinces of Iran [1] and only its essential oil has been studied previously. We have undertaken a phytochemical investigation on ethyl acetate extract of *Micromeria persica* to discover novel and potentially bioactive secondary metabolites. Fractionation of the ethyl acetate extract of the aerial parts of this plant using repeated column chromatography led to the isolation of one new triterpenoid [1] and a new glycosylated long chain fatty alcohol [2], together with six known compounds. By comparison with the reported data, the known compounds were identified as one phenyl ethanoid ester, two triterpenoid betulinic acid and ursolic acid, one glycosylated flavonoid linarin, and two steroidal compounds daucosterol and  $\beta$ -sitosterol, all of them are described for the first time from this plant. Their structures were established on the basis of extensive spectroscopic data, including <sup>1</sup>H NMR, <sup>1</sup>H-<sup>1</sup>H COSY, HSQC-DEPT and HMBC. Biological effects of some of these compounds on a number of cancer cell lines is underway.



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PHYTOCHEMICAL ANALYSIS OF THE *N*-HEXANE  
EXTRACT OF *STACHYS PILIFERA*

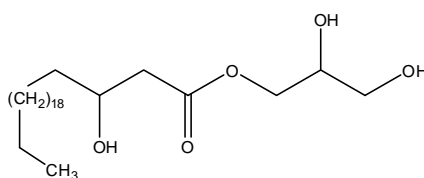
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The genus *Stachys* comprises over 300 species, being one of the large genera of the family *Lamiaceae*. In Iran, the genus *Stachys* consists of 38 annual and perennial species, 13 of which are endemic. Some of the species are used in traditional medicine as astringents, anti-diarrhoeic, anti-inflammatory and for renal diseases. In addition, some biological properties including antibacterial, antioxidant and anticancer activities have been reported for a number of species of this genus [1,2]. *Stachys pilifera* is an endemic species that mostly grows in Irani–Tourani regions. A literature survey showed that there has been no phytochemical study on *S. pilifera*, with the exception of the analysis of the essential oil. We have undertaken a phytochemical investigation on *n*-hexane extract of *S. pilifera* to discover novel and potentially bioactive secondary metabolites. Fractionation of the *n*-hexane extract of the aerial parts of the plant using repeated column chromatography led to the isolation of one new mono-glyceride (1), together with nine flavonoids, and two steroidal compounds, all of them are described for the first time from this plant. Their structures were established on the basis of extensive spectroscopic data, including <sup>1</sup>H NMR, <sup>1</sup>H-<sup>1</sup>H COSY, HSQC-DEPT and HMBC. Flavonoid compounds were tested for their inhibitory activity toward MCF-7 cell lines and a preliminary SAR study was also carried out against this short series of flavonoids.



1

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**THE STUDY OF *CINNAMOMUM ZEYLANICUM* HYDRO-ALCOHOLIC EXTRACT  
ON PEROXISOME PROLIFERATOR-ACTIVATED RECEPTOR  $\beta/\delta$  GENE  
EXPRESSION IN HUMAN BONE MARROW-DERIVED  
MESENCHYMAL STEM CELL**

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In traditional medicine Cinnamon used in different conditions remedy for respiratory, digestive, Inflammatory and gynecological ailments. *Cinnamomum zeylanicum* (C.Z.) is one of the most important spice in cooking nations [1]. Peroxisome Proliferator-Activated Receptor  $\beta/\delta$  (PPAR $\beta/\delta$ ) is one of the cell nucleus receptors that act as a transcription factor by activating the expression of various genes in biological processes, including inflammation [2]. Since in some inflammatory diseases such as Rheumatoid Arthritis, the expression of gene PPAR $\beta/\delta$  was reduced, in this study we evaluated the roll of cinnamon hydro-alcoholic extracts effects on PPAR $\beta/\delta$  mRNA expression level. Mesenchymal stem cells where cultured and treated in 7 groups by 2 doses 50 and 100 $\mu\text{gml}^{-1}$  of cinnamon extract in 3 times 2,16 and 24 h .RNA was extracted, cDNA synthesized and IL6 gene expression level evaluated by real-time PCR. Expression fold change were detected by  $2^{-\Delta\Delta\text{Ct}}$  and statistically analyzed by T-Test. Treatment of 10 $\mu\text{gml}^{-1}$  extract after 2 and 16 hours significantly increased PPAR $\beta/\delta$  mRNA expression level but in 100 $\mu\text{gml}^{-1}$  treatment only after 16 hour increased expression level was seen. After 24h in all doses there were significant decreased in expression level. Increased expression of PPAR $\beta/\delta$  may be involved in recovery of some inflammatory diseases. As a results we found that cinnamon affected expression level dose and time dependent. 16h after treatment expression level increased and 24h after treatment decreased and low dose affected soon as high dose these results after evaluation of protein levels in last studies could be helpful for designing safe and effective treatment methods for some inflammatory diseases.

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**THE EFFECT OF HYDROALCOHOLIC EXTRACT OF *VIOLA ODORATA* L. ON  
SERUM-BASED BIOMARKERS AND HISTOLOGY OF THE PANCREAS IN  
STZ-INDUCED DIABETIC RATS**

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Viola is documented by some properties including antimicrobial, antifungal, antihypertensive, antidyslipidemic activities and lowering the blood glucose. It is already reported cyclotide extracted from Viola has antitumor effects and causes cell death by membrane permeabilization and pore formation in tumor cells that could be considered as a side effect of Viola odorata in normal cells in spite of its benefits. The aim of this study was to investigate the effect of Viola odorata L. extract on blood glucose, total antioxidant capacity, some biomarkers in serum and histology of pancreas of diabetic rats to evaluate the benefits and side effects of Viola odorata. Forty (N=40) adult male Wistar rats were randomly selected and assigned to five groups: normal control, diabetic control and diabetic which treated by intraperitoneally injection of Viola extract in 100, 200, 400 mg/kg dosage for 28 days. 45 mg/kg Streptozotocin induced diabetes in male rats by intraperitoneally injection in single dose. Serum glucose concentration and amylase activity were measured using photometric assay. Microscopic studies were done to measure the area and circumference of pancreatic islets. Viola extract in doses of 200 and 400 mg/kg significantly reduced serum glucose level in comparison with diabetic group ( $p < 0.001$ ). In doses of 200 mg/kg Viola increased serum amylase in comparison with control group ( $p < 0.05$ ). No differences in the area and circumference of pancreatic islet were seen. Viola extract seems may be effective to decrease blood glucose concentration but the side effects of this amount of extract on pancreas could be considered. Further studies need to confirm if pancreatic cell affected by cytotoxic properties in dose-dependent manner of Viola extract.



**EFFECT OF *ECHINACEA PURPUREA* HYDROALCOHOLIC EXTRACT ON CONTACT ALLERGIC DERMATITIS CAUSED BY DICHLORO NITROBENZENE (DCNB) IN ADULT MALE SOURIS MICE**

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Contact dermatitis, a late hypersensitivity reaction, is often the result of skin contact with allergens. Topical corticosteroids usually apply to the site of dermatitis for maximum 3 weeks and in severe generalized forms, oral steroids may be prescribed. Due to the wide range of side effects, herbal medications are more preferable compared to corticosteroids. Medicinal herb Echinacea (*Echinacea Purpurea*), is a wild flower native to America. From Asteraceae. Echinacea products include various components such as Caffeic acid, polysaccharides and glycoprotein proteins. Echinacea activates macrophages, and in the following, TNF, Interleukin1, Interleukin6 and Interferon motivate antiviral properties against Influenza, Poliovirus and herpes. Echinacea has Anti-inflammatory, antioxidant and immune system modulator effects based on several investigations. It seems that there is a relationship between the pathophysiology of allergic contact dermatitis and these properties of *Echinacea Purpurea*. To determine the effect of hydro-alcoholic extract of *Echinacea Purpurea* in allergic contact dermatitis caused by Dichloroisocyanurate nitrobenzene in adult male *Souris* mice, 35 adult male *Souris* mice in the weight range of 25-20 gr were concluded in 5 groups with 7 members. In order to create allergic lesions, they have been sensitized by Dichloronitro benzene DNCB. After that, they were treated on day 0-3-7-10 with Intraperitoneal injection of triamcinolone ointment or 50-100-200 mg/kg hydroalcoholic extracts. Then, delayed type hypersensitivity responses (Delayed – type hypersensitivity: DTH) DNCB were measured and morphological inflammatory markers (erythema, itching, hair loss, induration and granuloma) were assessed. Based on the results, purple coneflower extract that was used in the three doses (50, 100 and 200 mg/kg), significantly reduced inflammatory reactions and dermatitis symptoms. Significant changes in inflammatory markers in response to triamcinolone ointment 1% were observed on day 7 and day 10. But on day 14, Echinacea extract in doses of 100 and 200 mg/kg non-significantly works better than triamcinolone ointment 1% ( $P < 0.05$ ). Based on these findings, we can conclude that Echinacea extract improves inflammatory symptoms of allergic contact dermatitis in the concentrations specified. But further investigations with more sample size are needed to assess the effect of Echinacea extract on inflammatory responses.



**THE EFFECT OF DRINKING THYME ESSENCE ON SERUM BIOCHEMICAL  
PARAMETERS, PROTEINS, ENZYMATIC ACTIVITY AND HEMATOLOGICAL  
CHARACTERISTICS IN BROILER CHICKENS**

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The challenge of antibiotic-resistant bacteria persuades researchers to follow other alternatives and substitutes. Some consideration like reduction the number of certain pathogenic bacteria and its challenges, improving gut health, as well as better pictures of blood metabolites, are beneficial effects of adding organic matters such as phytogetic feed or water additives in poultry nutrition. Thyme (*Thymus Vulgaris* L.) is a popular medicinal plant belonged to Lamiaceae sp. and mostly grown in Mediterranean regions. This herb has been paid more attention due to its antioxidant, antibacterial anticoccidial, antifungal and antioxidant properties. This experiment investigated the effects of different levels of drinking thyme essence (DTE) on hematological characteristics of Five hundred similar day old male chickens (Ross-308) in completely randomized design with 4 treatments, 5 replicates and 25 chicken in each. Treatments were arranged in: Control group (plain water), 0.1%, 0.15%, and 0.2% of pure thyme (*Thymus Vulgaris* L.) oily essence (with 99.5% pure) added to per litter of drinking water for chickens. Blood samples were collected from wing vein at 21 and 42 days of age and analyzes of samples were performed by Gimsa color, spectrophotometrically by cyanomethaemoglobin method, hemocytometer and microhematocrit tubes. Statistical analyses was performed by attention to 3% mortality (the ANOVA procedures of the statistical software. Comparisons of means were done using Duncan's multiple range tests, assuming error level of 0.05. The 0.2% level of DTE result to meaningful ( $p < 0.05$ ) increase of Hemoglobin, hematocrit percentage, red blood cells (RBC), whit blood cells (WBC), and heterophile counts, but lymphocyte count significantly ( $p < 0.05$ ) altered by all levels of DTE in both periods. The present results are in agreement with Tollba *et al.* and Hertrampf, who reported that this improvement may be due to antioxidant activity of essential oil components in thyme products. Thus water containing thyme essence exhibits a positive effect on changing of hematological characteristics. Tollba *et al.*, illustrated that different components of herbal extracts due to nutritive and anti-oxidative effects could stimulate the blood cells producer organs. Similar results have been gained by essential oil of cinnamon. Also Ibrahim *et al.* have reported that RBC count, hemoglobin and Packed cell volume (PCV) with 0.5% thyme were significant ( $p < 0.05$ ) increased in rabbit. Al-Kassi, showed that using dietary essential oil of thyme and cinnamon caused significant ( $p < 0.05$ ) increase in the amounts of hemoglobin, RBC, WBC and Hematocrit (HCT). As a final result, thyme essence in water has a positive effects on the hematological characteristics, which can be evidenced by a level of 0.2%.

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**THE EFFECTS OF DIMETHYLESULPHATE ON DIVERSITY CREATION AND GROWTH CHARACTERISTICS IN PURSLANE (*PORTULACA OLERACEA* L.)**

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Purslane (*Portulaca oleracea* L.) is a valuable medicinal plant, containing a different kind of active ingredients. Induced mutation can efficiently be used to induce new variations as a basis for plant breeding. This study was conducted to evaluate the effect of dimethylesulphate (0, 0.03, 0.05, 0.1, 0.2, 0.3, and 0.4 %) in a completely randomized design on rootlet length, shootlet length, plant height and germination rate and also to determine the suitable concentration of dimethylesulphate for mutation induction. On the basis of multiple variance analysis, significant differences were observed among different dimethylesulphate concentration for evaluated traits (rootlet length, shootlet length, plantlet height and germination rate) ( $P < 0.01$ ). The least germination rate (0%) was obtained in concentrations 0.6, 0.8, and 1 percentage of dimethylesulphate. The maximum germination rate (91%) was observed in control, although the difference of this treatment was not significant with a concentration of 0.03 (89%).



**ANTIOXIDANT PROPERTIES OF FIVE DIFFERENT ALGAL SPECIES  
ISOLATED FROM IRAN**

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The deleterious influence of reactive oxygen species in the pathogenesis of neurodegenerative disorders has been widely discussed in recent years [1]. Antioxidants have been well known for being strong free radical scavengers. Antioxidant activity is one of the most studied, due to the interest of these compounds both as preservatives and protectors against oxidation in food and cosmetics and also due to their health implications [2]. Algae are known to contain a wide variety of bioactive compounds and many marine algae have attracted the attention to the search for natural bioactive compounds to develop new drugs and health foods. In this study the antioxidant properties of five different algal species isolated from Iran were investigated using ferric reducing antioxidant power (FRAP) assay [3]. The antioxidant activities of extracts were calculated and expressed as ascorbic acid equivalence. Extracts of strains *Cladophora* sp., *Laurencia* sp., *Cystoseira myrica*, *Ulrafasciata* and *Dictyota* sp. showed 10.63, 9.90, 13.41, 10.67 and 12.15 milligram ascorbic acid equivalence per gram of dried extract, respectively. Also concentrations of the total phenols were measured by the method of Folin-Ciocalteu assay against a series of gallic acid standard solutions [3]. According to the results the highest antioxidant activity was observed in algae *C. myrica* which has the lowest total phenols, suggesting that total phenol content of the extracts did not correlate with the determined antioxidant activity. It is believed that a different kind of secondary metabolite in this algae could be involved for the antioxidant activity [4].

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**RESPONSE OF CHIA (*SALVIA HISPANICA* L.) TO DIFFERENT NUTRIENT  
INPUTS AND PLANT DENSITY**

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Chia (*Savia hispanica* L., Lamiacea) is a medicinal plant that is well known for its nutritional and medicinal value. Chia's seed as a functional food are rich in unsaturated fatty acids (Omega 3 & 6), protein, mucilage and other minerals. A split plot experiment based on randomized complete block design with three replications was conducted to investigate the effect of different planting distance (70\*50 and 90 \* 50cm) and nutrient inputs (NPK, cow manure (10 and 15 t.ha<sup>-1</sup>), vermicompost (5 and 10 t.ha<sup>-1</sup>), NPK+ 5 t.ha<sup>-1</sup> cow manure, NPK + 5 t.ha<sup>-1</sup> vermicompost and no nutrient input as control) in Research Station of Department of Horticultural Science and Landscape Engineering, University of Tehran in 2016. Morphological criteria such as plant height, length of lateral branches, number of flower head, leaf dry weight and herbal dry weight were investigated. Results indicated that the main and interaction effect of nutrient inputs and planting distance significantly affected all measured criteria in which integration of NPK with vermicompost at 90 cm planting distance increased length of lateral branches and number of flower head. Also, application of 10 t.ha<sup>-1</sup> vermicompost at 90 cm planting distance caused an increase in case of plant height. The herbal dry weight pronounced better by using NPK at 90 cm planting distance in which showed an increase of 77.7% compared to control at 90 planting distance. Also, NPK at 90 cm planting distance resulted in 60% increase in leaf dry weight compared to control at the same planting distance.





**EFFECT OF HABITAT ALTITUDE ON BIOCHEMICAL DIVERSITY  
OF *THYMUS DAENENSIS***

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Thyme (*Thymus daenensis*) belongs to Lamiaceae family and is one of the endemic *Thymus* species in Iran that grows wild in the central and northwestern Iran and has multiple uses in food industry, sanitary, cosmetic and especially pharmaceutical. The aerial parts of *Thymus* species are traditionally used as carminative, digestive and antispasmodic in the Iranian folk medicine. This plant has different compounds such as phenol, flavonoid and antioxidant activity. The aim of this study is investigation of biochemical diversity based on wild habitat altitude. For this reason 12 plants were collected from 4 regions (in Nahavand) with 3 different altitudes in each region (1698 up to 2248 meter above sea level). Then biologically active compounds (total phenol and flavonoid) as well as their antioxidant activity were measured. Total phenol varied from 20.19 to 26.82 (mg GAE/g dw) and the radical scavenging ranged from 89.05 to 92.72 mg/ml, as well as flavonoid differed from 0.037 to 0.064. As a result, wild habitat altitude showed significant differences in plants in the content of total phenol and antioxidant activity but there was no significant difference between plants as a matter of flavonoid.



**INVESTIGATION OF SEEDLING GROWTH OF GOOSEBERRY  
(*PHYSALIS PERUVIANA* L.) BY APPLICATION OF DIFFERENT  
ORGANIC GROWTH MEDIA**

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Gooseberry (*Physalis peruviana* L., Solanaceae) is a tropical plant with nutritional and medicinal values. In order to investigate the effect of different organic media on growth characteristics of gooseberry seedling, a completely randomized design experiment with four replications was conducted in Research Greenhouse of Department of Horticultural Science and Landscape Engineering, University of Tehran, in 2014. Treatments included organic inputs such as vermicompost, cow manure and municipal waste compost in 10, 20, 30, 40 and 50% V applied in coco peat-perlite substrate (50:50 V:V) and control (substrate without organic inputs). Criteria such as root length, shoot height, crown diameter, leaf number, internode length, fresh and dry weight of aerial parts and dry weight of root were evaluated. Results indicated that treatments significantly affected all measured criteria. Application of vermicompost in substrate improved most measured criteria. The highest root length and root dry weight was observed in substrate with 30% vermicompost. The highest crown diameter (5.4 mm), leaf number (10), internode length (8.6 mm), fresh and dry weight of aerial parts (5.07 and 0.41 gr) was observed by using 50% vermicompost in coco peat-perlite substrate. Although, there was no significant differences between 30 and 50 % vermicompost in substrate. The use of 40% vermicompost in substrate caused 75.36% increase in shoot height compared to non application of organic inputs in coco peat-perlite substrate (control). According to the results, among organic inputs, vermicompost in substrate performed better than the others. Because of no significant differences between 30 and 50 % vermicompost, the ratio of 30% V of vermicompost in coco peat-perlite substrate could be recommended.



**IN VITRO AND IN VIVO SURVEY OF CRUDE EXTRACT AND FRACTIONS OF  
ARTEMISIA DRACUNCULUS ON TOXOPLASMA GONDII**

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toxoplasmosis is an infectious parasitic disease with worldwide prevalence which caused by an obligate intracellular parasite *Toxoplasma gondii*. Typically, the choices for treatment are pyrimethamine and sulfadiazine, however their use is limited because of drug toxicity and serious side effects. Therefore, new drugs with lower toxicity are urgently needed. The aim of the present study is to surveying *in vivo* and *in vitro* effects of different fractions of *A. dracunculus* against *Toxoplasma gondii*. *In-vitro* toxoplasmodicidal evaluation was performed using different concentrations of fractions (Aqueous, Ethyl acetate, n-hexan, Dichloromethane) on *T.gondii*. Then flowcytometer apparatus was used to determine the antiparasitic activities. For *in vivo* studies, toxoplasmosis was induced by intraperitoneal injection of tachyzoite form of parasite. Infected mice were divided into 18 groups (6 control groups and 12 therapeutic groups). There was a defined dose of fractions for every group. After a period of 7 days treatment, the survival of mice were compared with the control groups. Comparison of the therapeutic groups with control groups and statistical analysis revealed that there was significant effect against *T.gondii*. In this study it showed that there was a dose-dependent relationship between tachyzoitecidal activity of *A. dracunculus* fractions *in vitro*, Also there was a significant difference between n-hexan fraction and control group in *in vivo* experiments. Our study demonstrated that several fractions of *A. Dracunculus* had significant activities against *T.gondii* and may be the sources of new anti-toxoplasma compounds.

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**EFFECT OF SORBITOL INDUCED OSMOTIC STRESS ON THE  
PHYSIOLOGICAL CHARACTERISTICS OF *TAXUS BACCATA* L.  
CALLUS CULTURE**

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The genus *Taxus* L. belongs to the Class Pinopsida, the Order Taxales and the Family Taxaceae which has generated considerable interest due to its content of diterpene alkaloids, particularly taxol (known also as the generic drug paclitaxel). Taxol can be extracted from the inner bark of several *Taxus* species and be also semisynthetically produced via the conversion of its precursors as 10-deacetylbaaccatinIII (10-DBA). Plant cell, tissue and organ cultures of the plant constitute an alternative source of anticancer drug taxol during past decade. Abiotic stress like inadequate water supplies lead to cellular dehydration in plants which causes osmotic stress, are important factors affecting plant growth, development, morphogenesis and the biosynthesis of secondary metabolites (SMs). Sorbitol is none-metabolic osmotic stress agent used in these cases. Here, the effect of different concentrations of sorbitol as induced osmotic stress agent on *T. baccata* callus culture was studied. Callus culture was performed on the B5 medium supplemented with 3 mg/l 2,4-Dichlorophenoxyacetic acid (2,4-D), 0.5 mg/l kinetin (Kin), 0.5 mg/l gibberellic acid (GA3) and 0, 10, 20, 30 and 40 g/l of sorbitol. After three weeks of culture, viability, fresh and dry weight and proline accumulation were measured. The results showed that increasing of sorbitol concentration in the medium decreased cell viability and fresh weight of callus. Proline accumulation increased significantly with increasing concentration of sorbitol in the medium and maximum concentration of proline was observed in 40 g/l of sorbitol. Proline act as osmolyte for osmotic adjustment, contributes to stabilizing sub-cellular structures (e.g., membranes and proteins), scavenging free radicals and buffering cellular redox potential under stress conditions [1]. It may also act as protein compatible hydrotrope [2], alleviating cytoplasmic acidosis and maintaining appropriate NADP<sup>+</sup>/NADPH ratios compatible with metabolism [3]. In many plant species, proline accumulation increase under drought stress. Our results demonstrate that sorbitol in high concentration has toxic effects on the growth and viability of *T. baccata* callus.

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**THE EFFECT OF GOLD NANOPARTICLES PRODUCED FROM  
HIBISCUSSABDARIFFA ON SUPPRESSION OF AGGREGATION ALPHA-  
LACTALBUMIN**

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In pathway of folding of protein to its natural state, intermediate state is created and formation of amyloid fibrils, caused by the accumulation of these intermediates due to oxidative stress, pH and temperature. These changes can cause neurodegenerative diseases including Alzheimer, Parkinson and Huntington.  $\alpha$ -Lact albumin, is a milk protein with 4 disulfide bond and 4 tryptophan residue that can be a good sample for study the amyloid formation due to the formation of molten globule, which is an intermediate mode [1]. Nanoparticles are materials with a dimension of 1-100 nm and high ratio of surface to volume that have considerable capacity in transporting of chemical compounds and drugs; and therefore nowadays nanoparticles are very important in medicine and pharmacy [2]. The gold nanoparticles are the most bio-compatible, which produce from salt of gold. In this study, the plant hibiscus (*Hibiscus Sabdariffa*) used to synthesis the gold nanoparticles because of polyphenolic groups as reducing and stabilizing agent. The effect of gold nanoparticle on the aggregation of  $\alpha$ -lactalbumin was evaluated using UV-visible spectroscopy, fluorescence spectroscopy (ThT assay, intrinsic fluorescence assay and ANS binding assay). The results show that gold nanoparticles inhibit aggregation of  $\alpha$ -lactalbumin in a concentration dependent manner this may be because of increasing adsorption of protein on nanoparticles and so increasing interaction with nanoparticles. In general, the results of this research show that biosynthesized AuNPs mediated by hibiscus can be used as effective therapeutic agent for prevention of protein aggregation in the treatment of amyloid disease.

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**INTRODUCE SOME OF THE MEDICINAL PLANTS SPECIES WITH THE  
MOST TRADITIONAL USAGE IN NORTHERN COUNTIES  
IN WEST AZERBAIJAN**

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Given that one of the foundations of traditional knowledge intensive use of natural medicinal plants and urban and rural elderly has important information about cases and how to use them. With the deaths of their traditional knowledge to be quickly destroyed, the registration and storing this information as well as the introduction of widely used medicinal plants is very important and necessary, to provide accurate information and appropriate conditions, medicinal plants commonly cultivated in the region for direct and indirect employment of indigenous people provided. First, the position of each city and region on the map of the province and the region has identified groceries and qualified individuals, and in person at any of the persons interviewed and the information collected, analyzed and evaluated. And in person at any of the persons interviewed and the information collected, analyzed and evaluated. In this study of traditional medicine information on 21 medicinal plant species belonging to 15 were collected and detected dark. From these 21 species, five species in all the cities of North Azerbaijan had the highest consumption. To use common species in most areas and more for infusion or decoction is identical. Common diseases in the area can be treated with the use of this type of kidney and intestine infection, neuroscience, colds and so on. North West Azerbaijan trove of traditional medicine that has been preserved over the generations. Therefore, this information can be recorded and identification of medicinal plants that are more in demand and consumption, they are grown as crops and greenhouse, the development of the agricultural economy of the region.



**EVALUATION OF ANTIOXIDANT PROPERTIES AND TOTAL PHENOLIC OF  
HYDROALCOHOLIC EXTRACT OF SAFFRON PETAL**

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Many human diseases are caused by free radicals. Antioxidants neutralize free radicals and thereby reduce the risk of cardiovascular and cancer [1]. Recently, due to toxicity and carcinogenicity many of industrial antioxidants, attention is focused on the identification of antioxidants derived from natural sources. It has been shown that plants with phenolic compounds, has the potential antioxidant [2]. The aim of this study was to determine free radical scavenging activity of the extract of saffron petals. Saffron petal is a rich source of Polyphenolic substances and antioxidant activity of the petal extract was measured using free radical scavenging (DPPH) [3]. Results showed that total phenolic compounds petal extract 4.99 (mg GAE/g dry wight ectract) this value was higher than amount of phenolic acids (1.38 mg caffeic acid/g dry weight) reported by Termentzi and Kokkalou (2008) [4] for saffron petal harvested in Greece. In this study in DPPH method, extract radical scavenging activity% (0/01g extract /10ml methanol) was 24/93. The result goli et al (2012) [5] % radical scavenging activity of saffron petal extract at 50 ppm concentration was 22.45. The results showed that saffron petal could be considered as a bioresource of phenolic compounds with high antioxidant activity.

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**ANTIGLYCOTOXIC ACTIVITY AND THE MODE OF ACTION ON  
HEMOGLOBIN GLYCATION BY EXTRACT AND POLYPHENOLS FROM  
*MELISSA OFFICINALIS* L.: INHIBITION OF  
FRUCTOSE-MEDIATED GLYCATION**

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Hyperglycemia and advanced glycation end products (AGEs) in the erythrocyte of diabetes stimulate the pathways involved in hemoglobin (Hb) glycation, prompting the search for suitable medicines that could control the process. Since the antioxidant activity of polyphenols is the most striking feature of *Melissa officinalis* L. (lemon balm), and a correlation has been established between antioxidant and anti-glycation activity of phenolic herbal extracts, the present study was designed to determine if balm could display antiglycating activity *in vitro*. *M. officinalis* is a polyphenol-rich folk medicine with numerous traditional properties and uses like anti-inflammatory, antiviral, anti-cancer, antioxidant and cardiac tonic. The ability of balm on the inhibition/reversion of glycation was assessed in the hemoglobin/fructose model by employing a range of techniques: thioflavin T (ThT), ANS and AGE-specific fluorescence assays, circular dichroism and UV-Vis spectroscopy. Rosmarinic acid (RA) was estimated as the major phenolic compound in the extract by means of HPLC. Pathophysiological effect of glycated Hb in the cultures of CHO, HEK and fibroblast cells was reduced upon balm treatment evaluated by MTS assay. The extract showed antiglycative activity in all the assays. Its effectiveness was pronounced at both early and advanced glycation steps. Helix depletion during the Hb fructation was appreciably inhibited by the extract. The antiglycotoxic activities were in good agreement with RA content. *In vitro* cytotoxicity assays established the protective effect of balm on glycated-induced cell death. The results demonstrated the protective role of balm against various events of glycation through inhibition of oxidative stress mediated by RA. Accordingly, balm is an outstanding natural resource with antioxidant and anti-AGE functions, has protecting role against fructose-induced cellular damage with the anti-glycotoxic properties applicable for possible treatment of AGE-associated diseases.





**EVALUATION OF ANTIOXIDANT ACTIVITY, TOTAL PHENOLS AND FLAVONOIDS OF POMEGRANATE (*PUNICA GRANATUM* L.) STEM BARK**

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Pomegranate, rich in polyphenols, traditionally has been used as a remedy for some diseases in ethnobotany. Generally, tree bark contains phytochemicals such as flavonoids, tannins and phenolic acids which possess antioxidant activity. In this study, methanol extract of pomegranate stem bark prepared by soxhlet apparatus during 8 hours was evaluated for total polyphenols content (TPC), total flavonoids content (TFC) and antioxidant activity using 2,2 diphenyl-2-picrylhydrazyl (DPPH) radicals scavenging, metal chelating activity and trolox equivalent antioxidant capacity (TEAC). The TPC was determined by colorimetric method using Folin-Ciocalteu reagent and gallic acid as standard according to the method described by Singh et al [3]. The TFC was evaluated by aluminum chloride (AlCl<sub>3</sub>) using catechin as standard as the method described by Zarin and Tan. The DPPH radicals scavenging activity was estimated according to the method described by (Elfalleh *et al.*, 2012). 100 µL of different concentrations of the extract (200, 100, 50, 25, 12.5, 6.25 and 3.125 µg/ml) was mixed with 100 µL of 0.2 mM DPPH and read at 515 nm. Ascorbic acid was used as positive control. To evaluate metal chelating activity 250 µL of different concentration of extract was mixed with 20 µL 1 mM FeCl<sub>2</sub> and 60 µL of 3 mM ferrozine and read at 570 nm according to the Aparadh, et al [1]. TEAC was performed based on the method of (Loizzo, Tundis et al. 2012). 30 µL of extracts or Trolox (standard) was mixed with 330 µL of the ABTS+ solution and read at 750 nm. The results showed that extract contained 59.69 ± 2.913 mg GAE/g DW and flavonoids content 15.89 ± 0.98 mg CAT/g DW. Antioxidant activities in term of IC<sub>50</sub> were 14.99 ± 1.18 and 888.10 ± 48.38 for DPPH and metal chelating activity respectively. TEAC value was estimated as 2.636 mM trolox equivalent /100g DW.

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**DETERMINATION OF TRITERPENE GLYCOSIDES IN THE *AESCULUS HIPPOCASTANUM* L. SEED EXTRACTS FROM FOUR ASIAN SUPPLIERS BY HPLC-DAD**

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*Aesculus hippocastanum* (Horse Chestnut) seeds are used for swelling and pain due to varicose veins and poor circulation in the legs. For major saponins in the Horse Chestnut extracts in powdered form from four Asian suppliers were quantified by HPLC-DAD [1]. The saponins escin Ia, escin Ib, isoescin Ia, and isoescin Ib were characterized in the extracts. According to USP 36, powdered Horse Chestnut contains not less than 3.0% of triterpene glycosides calculated on the dried basis as escin (C<sub>55</sub>H<sub>86</sub>O<sub>24</sub>) [2]. Accordingly the Horse Chestnut extracts from Changcha Nutra, BNP, Sciyu Biotech, and World-Way Biotech were ended up and reported as 1.10, 2.98, 2.61, and 1.31 percent (w/w).

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**THE ANTIFUNGAL EFFECTS OF SILVER NANOPARTICLE USING  
EXTRACT OF *ANCHUSA ITALICA***

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Silver has long been recognized as having inhibitory effect on microbes present in medical and industrial process [1,2]. Many techniques of synthesizing silver nanoparticles, such as chemical reduction of silver ions in aqueous solutions with or without stabilizing agents [3], thermal decomposition in organic solvents [4], chemical reduction and photo reduction in reverse micelles [5], and radiation chemical reduction have been reported in the literature. Many reports are available on the biogenesis of silver nanoparticles using several plant extracts and few microorganisms. In this study green synthesis of silver nanoparticles with various shapes using the leaf and flower extract of *Anchusa italica* is reported. This is a simple, cost-effective, stable for long time and reproducible aqueous room temperature synthesis method to obtain a self-assembly of Ag nanoparticles. Appearance of yellow color and peak at 425 nm in UV-vis spectrum confirms the Ag NPs formation. Antimicrobial activity of Ag NPs showed good inhibitory activity against *Candida albicans* using standard disc diffusion and well diffusion assay. The diameter of inhibition zone was recorded 17mm.

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**EFFECT OF ZINC SULFATE AND SALICYLIC ACID ON THE YIELD AND  
BIOCHEMICAL CHARACTERISTICS OF *LALLEMANTIA IBERICA*  
UNDER IRRIGATION LEVELS**

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Dragon's head (*Lallemantia iberica* Fish. Et Mey., Labiatae family) is one of important annual medicinal plants that are valuable sources in Iranian natural resources whose understanding and scientific cultivation can play an important role in people's health and job creation [2]. Salicylic acid (SA) is considered as a hormone-like substance, which plays an important role in the regulation of plant growth and development, seed germination, fruit yield, rooting of cuttings and resistance to abiotic stresses [3]. Zinc a microelements essential for the growth and development of plants and is involved in many metabolic processes also, the structure of many enzymes, such as oxide reductase, transferase, hydrolase, isomerase and ligase [1]. In order to compensate the effect of water deficit stress on biological and grain yield, leaf chlorophyll *a* and *b*, carotenoid, soluble sugar, proline and glycine betaine in 'Dragon's head' under different irrigation regimes, a 2-year split plot experiment was conducted based on a randomized complete block design with three replications at the Agricultural Research Field of Shahid Beheshti college of Urmia. Treatments were irrigation (after 40, 80, 120 and 160 mm of evaporation from pan class A) as main plots and foliar spraying (zinc sulfate, salicylic acid and control) as sub plots. Results showed the significant effect of irrigation on the biological yield and grain yield, chlorophyll *a* and *b*, carotenoid, soluble sugar, proline and glycine betaine. Irrigation after 40 mm of evaporation produced the highest biological yield (3168 kg/ha) and seed yield (715.3 kg/ha). The highest content of chlorophyll *a* (39.42 mg/g fresh weight), chlorophyll *b* (16.8 mg/g fresh weight), carotenoid (26.72 mg/g fresh weight), soluble sugar (112 mg/g fresh weight) and glycine betaine (45.67 mg/g) were observed in 120 mm, and the highest proline (30.56 mg/g fresh weight) belonged to 160 mm of evaporation. The effect of foliar spraying on biological and seed yield was significant. In this research the maximum biological yield (2859 Kg/ha) and seed yield (687.4 kg/ha) was obtained by spraying zinc sulfate. The study showed that the biochemical characteristics of *Lallemantia iberica* responded to irrigation regimes, as well as to increase of irrigation levels secondary metabolites content was increased.

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**THE EVALUATION OF SECONDARY METABOLITES OF *PEROVESKIA ABROTANOIDS* UNDER DROUGHT STRESS IN TWO NATURAL REGIONS**

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Medicinal plant Borazambol with the scientific name of *Perovskia abrotanoides* belongs to the family Lamiaceae. It is growing wild in the margin of mountainous roads of arid. It is for a long time that indigenous people by different methods in traditional medicine use its products in preventing and curing diseases. In this research beside obtaining the effect of drought stress treatment (90%, 80%, 60% and 50% FC) on some secondary metabolites such as phenol, anthocyanin and flavonoids of *Perovskia abrotanoides* plants from two regions of Khorasan. The results show that with increased drought stress treatment the amount of secondary metabolites increased in two regions. There is no difference between flavonoids and anthocyanin in two regions (Kalab and Golamakan). The maximum and minimum of flavonoids and anthocyanin were obtained in 50% and 90% FC treatment, and the maximum (130 mg GAE/ gr) phenols were found in 60% FC treatment in Kalab region. Data analysis of variance showed there is no significant effect of regions on number of leaf, height of plant and dry weight but the maximum number of leaf and height of plants was found in 80% Fc treatment.



**EVALUATION OF DIFFERENT ECOTYPES OF *ZIZIPHORA CLINOPODIOIDES*  
LAM. BASED ON MORPHOLOGICAL TRAITS**

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*Ziziphora clinopodioides* a species from Lamiaceae family is found in many parts of Iran and has many curing effects such as improving digestive system, anti-inflammation and anti-pain. Evaluation of different ecotypes of a species reveals its intraspecific variations and is a preliminary step toward breeding and domestication. So far no comprehensive study has been done about this matter on *Z. clinopodioides* in Iran. In this research five morphological traits including internode, stem and inflorescence height, and leaf width and length were investigated. The results of analysis of variance showed that the entire traits had significant differences in 1% probability level. The largest values of the studied traits were found in Ilam ecotypes, while the lowest amounts for leaf length were observed in Evard ecotypes, for leaf width in Boroujen ecotype, for stem height in Bajgiran ecotypes, for inflorescence length in Khoy ecotype and for internode length in Evard ecotype. A positive and significant correlation was obtained between internode height and three traits including leaf length and stem and inflorescences height.

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**EFFICACY HABITAT CHANGE ON MORPHOLOGICAL CHARACTERISTICS  
OF MEDICINAL PLANT (*HYPERICUM PERFORATUM* L.) IN SEVERAL  
DIFFERENT HABITATS IN MAZANDARAN CHALUS, SARI AND AMOL**

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*Hypericum perforatum* (L.), (Hypericaceae) with locally known as (Perforate St John's-wort) Perennial herb, without shaggy and one of the most important and most valuable medicinal plant in the world and is widely used in the treatment of many diseases, especially depression. According to studies the plants resistant to frost and shade intolerant as well as Lime friend and habitats such as roadsides, meadows and pastures grow. Mazandaran province with a good ecological diversity that has the potential to grow many medicinal plants [1,2]. In this study medicinal plant *Hypericum* in late August 2016 some areas of the province (Chalus, Sari and Amol) were studied and morphological traits in 15 replications. Factors measured include: plant height, length and width canopy cover the roots and leaves. Results showed that the habitat on the type of root and leaf length and width, number of branches and sub and plant height, flower number, plant size, leaf number and dry weight and more effective herbal and medicinal plant *Hypericum* traits to habitat change plant morphological changes. Based on the results obtained in this study it can be concluded that different climatic conditions and soil type and altitude above sea level and etc can cause morphological changes in plants.

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**CHANGES IN PHYTOCHEMICAL AND PHYSIOLOGICAL TRAITS OF THYME  
(*THYMUS VULGARIS* CV. *VARICO* 3) UNDER DIFFERENT SALINITY LEVELS**

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Thyme is a valuable medicinal plants that should be evaluated in areas with different salinities for planting. This study aimed to investigate the effect of salinity on, physiological and thymol in thyme. The study was conducted as a randomized complete block design in the Institute of Medicinal Plants with 4 levels of salinity treatments (control, 50, 100 and 150 mM) and three replications and to evaluation of salinity effects the phytochemical trates were assessment. The results of the means comparison showed that by increasing levels of salinity, sodium, electrolyte leakage and proline increased and the amount of potassium were decreased. The content of thymol and carvacrol increased by higher levels of salinity (100 mM sodium chloride) compared with control. Although the majority of yield related traits negatively affected by salinity but the percentage of thymol and carvacrol were significantly increased in the essential oil in 100 mM salt concentration compared with control.

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**STUDY THE APPLICATION EFFECTS OF MYCORRHIZA AND SALICYLIC ACID ON YIELD AND QUALITY OF CALENDULA UNDER SALINITY STRESS**

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Marigold (*Calendula officinalis* L.), originated from NorthWest Africa [1]. Recently, this crop is find great interests because of considerable oil in its seeds contain unique polyunsaturated fatty acids that can be used in pharmaceutical, paint and coatings industries [2]. This study was conducted at pole-E- Dokhtar city located in Lorestan province during growing season of 2015. Experiment was conducted based on randomize block design with four replications. The first factor was salinity stress at five levels of (2, 4, 6 and 8 ds/m) and the second factor was salicylic acid at concentrations of (0, 0/3, 0/6 and 0/9 mmolar) and the third factor was application of mycorrhiza (*Glomus Fasciculatum*) at two portion of with (50 g/kg soil) and without mycorrhiza. Stress induction was at 20 days after planting and the first foliar application of salicylic acid was at five leaf stages of calendula and the second spray time was at 15 days letter. Results showed that vegetative growth and floral yield were significantly reduced by increasing salinity levels (1%, 5%). Percentage of root colonization and carotenoid also were negatively affected as results and severity of salinity stress.

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**SEDATIVE-HYPNOTIC EFFECT OF DIETHYL ACETATE EXTRACT OF  
*SCROPHULARIA STRIATA* IN MALE NMRI MICE**

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Sleep disorders are the major psychological problems in the modern human life. These problems directly affect the people's quality of life. There are several anti-anxiety and hypnotic medications in the market. However, they may have adverse drug reactions. In traditional eastern medicine *Scrophularia striata* has been used as a hypnotic agent. In this study the sedative-hypnotic effect of *Scrophularia striata* was evaluated in mice. We treated mice with diethyl acetate extract of aerial part of *S. striata* at 50, 100 and 200 mg/kg doses. We examined hypnotic activity of the extract utilizing the righting reflex loss after sleep induction by injecting pentobarbital (50 mg/kg). Open field test was used to evaluate the sedative effect of the extract. We injected the extract to mice and after 30 minutes, the mice were transferred to a cubic arena (40x40x40 Cm) and we recorded the activity of the mice by a digital camera. Ethovision was used as tracking software to evaluate the locomotor activity of the mice and total distance movement of the mice in a 10-minute period was reported [1]. The result of our study revealed that this extract has hypnotic effect at dosages of 100 mg/kg and 200 mg/kg. At 100 and 200 mg/kg, naloxone (1mg/kg) and flumazenil (10mg/kg) were not able to prevent the hypnotic effects of the extract indicating that benzodiazepine and opioid receptor are not involved in the reported effect. The extract at doses of 100 mg/kg and 200mg/kg reduced the total distance movement in open field test indicating the sedative effects of the extract. More experiments are necessary to find the exact active components of the plant and the mechanism of action of them.

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**EVALUATING THE EFFECT OF AQUEOUS EXTRACT OF *MYRTUS COMMUNIS*  
ON LEISHMANIA MAJOR IN VITRO CONDITION**

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Leishmania (Family Trypanosomatidae) are the causative agents of one of the most widespread and devastating diseases, i.e. Leishmaniasis, which are transmitted by sandflies. Leishmaniasis manifests as three types of complications, including cutaneous, mucocutaneous and visceral. There are several, common chemical compounds which are used for treatment of CL, such as Glucantim, Pentostam, Allopurinol and Allupurinolriboside, Paramomycin, aromatic diamidines and polyene antibiotics (Amphotericin B) that most of them have many side effect. *Myrtus*, with the common name myrtle, is a genus of flowering plants in the family Myrtaceae, is native across the Mediterranean region, Macaronesia, western Asia, and the Indian subcontinent. *Myrtus communis* has antiseptic properties. We used aqueous extract in this study. Procurement promastigotes of Leishmania and Proliferation Leishmania in Medium RPMI. Promastigotes of Leishmania treated with 400, 200, 100, 50, 25, 12.5 µg/ml of extract for 24h incubated in 24 °C and the promastigotes were counted by Neubauer Chamber. Macrophages infected with promastigotes treated with 400, 200, 100, 50, 25, 12.5 µg/ml of extract for 24h and incubated in 37°C then the amastigotes counted in 100 macrophages. Macrophage in Medium RPMI affected with 400, 200, 100, 50, 25, 12.5 µg/ml of extract for 24h incubated in 37°C and cytotoxicity evaluated with MTT test. The results showed that the IC50 for treated promastigotes with *Myrtus communis* was 50 µg/ml.



**IMPACT OF WEED COMPETITION ON GROWTH, CHLOROPHYLL CONTENT  
YIELD AND SEED QUALITY OF INDUSTRIAL HEMP**

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Industrial hemp (*Cannabis sativa* L.) has been grown around the world. Hemp seeds can be consumed for human or animal consumption and may be used as whole seeds, flour, and protein. Oil extracted from seeds is suitable for human consumption and industrial uses, such as in the inclusion of cosmetics [2]. The problem of weed invasion is a major problem in hemp production, which can lead to major economical yield losses. Hence, in this research we aimed to investigate the effects of weed interference on growth and grain yield, oil percentage and fiber yield of hemp. Living mulch significantly influenced weed suppression and a number of phenological characters, and yield of industrial hemp. Using living mulch markedly reduced weed weight. However, weed competition significantly decreased all above mentioned traits in industrial hemp. Weekly height data showed that the weed interference resulted in shorter plants at harvest due to a more rapid decline in leaf area index and crop growth rate than for the living mulch. Weed interference significantly decreased stem thickness compared to that of living mulch. Also, leaf chlorophyll content was significantly affected by weed competition. Fibre yield of hemp was greatest at living mulch treatment, which was significantly higher in comparison to weedy plots. Seed and oil yields were very poor overall weedy treatment compared to living mulch treatment. It can be concluded that using living mulch technique can be exploited in order to maximize the oil, fiber and seed yields and quality of industrial hemp.

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**ESSENTIAL OIL VARIATION IN DIFFERENT PLANT ORGANS AND  
POPULATIONS OF CELERY (*APIUM GRAVEOLENS*)**

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Medicinal plants are used in traditional medicine to treat many diseases. Celery (*Apiumgraveolens*) is a native plant widely distributed in Iran. Celery plays a role in prevention of cardiovascular disease, lowering blood glucose, decrease blood pressure and strengthen the heart. This herb has anti-bacterial, anti-fungal and anti-inflammatory effects [1]. Also, a powerful antioxidant property has been attributed to compounds such as apigenin, apiein, vitamins A and C. Recognition of plants in each region helps better recognition of restorable natural resources and characteristics of the medicinal plants and their applications. Here, the rate of essential oil from aerial parts of celery was investigated. For the purpose, four populations of wild celery were collected from the provinces of Hamedan, Zanjan, Urmia and Karaj. The essential oil (EO) obtained by hydrodistillation method for petiole, blade, total leaf (petiole + blade) and seed. The rate of essential oil changed in the populations, between 0.70-0.86%, 1.00-2.00%, 0.83-1.33% and 1.14-2.00%, for petiole leaf, blade leaf, total leaf and seed, respectively. In all populations except Hamedan population (especially for blade leaf), EO% was higher in seeds than in leaves.  $\beta$ -pinene,  $\alpha$ -pinene, and D-Limonene were characterized as main components of essential oils according to GC-MS analysis, while their rates were changed according to the populations. Generally, celery widely used in pharmaceutical, food and ornamental industries, that causes its significant commercial value. So, various combinations and numerous medicinal properties of seeds, leaves and stems, cause the need further and more research about the other useful and unknown properties of celery.

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**INFLUENCE OF IRON AND ZINC NUTRIENTS ON YIELD AND QUALITY  
OF FIELD PUMPKIN**

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To evaluate the effects of foliar application of iron and zinc on quantitative and qualitative characteristics of field pumpkin seed, an experiment was laid out as a randomized complete block design (RCBD) with three replications. Treatments included foliar application with ferrous sulfate (3 g l<sup>-1</sup>), zinc sulfate (3 g l<sup>-1</sup>), mixture of ferrous sulfate and zinc sulfate (3 g l<sup>-1</sup>), and water (control). This experiment was carried out at the Agricultural Research Station of Bu-Ali Sina University. The results indicated that foliar application had a significant effect on all characteristics except number of fruit plant<sup>-1</sup>. The highest number of seeds fruit<sup>-1</sup>, fruit diameter, fruit weight, weight of thousand seeds, oil percentage and grain and oil yields were achieved at the treatment of iron and zinc foliar application. By the way, the lowest values for above mentioned characteristics were obtained at control treatment (foliar application with water). Also, in comparison with control treatment, foliar application of both Fe and Zn increased significantly the concentrations of iron and zinc in seed. In general, consumption of both ferrous sulfate and zinc sulfate as a foliar application in the field pumpkin cultivation, could increase seed oil percentage, seed iron concentration, seed zinc concentration and oil yield.

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**EVALUATION OF ANTINOCICEPTIVE EFFECTS OF *MARRUBIUM ASTRACANIUM* AQUEOUS EXTRACT USING WRITHING REFLEX IN MICE**

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The genus *Marrubium* (*Lamiacea*) contains about 40 species which mainly found in areas along the Mediterranean sea and in temperate zone of the Eurasian Continent. In Asia these species were found in Iran, Iraq, Uzbekistan, Pakistan and India. There are some reports about the use of *Marrubium astracanium* for the treatment of joint pain, gout, stomachache and colic in Iranian traditional medicine. This study aimed at evaluating the antinociceptive properties of areal parts of *Marrubium astracanium*. Antinociceptive activity of total aqueous extracts were analyzed using writhing reflex test in mice (20-25gr). Various doses of our extract (100-400mg/kg) were injected intraperitoneally 30 minutes before the injection of acetic acid (%1) in different groups of male NMRI mice (n=10). Mice were observed for 25 minutes and number of writhes were recorded in each mouse. Protection against abdominal writhing was considered as antinociceptive effect. Our results show that *Marrubium astracanium* extract has significant antinociceptive effect compared to control group. (Pvalue<0.01).

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**THE EFFECT OF SPACING ON GROWTH INDICES AND ESSENTIAL OIL OF  
DIFFERENT SPECIES OF SAGE (*SALVIA SPP.*) IN QAZVIN PROVINCE**

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Sage (*Salvia* genus) is the largest genus of Lamiaceae family with 58 species in Iran. Many species of this genus in the world are used in pharmaceutical industry, aromas and spices. To assess how growth of sage a factorial experiment based on a randomized complete block with two treatments of 30 and 40 cm plant spacing and 11 species were conducted. In early March 2014, 11 species of sage seeds were planted in greenhouse in International University of Imam Khomeini. Seedlings were transferred to the farm of university in late April 2014. Row spacing (50 cm), fertilizer and water consumption values were carried out evenly for all plots. In the first year most of species were remaining in the rosette stage and did not form flower stalks. Next year, most of species produced flower stalks but flowering stage of *S. sclarea* was in early June. The canopy and height, plant fresh weight and dry weight (biomass) were measured. Essential oil percent from foliage and flowers was obtained by using Clevenger apparatus. GENSTAT statistical software was used for data analysis and mean comparisons were performed using Duncan Multiple Range Test. Planting distance treatment on canopy, fresh weight, plant height and also species treatment had showed a significant effects on all measured traits. In mean comparison of canopy, spacing of 30 cm and *aethiopsis* and *sclarea* species pursued excellence. *S. spinosa*, *S. aethiopsis*, *S. sclarea* and *S. reuterana* species had the highest amount of dry weight, respectively. In fresh weight spacing of 30 cm was better and between species, *S. spinosa* was the superior and in the first place and *S. reuterana*, *S. aethiopsis* and *S. sclarea*, species were in the next group, respectively. In plant height, spacing of 40 cm was superior and *S. limbata* and *S. palaestina* species have high amount of height. In essential oil *S. spinosa* had highest rate (1.28%) and was followed by the *S. limbata* species.

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**ETHNOBOTANICAL INFORMATION OF MEDICINAL PLANTS USED FOR THE  
TREATMENT OF DIGESTIVE AND LIVER DISEASE IN THE ZARMROOD  
DISTRICT IN NEKA (NORTHERN PART OF IRAN)**

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Today traditional medicines are a great part of modern health care systems in the world [1,2]. Zaramrood area is an important region located in Neka county of Mazandaran province in north of Iran. The traditional usage of plant species is commonly observed in the region. However, very little information is available on the traditional plants of this region. The results of study revealed 23 plant species that are used for the treatment of Digestive System disease, Appetizer, Gastritis, Laxative, Cramps and Liver stiffness. These plants belong to 19 genera and 11 family. Rosaceae and Lamiaceae with 6 species, Asteraceae with 3 and Violaceae with 2 species are the most important families respectively. The most commonly utilized portions of plants for medicinal purpose include the leaves. Other part used are fruits, stems and roots. The methods of preparation often employed are infusions and decoctions. Furthermore, based on current findings many of the mentioned plants have potential active ingredients to influence Digestive disease. Therefore the comprehensive ethnobotanical survey in the area is necessary to finding more useful species.

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**AUTECOLOGICAL INVESTIGATION OF RHUBARB (*RHEUM KHORASANICUM*)  
IN IRAN**

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Rhubarb (*Rheum Khorasanicum*) was introduced from the east of Iran. This plant species as the range plant has medicinal value. Unsustainable utilization of rhubarb from natural habitats had been increased, so this will lead the destruction of this plant habitat and may be affect its stablishment. The present study performed in order to providing the ecological information required for necessary programming in protection and supporting from this plant. Soil-vegetation interrelationships in rhubarb habitats of north eastern Iran were studied using multivariate analysis. The stratified- random system of sampling was employed to randomly collect vegetation and soil data from seventyquadrats of  $3 \times 3 \text{ m}^2$ . Data was analyzed by Principle component analysis (PCA), for recognize characters with highest effect on total variance in soil and vegetation characters. In each quadrats, in order of soil properties, samples was gathered from 0-15, 15-30, 30-45 cm of soil depth and physical and chemical properties of soil was measured in laboratory. Climate information of each area was obtained from Neyshabour Climatic and synoptic Station. Results indicated that the amount of Sodium, Potassium, saturation point of humidity, calcium carbonate gathered from the firth and third depth of soil, and the percent of sand, organic material, EC, pH in all three soil s depth was the affectes on total varianc. In addition, the amount of Phosphorus, silt and clay in samples gathered from the first and second depth of soil had affected on total variance. The frequency- cover of companion plant species and frequency of *Rh. Khorasanicum* was measured and data indicated that the most frequencies were in quadrates No. 6, 12 and 14. Based on these result it seems that the best growth condition for rhubarb has been provided in these quadrats. Based on Cluster Analysis all of these quadrates classified in one cluster, which indicated there are most similarity among them. Result indicated that the best condition for growing *Rh. khorasanicum* is in the soils with pH = 7.5-8, EC= 1- 3 ds/ m, CaCO<sub>3</sub> concentration= 10-27 mEq/L, P concentration= 32 mg/L, organic material= 0.4-0.8 % , Na concentration =2-5 ppm and K concentration = 2-6 ppm and the best soil texture is the Silty to silty- Clay.



**SYNTHESIS AND OPTIMIZATION OF IRON MAGNETIC NANOPARTICLES  
FROM MEDICINAL PLANT EXTRACTS THYME AND GREEN TEA**

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In recent years, green synthesis of iron magnetic nanoparticles from plant extracts with high antioxidant properties have been studied by many researchers [1-2]. Iron Magnetic nanoparticles have important features such as biocompatibility, non-toxicity, long half-life in blood circulation, having many applications in targeted drug delivery and high-contrast imaging of the blood [3]. Thyme and green tea extracts contain high anti-oxidants and strong reducing agents of iron ions. Quick colour change in solution from yellow to black in certain concentrations proves the reduction of iron ions to nanoparticles. The size of synthesized nanoparticles changes by the reaction temperature and pH. In this research, reaction temperature and pH were optimized. Characteristics and the size of synthesized nanoparticles were detected using UV- absorption spectrophotometer, scanning electron microscopy (SEM) and dynamic light scattering (DLS). Results show that, 30 min time and pH=8 of the iron nanoparticles showed average size with 48 nm.

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**THE STUDY ON ESSENTIAL OIL CONTENT, YIELD AND COMPOSITION OF  
*MENTHA* × *PIPERITA*. POPULATIONS UNDER AHVAZ CONDITION**

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The genus *Mentha*, one of the important members of the Lamiaceae family, is represented by about 19 species and 13 natural hybrids. They are fast growing and invasive and generally tolerate a wide range of agro-climatic conditions with distribution across Europe, Africa, Asia, Australia, and North America. The most common and popular mints for cultivation are *M. × piperita* L. and *M. spicata* L. [1]. Peppermint, which is a sterile hybrid developed from a cross between water mint (*Mentha aquatica*) and spearmint (*Mentha spicata*), is used for medicinal and food purposes. Its cultivation has economic importance, due to its ability to produce and store essential oil, whose main constituent is menthol, used in oral hygiene products, pharmaceuticals, cosmetics, and foods. Menthol also has high antifungal and antibacterial potentials, thus becoming one of the most demanded substances by the scents and essences industry. Because of this and other reasons, peppermint essential oil ranks high in terms of total sales volume [2]. However, Menthol as main components of plants is affected by high temperature [3]. This experiment was aimed to evaluate the essential oil content, yield and composition of peppermint populations under Ahvaz condition. The experiment was conducted in a randomized complete block design with three replications in research farm of Shahid Chamran University of Ahvaz with five treatments and three replications. Treatments were peppermint populations (Dezful, Ilam, Tehran, Hungary1 and Hungary2). There were significant differences between populations in regard to essential oil content of fresh and dry herbage. Moreover, oil content of fresh and dry herbage was ranged from 0.64-0.78 % and 1.43-2.33 %, respectively. Menthone, iso-Menthone, Menthol, Pulegon, Methyl acetate, 1,8 Cineole and Limonene were the main oil components of peppermint populations. Totally, result showed that essential oil content of some populations was increased under Ahvaz conditions. In contrary, menthol was below 50 % in most of populations.

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**BIOLOGICAL ACTIVITIES OF SILVER NANO PARTICLES FROM  
*TANACETUM VULGARE* LEAVES EXTRACTS**

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Nanomedicine is a rapidly developing and promising field that makes best use of inert metals like silver, gold, and platinum to synthesize metallic nanoparticles with high therapeutic potential for various biomedical applications. Silver with its potent antimicrobial activity has been used in the synthesis of silver nanoparticles which finds extensive use in the preparation of creams, topical ointments and medical implants [1,2]. The main objective of this study is to synthesize silver nanoparticles from *Tanacetum vulgare* divaricate leaves through a green chemistry approach. Silver ions were rapidly reduced by aqueous *Tanacetum vulgare* leaves extracts, leading to the formation of highly crystalline silver nanoparticles. Formation of silver nanoparticles nanoparticles have been characterized by UV-Vis absorption spectroscopy, Fourier transform infrared spectroscopy (FT-IR), X-ray diffraction (XRD), energy dispersive X-ray analysis (EDX) and transmission electron microscopy (TEM) analysis. Surface plasmon resonance (SPR) confirmed the formation of Ag-NPs with maximum absorbance at  $\lambda$  max of 450 nm. FT-IR, analysis suggests that the obtained silver nanoparticles might be stabilized through the interactions of carboxylic groups, carbonyl groups and the flavonoids present in the *Tanacetum vulgare* extract. X-ray diffraction spectra show four prominent peaks of the crystalline metallic Ag-NPs. Transmission electron microscopy show the spherical morphology of Ag-NPs with the size range of 15–50 nm. At last antimicrobial activities of green NPs were examined and results showed that green synthesized Ag-NPs had effective antibacterial and antifungal activities. By these deals, green synthesis of NPs as an eco-friendly and inexpensive method in large scale for medicinal and industrial application severely recommended.

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THE STUDY ON ESSENTIAL OIL CONTENT, YIELD AND COMPOSITION OF  
POPULATIONS OF *MENTHASPICATA* L. UNDER AHVAZ CONDITION

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Carvone is a monocyclic monoterpene ketone which exist both as R and S enantiomers in natural products. It has strong antiseptic properties and used as mosquito repellent and in the food industry as a flavouring agent. Carvone-rich essential oils have been recorded only for the three species; *M. spicata* L., *M. longifolia* (L.) Huds., and *M. Sauveolens* Ehrh. Carvone is the main component of essential oil of *M. spicata* L., for which it is widely used as spices. It constitutes 50–65% of its total monoterpene composition. Other major components of *M. spicata* L. oil are limonene, and 1,8-cineole [1]. Anyway, previous study on spearmint showed that high temperature during summer lead to increase in its oil and Khuzestan province has suitable climatic conditions for cultivation of spearmint [2, 3]. So, aim of present study was to evaluate oil content and composition of different population of spearmint. A field experiment was conducted in a randomized complete blocks design with five treatments (spearmint populations) and three replications in research farm of Shahid Chamran University of Ahvaz. Spearmint populations were Dezful, Shushtar, Hungary1, Hungary2 and Hungary3. Aerial parts of plants were harvested at the beginning of flowering stage, then the plants were dried at 40 °C temperatures. Essential oil was extracted via steam distillation using a Clevenger apparatus with a distillation time of 180 min. The essential oil's chemical composition was analyzed by GC and GC/MS. There was a great variation in the essential oil content of fresh and dry herbage of spearmint populations, ranging from 0.35-0.83% and 0.92 to 2.36% for fresh and dry herbage, respectively. Carvone (54.74-71.88%), Limonene (15.48-20.79%) and trans-Caryophyllene (2.1-3.88%) were determined as major components essential oil most of spearmint populations. In contrary, Hungary1 had different GC-MS profile and cis-Caryophyll acetate, 1,8-Cineole, Limonene, beta-Myrcene and trans-Caryophyllene were its major components essential. Overall, results showed that some populations can be recommended for cultivation in large scale under Ahvaz condition.

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**ECO-FRIENDLY SYNTHESIS OF SILVER NANO PARTICLES USING LEAVES  
EXTRACT OF *TRIFOLIUM PRATENSE* L. AND STUDY OF THEIR  
ANTIBACTERIAL ACTIVITY**

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Nanoparticles synthesis is an evergreen research field of 21<sup>st</sup> century in which the connotation of the biomediated experimental process is highly important. The biosynthesis of nanoparticles as an emerging highlight of the intersection of nanotechnology and biotechnology has received increasing attention due to a growing need to develop rapid, clean, nontoxic, simple and environmentally friendly synthetic technologies. The significance of such a synthetic protocol has been well demonstrated [1-3]. In the present report, silver nanoparticles were synthesized using *Trifolium pratense* L. extract for *in vitro* antibacterial efficacy against *Staphylococcus aureus* and *Escherichia coli*. Characterization of the silver nanoparticles was done by UV-Vis Spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Transmission Electron Microscopy (TEM). The surface plasmon resonance (SPR) found at 425 nm confirmed the AgNPs synthesis. The phytochemical like phenolic compounds and etc play a vital role in the nanoparticles synthesis was identified using the FT-IR. The as-synthesized AgNPs were phase pure and well crystalline with a face centered cubic (FCC) structure. The particle size of the AgNPs was studied by TEM and showed the presence of AgNPs in the size range 40–70 nm. The synthesized AgNPs exhibited good antibacterial potential against gram positive and gram negative bacterial strains. Thus, the synthesis of AgNPs using whole plant aqueous extract of *Trifolium pratense* L. would be helpful for the preparation of pharmaceutically useful drugs to destroy pathogenic microbes.

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**PRELIMINARY PHYTOCHEMICAL SCREENING IN METHANOLIC EXTRACTS  
OF LEAVES OF *ORIGANUM VULGARE* L.**

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Secondary metabolites are produced by plants mainly as products of primary metabolism and as part of the defence mechanisms of plants. Phytochemicals such as, alkaloids, tannins and flavonoids are examples of secondary metabolites produced by plants, from which the plants are thought to get their healing properties [1]. The aim of this study was to evaluate the bioactive compounds of methanolic extract of leaves of *Origanum vulgare* L. belonging to the family *Lamiaceae*. The leaves of *Origanum vulgare* L. were harvested in the highlands of Ardebil, Iran and methanolic extract prepared by microwave assisted extraction (MAE) method. The present study reveals that the phytochemicals analysis of eleven different chemical compounds Coumarins (Sodium hydroxide Test), Cardiac glycosides (Keller-Killani Test), Di-terpenoids (Copper acetate Test), Alkaloids (Mayer's Test), Saponins (Foam Test), Flavonoids (Alkaline Reagent Test), Terpenoids (Salkowski Test), Phenols (Ferric Chloride Test), Tannins (Ferric Chloride Test), Phlobatannins (HCl Test) and Quinones (Sulfuric acid Test) were tested in methanolic extract. The results of the phytochemical screening of methanolic extract of leaves of *Origanum vulgare* L. were alkaloids, terpenoids, flavonoids, quinones, di-terpenoids, tannins, and cardiac glycosides presented. Therefore, the leaves of *Origanum vulgare* L. might represent a new phytoconstituents and antibacterial source with stable, biologically active components that can establish a scientific base for modern medicine.

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## NATURAL SNAKE REPELLENTS

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Snake bites and fearing snakes are among the most important problems in the environment especially rural areas and military operations. Estimates showed a variation of 1.2 to 5.5 million snakebites, 421,000 to 2.5 million envenoming's and 20,000 to 125,000 deaths per year. Iran is located in tropical and subtropical regions and for this reason it has the world's second snake and scorpion bites. In Iran about 65 known species of snake found that 12 species are toxic. There are two functional categories prophylactic (physical and chemical) and remedial methods to snake control. Chemical snake repellents generally are associated with human and environmental health safety concerns. All of the currently registered products for use as snake repellents contain some combination of sulfur and naphthalene as active ingredients. The aim of this study is to gathering natural products which may serve as a snake repellent. Data for this study were collected from published literature on snake repellents from databases such as PubMed, Scopus, Google Scholar and Science-direct up to 30 January 2017 and main traditional treatises such as Zakhire-e-Kharazmshahi, The Canon of Medicine, Tohfeh-e-Hakim Momen and Makhzan-ol Advieh. Our results showed that 11 herbals, 3 animals and 3 mineral substances so far have been used as snake repellents. Aerial parts or extracts of such materials are administrated mostly in the form of powder formulation or smoking. Natural products, herbal, animal and mineral are rich sources for human requests. In this study we present opportunities for the production of natural dosage forms for repelling poisonous snakes. Further laboratory studies will have showed the snake repelling efficacy of such natural products.

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**EFFECT OF IRRIGATION ON SOME AGRONOMIC PROPERTIES AND  
ESSENTIAL OIL CONTENT OF *THYMUS DAENENSIS***

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Aromatic plants are considered of great interest for their flavors and medicinal properties. A large number of aromatic species belong to the family Lamiaceae, that is located in Iran. The species *Thymus* have been used for thousands of years as spices and local medicines in traditional medicine. Dried *Thymus* species are also used for the production of essential oil and an aromatic water or hydrosol (*Thymus* water). *Thymus daenensis* subsp. *daenensis* Celak has been known to be an endemic species grown in Iran. This subspecies generally grows in high altitudes in Zagros mountains range. The performance and production of secondary metabolites in different ecosystems is affected by genetic and environmental factors such as irrigation. There are no papers about the effect of irrigation on the *Thymus* in Urmia condition. It is believed that this study will be a good source for future studies and contribute to produce a new medicinal and aromatic plant in the region. The trial was carried out at the experimental field and agricultural laboratory of Urmia University, Iran during 2015-2016. Generative propagation of the plant was carried out in green house. The trial arranged in a randomized complete block design and three replications in plots with 6 m<sup>2</sup> area. Each plot had 6 rows with planting density of 50\*30 cm. Irrigation treatments included, irrigation every 15 days, 30 days, and without irrigation. samples harvested in second year (2016). The harvest was done at the flowering stage (50%). The plants were cut at height of 10 cm above soil. Leaf dry weight, stem dry weight, total dry weight, essential oil content and essential oil yield evaluated. According to the results the average of leaf dry weight ranged 1.34-1.84 (ton ha<sup>-1</sup>); stem dry weight ranged 0.66-1.16 (ton ha<sup>-1</sup>); total dry weight ranged 2.00-3.01 (ton ha<sup>-1</sup>); essential oil content ranged 3.91-4.38 (%); and essential oil yield ranged 52.18-76.61 (kg ha<sup>-1</sup>). In terms of essential oil content irrigation every 30 days was the best where as in terms of another properties irrigation every 15 days indicated the greatest amount. In conclusion in the agro-ecological condition of Urmia, to obtain productivity yield, the plant farm should be irrigated every 15 days.

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**EVALUATION OF LIGHT CONDITIONS ON THE GROWTH AND PRODUCTION OF ROSMARINIC ACID IN CALLUS CULTURE OF *PEROVSKIA ABROTANOIDES* KAREL (LAMIACEAE)**

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Callus culture (CC) with the aim of valuable medicinal compounds production is not of critical importance but it will be important when is used as the first step for cell suspension cultures and massive production of secondary metabolites (SMs). Cell suspension culture (CSC) is initiated by selection of cell line in high growth indices and productivity of considered metabolites. Light is an energy source which affects the biomass and SMs accumulation in cell, tissue and organ cultures [1]. In the present work, the growth indices (GI) and the amount of rosmarinic acid (RA) in induced calli from *Perovskia abrotanoides* root and leaf in two photoperiods of 16 h light and 8 h darkness as well as complete darkness were evaluated. The results showed that induced calli from both root and leaf explants had higher GI in dark conditions, while maximum accumulation of RA was recorded in both callus types at 16 h light and 8 h darkness. Totally, the GI of induced calli from root was higher than the induced calli from the plant leaf, while foliar calli was lighter in color and produced higher amount of RA (18.37 mg/g DW) in the photoperiod of 16 h light and 8 h darkness. In general, foliar calli with suitable growth in both darkness and light conditions produced higher quantity of RA than induced calli from *P. abrotanoides*. Our findings can be considered for further optimization experiments aimed at large-scale production of RA in bioreactor.

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## COUMARINS AND THEIR TAXONOMIC VALUE IN THE GENUS *FERULA*

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The genus *Ferula*, belonging to the family Apiaceae, includes about 150 species occurring from central Asia west to northern Africa. The genus has been represented in Iran by 31 species of which 16 are endemic to Iran. These plants were used in traditional medicine as anti convulsion, anti-swelling, anti-spasm and expectorant. The economic importance of this genus due to Asafoetida and Galbanum that are tow strategic material for medicinal uses. Coumarins are the most important compounds that founded in the genus *Ferula* but their chemotaxonomic value in this genus is not reported sofar. The aim of this study is using of the diversity of coumarins in the genus *Ferula* for improving the classification of *Ferula*. A systematic study of the chemical compositions of various species of the genus *Ferula* were searched in the followingdatabases PubMed, Scopus, Web of Science, and Science Direct up to 31 October 2016with *Ferula*, coumarin and terpenoid keywords. Then the chemotaxonomic relationships among the representatives of the genus *Ferula*obtained with NTSYS Software.Data for 73 species and about 200 coumarins with separated structure were gathered from databases. According to the biosynthetic pathway and chemical studies on the coumarins of the genus *Ferula* show the presence of many compounds belonging mainly to the groups of coumarins having an acyclic sesquiterpene substituent, coumarins with a monocyclic sesquiterpene substituent, coumarins with a bicyclic sesquiterpene substituent, prenylated coumarins, monoterpene coumarins and furanocoumarins. The diversity of *Ferula* coumarins is due to the structure of sesquiterpene residue, different types of carbon skeleton and different positions and nature of the substituting group. According toproblems of the classification of the genus *Ferula*, using of compounds in this genus can help to better classification species and prediction of despite having a special structure in the closely related species. However, the absence of similar studies and difficulties in identifying species are limitations of chemotaxonomic studies.

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**CHARACTERIZATION OF PHENOLIC COMPOUNDS PRESENT IN *PEROVSKIA ABROTANOIDES* KAREL LEAF EXTRACTS USING HPLC**

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Since ancient times, aromatic herbs and spices have been added to different types of foods to improve the flavor and organoleptic properties [1]. Phenolic compounds belong to the most active natural antioxidants found in the essential oils and crude extracts of the plants [2]. These diet antioxidants are important as they protect human body against oxidative stress and therefore maintain appropriate health. Antioxidants minimize oxidation of the lipid components in foods. There is an increasing interest in the use of natural and/or synthetic antioxidants in food preservation, but it is important to use such compounds fully for both antioxidant and pro-oxidant properties. The property of plant phenolic acids has been reported as powerful antioxidant compounds with both aspects which could be used as natural replacement for synthetic antioxidant food additives [2]. Thus, the objective of this study was quantitative and qualitative evaluation of phenolic acids in the extract of *Perovskia abrotanoides*. Dried powder of aerial parts (100 mg) of the plant collected from its natural habitat (Qamsar, Kashan) was extracted and then analyzed with high performance liquid chromatography (HPLC). Rosmarinic acid ( $341.1 \pm 7.2$  mg/100g extract) was the main phenolic acid followed by *p*-chronic acid ( $72.5 \pm 03.4$ mg/100g extract) and gallic acid ( $26.2 \pm 0.04$  mg/100g extract). Our results showed that *P.abrotanoides* is a rich plant source of phenolic acids especially RA that can be considered for further applications in food and pharmaceutical industries.

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**THE EFFECT OF DIFFERENT ECOTYPES ON SOME ELEMENTS AND  
MORPHOLOGICAL TRAITS OF *RHUS CORIARIA***

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*Rhus coriaria* have antimicrobial and antioxidant properties and it is useful for diabetics. In order to investigate the absorption of macro and micro elements and so the amount of Gallic acid production in different ecotypes, this experiment was conducted at Alborz research station, Research Institute of Forests and Rangelands, Karaj, Iran, in 2014-2015 in a randomized complete block design with three replications. Treatments consisted of five ecotypes of Karaj, the villages of SiahKollahan, Arankeh, Kalha and Atyshgah. Analysis of variance showed that there were differences between ecotypes on plant height, stem diameter, leaf width, canopy diameter, round up canopy, single leaf weight, leaf weight, the absorption of N, P, and K at 1% probability level and number of lateral-lateral branch, long of leaflet, width of leaflet, number of leaf, the absorption of Ca and Zn at 5% level. Means comparison showed that the highest of leaf yield with 559 and 618 kg/ha belonging to Kalha and Atyshgah ecotypes. Means comparison showed that the absorption of Fe of fruits were differences between ecotypes and the lowest of Fe with 350 ppm belonging to Karaj ecotype. Compared averages showed that there was a statistical difference between the Gallic acid produced by the fruit of ecotypes and lowest of the Gallic acid produced by the fruit with 71.6 ppm was the Atyshgah ecotype.



**AN OUTLOOK TO IRAN POTENTIAL IN FLAVONOIDS PRODUCTION:  
GERMPLASM, CLIMATE, HOW TO START- AND SCALE UP**

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Changing consumer lifestyles, focus on preventive medicine and rising demand for beauty and health supplements are reasons for highly global demand of flavonoid-containing products. The backbone of present article and lecture is our recent studies on flavonoid containing-plants. The plants we work on their flavonoids are *Dracocephalum kotschyi*, *Capparis spinosa*, *Salvia reuterana*, *Satureja hortensis* and *Rheum ribes* [1-3]. Since the primal sources of plants has been collected from natural habitat therefore it can provide a good opportunity for us to discuss about their germplasm. Novel *in-vitro* techniques for flavonoid production and problems we face with them, high efficient methods for extraction, new simple and advanced analytical methods are the other subjects of present study. With available data, exist potential for plant origin drugs, and growing rate of cardiovascular disease, diabetes, and cancer, Iran has the potential to become one of the world's largest flavonoid producer and consumer in the new future. Therefore to reach this goal, getting of fundamental managements and strategies are essential instruments to shortening the time taken or even increasing the success rate.

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PHYSIOLOGICAL AND BIOCHEMICAL CHARACTERISTICS RELATED TO  
COLD RESISTANCE IN *LINUM*

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In order to screen the cold tolerant *linum* varieties, in Iran County, we comprehensively evaluated 8 *Linum* varieties using subordinate function method combined with correlation analyses based on 2 physiological and biochemical indexes relevant to under cold tolerance. It was found that different *linum* varieties had different responses to the long duration of continuous cold stress, which were dull for CAT, POX. Based on the analysis by subordinate function method, we divided the tested varieties into three groups of cold tolerance. The group I had 4 varieties with high cold tolerance, the group II had 2 varieties with moderate cold tolerance, and the group III had 2 varieties with low cold resistance. It is feasible to evaluate the cold resistance at processing growth stage by using subordinate function method with multiple physiological and biochemical indexes, which can reveal the differences of cold hardiness in different *Linum* varieties, and provide good references for commercial *Linum* production.

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**METHYLATION-SENSITIVE AMPLIFICATION POLYMORPHISM (MSAP)  
PROTOCOL TO ASSESS DNA METHYLATION IN THE *LINUM* GENOME**

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The technique presented provides molecular markers for DNA methylation studies in the *Linum* genome. This technique can be used for studying DNA methylation in natural populations, in mapping populations, and also in plant organs or during plant development. DNA methylation as an epigenetic mediator plays the important role in spatial and temporal gene regulation and ensures the stability and the plasticity of organism. In this investigation, methylation sensitive amplification polymorphism (MSAP) were assessed in CCGG sites on *Linum*, in response to different temperature stresses. isoschizomers chosen for the study provides an estimation of the methylation status of DNA; markers identified as differentially methylated in the biological process surveyed can be easily cloned; low quantities of DNA are required (*i.e.*, 500 ng per sample), DNA methylation assays can thus be performed with small samples of plant material (*i.e.*, small plant organs).

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THE CHEMICAL COMPOSITION OF NIGELLA SATIVAL. IN DURING  
SEED MATURATION

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*Nigella Sativa* L. belongs to the botanical family of *Ranunculaceae* is a valued medicinal herb used in many countries for the treatment of a number of diseases. The extensive researches have been carried out by various researchers on *N. sativa* and the therapeutic effects of the extracts of the seeds (and some of its active constituents, volatile oil and thymoquinone) have been reported which include, antidiabetic, anticancer, immunomodulator, analgesic, etc. This study was performed to identify biochemical composition in developmental stages of *N. sativa* seeds. For this purpose, the samples of inflorescences were collected in 5 steps at 0, 10, 30, 50 and 60 days after anthesis and their extracts were prepared. The composition of the volatile oil was investigated by gas chromatography–mass spectrometry. After oil analysis by GC/MS, 20 compounds were identified in the volatile oil of *Nigella Sativa* in which p-cymene, Thymoquinone, carvacrol,  $\alpha$ -thujene,  $\alpha$ -pinene were the main constituents. Among them, p-cymene was the major component, reaching its maximal levels at 50 days after anthesis (DAA). monoterpene amounts changed during seed maturation.  $\alpha$ -thujene and c-terpinene display constant accumulation trends starting at 10 DAA and reaching their maximal level at 50 DAA. Thymoquinone also starts to accumulate at 30 DAA, reaching its maximal levels at 65 DAA. which approximately indicate constant accumulation trends in the stages of seed development. It would appear that the major compounds of the volatile oil are in the final stages of flowering.

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## ANTIMICROBIAL ACTIVITY OF *ARTEMISIA ANNUA* EXTRACTS

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*Artemisia* is a plant from Chicory category which is a green crucible. Different plants of the genus grow in Iranian plateau. The genus plants have wide spectrum medicinal uses. Problems in the treatment of infections caused by resistant strains of microorganism is the reason for more evaluation of herbal drugs. Due to antibiotic activity of *Artemisia* species, they are used to cure of abnormal digestion and to ward of the intestinal parasites and other infections diseases [1]. The purpose of this study was to determine the antibacterial activity of *Artemisia annua* extract. First, the plant was collected from south of Gorgan- Iran. Next the dried plant was macerated in methanol for 72 h and then fractionated by n-hexane. Then the antibacterial activity of the plant extract was evaluated using minimum inhibitory concentration (MIC) from concentration of 1000 µg/mL to 7/8 µg/mL against Gram-positive bacteria of *Staphylococcus aureus* and Gram-negative of *Klebsiella pneumoniae* according previous study [2]. The hexane extract did not show any antibacterial activity. However the methanolic extract inhibited the growth of *S. Aureus* with concentration of 250 ppm and *K. Pneumoniae* with 25 ppm. The extract activity was less than the positive controls of Ampicillin and Chloramphenicol.

**Table 1. MIC Result of Antibacterial Activity of Artemisia Annu Extracts (µg/mL)**

Bacterial name	Fraction		Controls	
	Methanolic	Hexane	Amp.	Chl.
<i>S. aureus</i>	250	Na	25	25
<i>K. pneumoniae</i>	250	Na	25	25

Na:None active

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**THE EFFECT OF DIFFERENT LEVELS OF DIETARY HARMALA SEED POWDER ON IMMUNITY SYSTEM STATUS OF BROILERS**

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Health is an important and determining factor in performance, uniformity, and shelf life due to disease resistance. Many antibodies are found in body fluids and interstitial spaces and have the most effects on removal of extracellular pathogens such as bacteria and parasites [1]. Herbal supplements in poultry diets can increase the number of different types of immune cells, antibody titer, and also growth of lymphoid organs such as spleen and bursa of Fabricius [2]. Harmala with the scientific name of *Peganum harmala* is a perennial and non fluff plant from the family of Nitrariaceae. Alkaloids are the active compounds of harmala which also known as Beta-Carbolines, and accumulate in parts of the plant seeds and roots. They include Harman, Norharman, Harmine, Harmalol, Harmaline and Vasyzin. It has been reported that dietary inclusion of harmala seed and extract enhanced immunological responses in broiler chicks. In this study, 288 one-day old Ross 308 broiler chicks were randomly assigned to 4 treatments and 4 replicates of 18 birds in each. The experimental treatments were control (diet with no feed additive), diet containing 0.02% Virginiamycin as growth promoter antibiotic, diet containing 0.25% harmala seed powder and diet containing 0.50% harmala seed powder. At 19 day of age, Newcastle disease vaccine was administered orally to all chicks and 6 days thereafter, blood samples were taken from two birds of each cage via wing vein for determination of antibody titer against Newcastle vaccine. At the end of experimental period (42 day of age), two birds from each cage with the closest body weight to the cage mean weight were selected and slaughtered after recording their live body weights and their spleen and bursa of Fabricius gland weights were measured in proportion to live body weight. The data were analyzed in a completely randomized design using GLM procedure of SAS. Comparison of means was conducted by Duncan's multiple range test. The results of this study showed that the experimental treatments had no significant effect on spleen and bursa of Fabricius percentage but the antibody titer against Newcastle vaccine in group fed control diet was significantly ( $P < 0.01$ ) higher and in chicks fed diet containing 0.02% Virginiamycin was significantly ( $P < 0.01$ ) lower than those of other treatments. It seems that the reduction in population of intestinal bacteria which stimulate the production of immunoglobulin is the main cause behind the decline of antibodies by feeding antibiotics.

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**A SIMPLE AND NEW METHOD FOR STUDY OF LEAF FLAVONOID DIVERSITY  
AMONG CAPER POPULATIONS: COMBINATION OF TLC, COLOR SPACE  
MANAGEMENT AND MULTIVARIATE ANALYSIS**

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*Capparis spinosa* (Capparidaceae), is an herbaceous perennial plant with interesting pharmacological properties. Knowledge of phytochemical diversity among wild-growing populations of *C. spinosa* is an important tool for recognizing gen pools and domestication strategies. To achieve this goal phytochemical diversity among nine populations of Capers were studied. In order to flavonoid extraction methanol were used as solvent. The chromatography were done in 1 cm or less of BAW: butanol: glacial acetic acid: water into the chromatography tank. After development, the individual spots were identified by visibility methods (UV<sub>254</sub>, UV<sub>360</sub> and AlCl<sub>3</sub>) and using of R<sub>f</sub> values of standards, spot color and UV spectrum. The spots convert to real curves to create instrument for quantification. Nine flavonoid were detected which being rutin, quercetin and kaempferol as main components respectively. Asgrabad population was superior to others in terms of flavonoid compounds. Nine population were clustered to two groups. First clusters were composed of five with rutin and kaempferol as main components and the second were composed four population with high rutin/ kaempferol/quercetin. The most property of this study was use of new, simple and efficient method for identification and quantification of flavonoid.

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**EVALUATION OF PHYSIOLOGICAL CHARACTERISTIC, YIELD AND ESSENTIAL OIL OF *ACHILLEA MILLEFOLIUM* UNDER DROUGHT STRESS**

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In order to evaluate the effects of water stress on morpho physiological characteristics and essential oil percentage of yarrow (*Achillea millefolium* L.) an experiment were investigated at the greenhouse of Islamic Azad University of Mahabad. The experiment was based on Randomized Complete design with four replications. Treatment includes: four irrigation regime 100 (no stress), 75 (mild stress), 50 (medium stress) and 25% (severe stress) of field capacity. Characteristics including Prolin rate, chlorophyll (a, b and total rate), Cartenoid, total soluble sugar, water relative content, water deficit rate of leaf, biomass weight, plant height and essential oil percentage. Results showed at drought stress conditions Prolin rate increase in compare to control. Butt chlorophyll rate such ass chlorophyll a,b and total decreased. Drought stress had no effect on a/b chlorophyll rate. In addition drought in sever stress lead to 18 percentage decrease in Cartenoid in compare to control treatment. Other parameters that affects by drought include relative water content (RWC), water deficit rate biomass and plant height all of them were decreased by drought. Butt soluble carbohydrate and oil percentage had sensible increase in water deficit conditions.

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EVALUATING THE CHEMICAL COMPOUNDS OF *MORINA PERSICA* L. IN DEH SHEIKH RANGELANDS

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The Morinaceae contains 3 Genus and 13 species which distributed from the mountains of southeastern Europe Through the Himalayas to the Qinghai-Tibetan Plateau, especially Alpine Regions. *Morina persica* L. is one of the Endemic species of Iran that we consider its chemical compounds with Gc-Mass in this paper for the first time. The results of Gc-Mass of this plant in Flowering period shows that *Morina persica* has 25 compounds and main ones are: Cis-Chrysanthenyl acetate (34.263%), (E)- $\beta$ -Damascenone (4.44%),  $\beta$ -Gurjunene (6.951%), Dodecanoic acid (3.144%), Spathulenol (24.316%), Caryophyllene oxide (3.708%), Hinesol (4.548%),  $\alpha$ -Cadinol (2.734%). The results indicate that this plant can be use in healthful formulation and medical purposes.

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THE ESSENTIAL OIL ANALYSIS OF *SCROPHULARIA VARIEGATA* BY GC/MS

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*Scrophularia variegata* from the herbal of Scrophulariaceae was collected from the riverbanks of Sarab. After identifying, plant converted into powder and essential oil was extracted by distillation with water and then determined by GC/MS. Totally, 10 component were identified. The identified method of the components of each essence was based on comparing mass spectrum with mass spectrum of standard particles, comparing inhibition index with standard index and analyzing library guess of MS device. The major materials in the essence of *Scrophularia variegata* are as follows: 1-octene 3-ol (19.7%), 3 octanol (10.5%), Carvacrol (9.5%), 1 propene (30.3%), 1-(3-Methoxy phenyl) [1,2].

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**STUDY OF SEDATIVE-HYPNOTIC EFFECTS OF *ZATARIA MULTIFLORA*  
IN MICE**

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Sleep disorders like insomnia are increasing in the recent decades. There are plenty of chemical drugs in order to solve these problems. These drugs associate with limit healing and many side effects, which led patients to take herbal remedies. So achieving an effective medicine with fewer side effects can be helpful. This study was conducted to assess hypnotic-sedative effect of *Zataria multiflora* using righting reflex test. Maceration method was used in our study. The leaves of *Zataria multiflora* were immersed in ethanol 96% for 3 days. This procedure was repeated three times. Then the hydroalcoholic extract was concentrated and dried in rotary machine and Bain-marine, respectively. For evaluating hypnotic effect of the *Zataria multiflora*, pentobarbital was injected in 30 minutes after injection of different doses of the extract. Locomotor activity of mice was recorded by a digital camera 30 minutes after injection of the extract in different doses (100mg/kg, 200mg/kg, 400mg/kg) all the records were analyzed by ethovision software and total distance move was calculated for each mouse. Administration of 200 mg/kg of extract increased the sleeping time induced by pentobarbital, which indicates hypnotic effect of the extract. Naloxone prescription in dose of 1 mg/kg caused a reduction in insomnia of extraction. Also, in the open field test, the extract (400 mg/kg) showed significant decrease in locomotor activity of mice, indicating the sedative effect of the extract.

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**MEDICINAL PLANTS ESSENTIAL OIL AGAINST SOME PATHOGENIC FOOD BORN BACTERIA**

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Infections due to bacterial species also remain a serious clinical problem. Emerging resistance of bacterial species is seriously decreasing the number of effective antimicrobials. Because of increasing pressure of consumers and legal authorities, the food industry has tended to reduce the use of chemical preservatives in their products to either completely nil or to adopt more natural alternatives for the maintenance or extension of product shelf life. In these study the effect of antibacterial essential oil plants consist of *Pulicaria gnaphalodes*, *Ducrosia anethifolia*, *Carum copticum Benth*, *Foeniculum vulgare Mill* and *Major an hortensisminch* on *Listeria Monocytogenes ATCC1297*, *Bacillus subtilis*, *Bacillus coagulans*, *Bacillus anthracoid*, *Bacillus cereus* and *Bacillus phericus* were evaluated. To determine the strength of antibacterial essential oils were used in the disk diffusion method and tetracycline used as a control group. Among the essential oils, the highest antibacterial effect was related to the *Carum copticum Benth* essential oil that the diameter of inhibition zone respectively 30.6±9, 29±1.7, 28.4±3, 28±5.2, 27±4.3 and 23.3±1.1 mm. According to the results in this study tested the effect of some antimicrobial essential oils and extracts more than antibiotics available.

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**THE ANTIBACTERIAL EFFECT OF *PLANTAGO OVATE* AND  
*LALEMENTIA IBERICA* L. EXTRACT ON SOME HUMAN AND FOOD BORN  
PATHOGENIC BACTERIA**

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Due to the growing resistance of bacteria to antibiotics, researchers are finding new drugs pickup plant as an alternative to synthetic drugs are administered. In this study, the antibacterial effect of *Plantago ovate* and *Lalementia iberica* L. on bacteria *Psudomonas aaeruginosa*, *Psudomonas aflurossence*, *Bacillus subtilis*, *Bacillus coagulanse*, *Bacillus antheracoid*, *Bacillus cereus*, *Bacillus sphericus*, *Escherichia coli* O157, *Salmonella liatica*, *Salmonella typhymorium* ATCC3598 were studied. To determine the strength of the antibacterial syrup, *Plantago ovate* seed disk diffusion method was used and tetracycline was used as a control. According to the diameter of inhibition zone (izd) expressed in mm, results were appreciated as follows:  $izd \geq 15$ : very active,  $10 \leq izd < 15$ : moderately active,  $izd < 10$ : inactive. In this experiment *Lalementia iberica* L. on *B.subtilis*, *Psudomonasaaeruginosa* and high *B.spherics*, on average *B.cereus*, *S.typhymorium* ATCC3598 and other bacteria have no effect. *Plantago ovate* on *B.spericus* high impact and moderate impact on *Psudomonas aaeruginosa* and on other bacteria have no effect. Tetracycline as control group have significant impact on all bacteria. The results of these tests show that some traditional herbs can be an alternative to chemical antibiotics.

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**EFFECT OF CD IN GENE EXPRESSION FNSII IN *MATRICARIA CHAMOMILLA*.**

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*Matricaria chamomilla L* is a well-known medicinal plant species from the Asteraceae family often referred to as the "star among medicinal species." Nowadays it is a highly favored and much used medicinal plant in folk and traditional medicine. Recent research shows these properties are partly due to its phenolic compounds such as Flavones. Flavones are a large class of plant secondary metabolites. Epidemiology studies suggested that a high dietary intake of flavonoids, including flavones, may be linked to a reduced risk of several cancers (e.g., lung and colon cancer), coronary heart disease, chronic inflammation, and osteoporosis. Apigenin is one of the major flavones that found in *matricaria chamomilla*. The biosynthesis of apigenin in *matricaria chamomilla* to be catalyzed by flavone synthase II proteins (FNSII). In the current study, Real Time PCR was used to evaluate the gene expression and enzymatic activity of flavone synthase II (FNS2). The plants were treated with different concentrations of Cd (0, 90, 180 and 360  $\mu$ M) for 72h. then The activities were studied during flowering stage. The difference between gene expressions levels were analyzed by Duncan method ( $P \leq 0.05$ ) using SAS software (version 9.0). During the flowering stage, the results showed an increase in gene expression of flavone synthase II in plants treated with 90 and 180  $\mu$ M concentration of Cd. The gene expression of flavone synthase II was significantly higher (5%) for 180  $\mu$ M concentration of Cd samples compared to the control samples. but results showed a decrease in gene expression of flavone synthase II in plants treated with 360  $\mu$ M concentration of Cd.

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**THE EFFECT OF DIFFERENT LEVELS OF *DIETARY HARMALA* SEED POWDER  
ON BROILERS IMMUNITY RESPONSE TO SHEEP RED BLOOD  
CELL ANTIGEN**

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Health is an important factor affecting performance, uniformity, and shelf life based on resistance to disease. Many antibodies are found in body fluids and interstitial spaces and have the most effects on removal of extracellular pathogens such as bacteria and parasites [1]. One of the alternative ways to balance the immune system is creating a natural resistance to disease. Medicinal plants and phytobiotics which are products derived from medicinal plants, have such features naturally [2]. Harmala with the scientific name of *Peganum harmala* is a perennial and non fluff plant from the family of Nitrariaceae. Seeds from this plant are rich in carbohydrates, lipids, proteins, minerals, alkaloids and amino acids. Dried harmala seeds contain 35% protein, 17% oil and Harmaline, Harmine, Harman, Harmalol, Peganin, Isopeganin, Dipeganin, Vasizin and Vasyzinun alkaloids [3]. Alkaloids, Flavonoids and anthraquinones are the main phytochemical compounds of harmala. It has been reported that dietary inclusion of harmala seed and extract enhanced immunological responses of broiler chicks to sheep red blood cell (SRBC) antigen [4]. In this study, 288 one-day old Ross 308 broiler chicks were randomly assigned to 4 treatments and 4 replicates of 18 birds in each. The experimental treatments were control (diet with no feed additive), diet containing 0.02% Virginiamycin as growth promoter antibiotic, diet containing 0.25% harmala seed powder and diet containing 0.50% harmala seed powder. At 25 and 31 days of age, 1 ml of 5% SRBC suspension was injected to thigh muscles of two birds from each experimental unit and at 31 and 37 days of age, blood samples were taken from the same two birds of each cage via wing vein for determination of primary and secondary responses to SRBC, respectively. The data were analyzed in a completely randomized design using GLM procedure of SAS. Comparison of means was conducted by Duncan's multiple range test. The results of this study showed that the primary and secondary antibody titers against SRBC antigen in chicks fed diet containing 0.25% harmala seed powder was significantly ( $P < 0.01$ ) higher than those of other treatments. According to the results of this study, it seems that the utilization of *Peganum harmala* seed powder at level of 0.25 percent of the diet will result to improvement in immunity system status of broilers.

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MEIOTIC STUDY OF THE *HERACLEUM RAWIANUM*, AN IMPORTANT  
MEDICINAL SPECIES

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The genus *Heracleum* (Umbelliferae) with more than 120 species is considered as one of the widespread genera of the Apiaceae family [1]. The English common name of *Heracleum* species is “Cow-parsnip” or “giant parsnip hogweed”, and “Golpar” is the Persian common name for the plants of this genus [2]. The fruits and leaves of some species of this genus have been used as tonic, antiseptic, anthelmintic, analgesic agent, carminative, diuretic, digestive and aphrodisiac and reduce swelling in the Iranian folk medicine [3-4]. The genus *Heracleum* L. is represented by eight perennial aromatic species (*H. persicum*, *H. rawianum*, *H. transcausicum*, *H. gorganicum*, *H. anisactis*, *H. rechingeri*, *H. antasiaticum* and *H. pastinacifolium*), in the Flora Iranica [3]. These species grow wild in humid mountainous regions of Iran. *H. rawianum* is a native species growing in the Sabalan mountain in northwestern of Iran [1]. In this study meiotic analysis of Meshginshahr (Ardabil province) population of this species was performed. *H. rawianum* umbels were collected at different distinct stages. The umbels which collected before flowering start (premature inflorescences) were suitable for meiotic study, due to containing cells in meiosis. Whereas, pollen grains were studied in meiocytes of mature inflorescences (full bloom stage). Ploidy level, chiasma frequency, and distribution as well as chromosome associations were investigated. Chromosome number of this species is  $2n=2x=22$ , which is reported for the first time. Pollen fertility and meiotic aberrations such as stickiness, laggard chromosomes, anaphase bridge and also micronucleus formations were investigated.

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**PERSIAN SHALLOT, ALLIUM HIRTIFOLIUM BOISS, INDUCED APOPTOSIS IN HUMAN HEPATOCELLULAR CARCINOMA CELLS**

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This study investigated the potential of Persian shallot extract as an anticancer agent in HepG2 tumor cell line, an in vitro human hepatoma cancer model system. The inhibitory effect of Persian shallot on the growth of HepG2 cells was measured by MTT assay. To explore the underlying mechanism of cell growth inhibition of Persian shallot, the activity of Persian shallot in inducing apoptosis was investigated through the detection of annexin V signal by flow cytometry and expression of some apoptosis related genes such p21, p53, puma, caspase-8 family-Bcl-2 proteins like bid, bim, bcl-2 and bax were measured by real-time PCR in HepG2 cells. Persian shallot extract inhibited the growth of HepG2 cells in a dose-dependent manner. The IC50 value (inhibiting cell growth by 50%) was 149µg/ml. The results of real-time PCR revealed up-regulation of bid, bim, caspase-8, puma, p53, p21 and bax genes and down-regulation of bcl-2 gene in HepG2 cells treated with Persian shallot extract significantly. Therefore, increased expression of bid, bim, caspase-8, puma, p53, p21 and bax expression genes and down regulation of bcl-2 gene is the first report indicating that the Persian shallot extract possibly induced the process of cell death through the intrinsic and extrinsic apoptosis pathways and triggers the programmed cell death in HepG2 tumor cell lines by modulating the expression of pro-/anti- apoptotic genes. Furthermore, we showed that Persian shallot extract increased annexin V signal and expression, resulting in apoptotic cell death of HepG2 cells after 24 h treatment. Therefore, according to the results of this study, the Persian shallot extract could be considered as a potential candidate for production of drug for the prevention or treatment of human hepatoma.

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**ANTI-TUMOR ACTIVITY OF THE SHOOT OF EUPHORBIA  
TEHRANICA ETHANOLIC EXTRACT ON HT-29 HUMAN COLON  
CANCER CELL LINE**

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Colorectal cancer (CRC) is one of the most common types of cancer affecting 1.23 million individuals per year. CRC in the past three decades in Iran has made it a major public health burden. *Euphorbia tehranica* is a medicinal plant and is a spurge endemic to Iran. Medicinal plants are the potent source of biologically active compounds and have always been of great interest for the effective chemotherapeutic agents and offering a broad spectrum of activity with greater emphasis on preventive action [1-5]. The aim of present study is to evaluate the antitumor properties of the shoot of *Euphorbia tehranica* ethanolic extract against HT-29 cell line induced human colon cancer. The anticancer property of the extract was evaluated by assessing the effect on cell viability. These results were obtained by the XTT assay. After 24, 48 and 72 hours, IC<sub>50</sub> for HT-29 cells were 600, 1200 and 600 µg/ml respectively. Ethanolic extract from the shoot of this plant exhibited significant growth inhibition of HT-29 human colon cancer cell lines. The results may suggest that the gene expression which is contributed in cell proliferation and apoptosis has been changed under treatment with ethanolic extract from shoot of *Euphorbia tehranica* in HT-29 cell line.

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**EFFECTS OF CALCIUM SULFATE AND CALCIUM CHLORIDE ENHANCERS  
ON PHOTOSYNTHETIC PIGMENTS OF *MENTHA LONGIFOLIA* L.  
UNDER ZINC STRESS**

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*Mentha longifolia* L. is a perennial plant with medicinal effects of antispasmodic, carminative, contractor of the gallbladder, sedatives and is used in food industries, pharmaceuticals and cosmetics. Zinc is one of the essential micronutrients that it has a key role in component of structure of many enzymes and acts as a cofactor. However, excess amount of metal such as zinc in the soil causes metabolic disorders and growth inhibition in many plant species [1]. Calcium is also an essential element for the plants that forms 0.2 to 0.5% of leaf dry weight and it plays an important role in construction of wall and cell members in the plant. This study was aimed to investigate the effects of Calcium sulfate and calcium chloride on photosynthetic pigments of *M. Longifolia* under zinc stress. It carried out in a pot. A factorial experiment in a completely randomized design with three replications was conducted in the years, 2014-15. The randomized experimental factors included the use of heavy metal in 4 levels: 0, 150, 300 and 450  $\mu$ M, calcium sulfate at two levels of 0 and 2 mM and calcium chloride at two levels of zero (as control) and 2 mM in the *M. longifolia*. The results show that zinc, calcium sulfate and calcium chloride had a significant effect on the studied traits. And the effects of zinc on the calcium sulfate interactions were significant for chlorophyll a. So that the level of 450  $\mu$ M zinc contrast to the control level reduced chlorophyll a, chlorophyll b, total chlorophyll and carotenoid content. On the other hand, calcium chloride significantly increased the amount of chlorophyll a, chlorophyll b, total chlorophyll and carotenoid. Level 2 mM calcium sulfate, zinc metal showed more chlorophyll a in 450 mM calcium sulfate control also has the lowest average chlorophyll a in the *M. longifolia*. Heavy metals by effect on biological membranes and inhibition of enzyme activity disturb biosynthesis of photosynthetic pigments such as chlorophyll [2].

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**THE EFFECT OF DIFFERENT CONCENTRATIONS OF HUMIC ACID AND FLOVYK ON SOME ABSORPTION ELEMENTS OF *OLEA EUROPAEA* L.**

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Olive (*Olea europaea* L.) belong family Oleaceae is a widely distributed tree grown in many arid areas of the world. Olive is one of the most important economic crop for many countries such as Spain, Italy, Greece, Turkey, Tunisia and Egypt. This study was performed to evaluate the effects of Humic acid and Flovyk on the quantity and quality of olive leaf extract in the field condition at Alborz research station, Research Institute of Forests and Rangelands, Karaj, Iran, in 2015 in a randomized complete block design with three replications. Treatments consisted of Five different concentrations of Humic acid and Flovyk, contains 0, 5, 7.5, 10, 12.5 and 15 l/ha. Measurement traits were main branch height, trunk diameter at the collar, the number of leaves and absorbed elements such as N, P, K, Ca, Mg, Fe, Mn, Zn, and Cu. Result showed that there was a significant effect on small canopy diameter, N, P, Ca, Mg, Fe, Mn, Zn, Cu and Quercetin. Means comparison showed that the most canopy diameter and Iron uptake were in concentration of 10 liters per hectare. the lowest nitrogen uptake was in control and 5 l/ha. The most phosphorus uptake in 12.5 l/ha was observed. The maximum of Ca and Zn in 7.5 l/ha obtained. Magnesium absorption and Quercetin increased with increasing consumption of Humic acid, so that the maximum of this traits were in 15 liters per hectare. The most amount of Cu was in 5 l/ha. Different elements, with particular relevance are attracted to plants and by examining a number of traits, was informed of the status of others and know about suitable treatments.



**COMPARISON THE EFFECT OF *PLANTAGO MAJOR* EXTRACT AND  
PHENYTOIN CREAM IN TREATMENT OF PRESSURE ULCER IN PATIENTS  
WITH PARALYSIS SECONDARY TO ACUTE STROKE**

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Stroke is one of the cerebrovascular accidents and as the third leading cause of death all over the world. One of the complications of stroke is bed sore. Prevention and treatment of pressure ulcers can lead to a reduction in the suffering, morbidity, crippling, and health care costs. In traditional medicine one of the most useful and veteran herbs for healing most of skin lesions and wounds is *Plantaginaceae* family. In this study *Plantago major* leaves were collected from natural habitat. Then to carry out clinical studies the extract of leaves was prepared with maceration method. After filtering the extract through filter paper, using a rotary evaporator under vacuum and freeze drying systems are completely will dry. Vaseline-based ointment 10% w/w weight of the extract will be prepared. In this study, 112 patients based on inclusion criteria and were randomly divided into 2 groups. All 112 patients participating in the study, regular care for bedsores, such as changing position every 2 hours and will benefit the wavy mattress. The second group of patients received two doses 12 hours. So that every two mornings will receive phenytoin cream on areas prone to bedsores (such as the sacrum, iliac, spine, elbows, lower back, shoulders, ears, heels and ankles). But 12 hours later extract the intervention group and the control group will receive placebo. Research conducted on selected patients will begin since the beginning signs of pressure ulcers grade 1 in the hospital. The forearm skin test 24 hours before the procedure is performed. In case of any symptoms and skin allergy in a patient, on his intervention will be avoided. Patient demographic information will be recorded. 24 hours after the intervention the patient through the list checked. In this study patients, doctor and statistical analyzer of the incoming patients are unaware from the type of material received. This study has already been carried out on 40% of patients and improvement in any two groups.

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**STUDY OF PHENOLIC COMPOUNDS AND ANTIOXIDANT ACTIVITY OF  
VARIOUS PLANT PARTS OF *BERBERIS VULGARIS***

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Increasing consumer demands for native and little-known or forgotten plants necessitate knowledge on their breeding, phytochemical compound and cultivation. North West of Iran is rich for wild edible species and Barberry is abundant throughout North West Iran. The aim of this study was to measure some phytochemical characteristics and antioxidant activity of some organs in Barberry (*Berberis vulgaris* L.) genotype grown in the Salmas. Spectrophotometer used for measurement phenolic compounds (such as total phenolic content and total flavonoid content) and antioxidant activity. Different organs of the Barberry showed a high level of total phenolic content, flavonoids, as well as antioxidant capacity. The result showed that amount of antioxidant activities by DPPH assay in different plant organs (fruit, flower and leaves) ranged 31.57, 85.81, 89.2% respectively. The amounts of total phenol content in three organs (fruit, flower and leaves) of plant were founded as 34.85, 45.45 and 72.63 mg GAE/g DW respectively. Measurement of total flavonoid result in three organs (fruit, flower and leaves) of plant showed amount 3, 6.79 and 13.6 mg QUE/100 g DW respectively. According to this study the highest and lowest amount of phenolic compounds were founded in leaves and fruits. Also the highest and lowest of flavonoids compounds and antioxidant activity were founded in leaves and fruits. Increase the amount of phenolic and flavonoid compounds was increased antioxidant activity. These results showed that different parts of *berberis* are promising sources of natural antioxidants and other bioactive compounds beneficial to be used in the food or the pharmaceutical industries [1, 2].

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**INTRODUCE OF *CHENOPODIUM FOLIOSUM* (ESPANAGH-WILD SPINACH) AS  
A EXPECTORANT AND ANTITUSSIVEMEDICINAL PLANT IN FOLKLORE OF  
TAROMAND NORTH OF IRAN**

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*Chenopodium foliosum* Asch. is an annual herb growing in mountainous regions of Europe, North Africa, Central and South-West Asia. Some medicinal properties of this plant have been reported in world for treatment of cancer and as an immune stimulant and antioxidant. Based on latest data, it is a source of hepatoprotective flavonoids. The seed of this plant was collected from wild habitat in mountains of Tarom-Foman and cultivated in greenhouse and farm conditions. All morphological and agronomical characteristics of this plant was studied and identified as *C. foliosum*. Based on folklore of Tarom (Province of Zanjan) and some parts of North of Iran, specially Fuman and Talesh, this species have more effective medicinal properties such as a expectorant and antitussive herb. It is named locally as: Espanagh.



INVESTIGATION ON ANTI-INFLAMMATORY EFFECT OF CAFFEIC ACID ON  
THE ACTIVATED MICROGLIA CELLS OF RAT BRAIN

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Caffeic acid (CA) is the precursor of some important phenolic acids and lignin. It is found in a wide range of plants and the extracts of medicinal herbs such as *Lithospermum officinal* [1]. Microglia cells are resident central nervous system (CNS) leukocytes which regulate innate immunity in CNS [2]. Microglia is activated by inflammatory mediators in a wide range of CNS pathologies including brain trauma, and neurodegenerative diseases. Activated microglia can kill neurons via inflammatory mediators such as nitric oxide (NO). This event plays a crucial role in the nervous system disorders [3]. Therefore, suppressing activated microglia can be an effective therapeutic strategy. In this research, anti-inflammatory effect of caffeic acid, as an herbal medicine, on production of pro-inflammatory mediators in the activated primary microglia cells was investigated. Primary microglia cells were prepared from the whole brain of 1-3 days old wistar rat and activated by lipopolysaccharide (LPS). The inflamed cells were subjected to different concentration of CA (0, 0.5, 1.5, 2.5, 3.5 and 5  $\mu$ M). The viability of these cells and NO production were measured by MTT and Griess assay, respectively. Results showed that 2.5  $\mu$ M of CA inhibited LPS-induced NO production and the cell viability assays revealed that CA was not toxic to the cells at this concentration. This study provides a new insight in application of phenolic acids for the treatment of the activated microglia at the early stages of neurodegenerative disorders.

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**ETHNOPHARMACOLOGICAL SURVEY OF MEDICINAL PLANTS USED BY  
INDIGENOUS AND TRIBAL PEOPLE IN UREMIA, IRAN**

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Ethnopharmacological surveys of medicinal plants are very beneficial for the conservation and discovery of novel biological resource [1]. There is very limited information about plants utilized by traditional healers in Uremia, for treating general ailments. Current study supplies significant ethno pharmacological information, both qualitative and quantitative on medical plants in Uremia. aim of present study was to document and preserve ethno medicinal knowledge use to treat different human ailments by traditional healers of around uremia region. Field work was conducted between July 2014 and September 2015 using semi structured questionnaires. A total of 300 people were debated, including Traditional Health Practitioners (THPs) and native people through open-ended and semi structured questionnaire. The collected data were analyzed qualitatively and quantitatively. This ethno medicinal knowledge was compared against the literature for reports of related usage and studies of phytochemical compounds responsible for respective ailments. A total of 131 types of plants, belonging to 23 families were recognized for the treatment of more than 80 types of ailments. These ailments were classified into 29 categories. Leaves were the most frequently utilized plant parts and decoction is the mode of provision of major portions of the plant species. The most common mode of administration was oral ingestion. Informant consensus factor ( $F_{ick}$ ) values of the present study reverberated the high agreement in the use of plants in the treatment of nervous system and respiratory problems among the informants. Gastrointestinal complaint had highest use-reports and 2 species of plants, namely Glycyrrhizin glare L. *Achilles mile folium* had the highest fidelity level ( $F_L$ ) of 100%. *Menthe long folia* L. indicated the highest relative importance (RI) value of 1.91. According to use value (UV) the most important species were *Achilles mile folium* (2.83) and *Menthe long folia* L. (1.96). As a result of the present work, we counseled giving priority for further phytochemical investigation to plants that scored highest  $F_L$ ,  $F_{ick}$  UV or RI values, as such values could be assumed as good indicator of prospective plants for realizing new drugs.

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**INVESTIGATION OF MORPHOLOGICAL AND YIELD VARIATION OF SOME  
LICORICE POPULATIONS GROWN IN IRAN**

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Licorice (*Glycyrrhiza glabra* L.) is one of the most important medicinal plants native to Iran, which is exported in significant amounts annually. The main active ingredient is a kind of Saponin Triterpenoid named Glycyrrhizic acid which is 50 times sweeter than sucrose and is used in pharmaceutical, food and tobacco industries. More harvesting causes to degradation of wild populations of this species. So it seems that this plant should be introduced to agricultural systems. Study morphological parameters of different wild populations is very important in domestication of wild medicinal plants, so in this research variation in morphological and yield dependent characteristics of different populations of licorice in Iran is studied. To study this variation, four populations of licorice are collected from regions which industries collected their raw materials and cultivated in same conditions in a Randomized Complete Block Design in three replications in year 2016 at research farm of Tehran university of Karaj. Our results in first year of study showed that it's a significant difference between parameters like plant height and width, number of branches, leaves and stems weight (g/plant), root and rhizome weight (g/plant). The results showed that the highest yield of roots and rhizomes weight (g/plant), leaves and stems weight (g/plant) plant height and width (cm), was recorded for the population of Eghlid. The results of this study can help expand the habitats and plantation to supply raw material for the pharmaceutical related industries.

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**THE FIRST REPORT OF POLYCARPIC GENOTYPE IN GALBANUM  
(*FERULA GUMMOSA* BOISS.) POPULATIONS**

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Based on literature review, galbanum (*Ferula gummosa* Boiss.) is a monocarpic species. Following of research on Iranian galbanum cultivars diversity, we find some genotypes that were not monocarpic. The clung parts of older roots behind fresh root, represented existence of two or three generations of growth in galbanum wild populations. These polycarpic genotypes were transferred to pots and established in greenhouse conditions. The domesticated plants showed unlimited power generations. About 10 to 15 lateral meristemic buds were established on the roots of this genotyp. The vegetative meristemic buds were planted on different rooting media as fine sand and soil. Also these asexual buds were cultured on MS medium for micro propagation. Based on published knowledge, this selection and introduce of polycarpic genotype in galbanum is first in world.



**INVESTIGATION ON ANTI-INFLAMMATORY EFFECT OF CAFFEIC ACID ON  
THE ACTIVATED MICROGLIA CELLS OF RAT BRAIN**

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Caffeic acid (CA) is the precursor of some important phenolic acids and lignin. It is found in a wide range of plants and the extracts of medicinal herbs such as *Lithospermum officinal* [1]. Microglia cells are resident central nervous system (CNS) leukocytes which regulate innate immunity in CNS [2]. Microglia is activated by inflammatory mediators in a wide range of CNS pathologies including brain trauma, and neurodegenerative diseases. Activated microglia can kill neurons via inflammatory mediators such as nitric oxide (NO). This event plays a crucial role in the nervous system disorders [3]. Therefore, suppressing activated microglia can be an effective therapeutic strategy. In this research, anti-inflammatory effect of caffeic acid, as an herbal medicine, on production of pro-inflammatory mediators in the activated primary microglia cells was investigated. Primary microglia cells were prepared from the whole brain of 1-3 days old wistar rat and activated by lipopolysaccharide (LPS). The inflamed cells were subjected to different concentration of CA (0, 0.5, 1.5, 2.5, 3.5 and 5  $\mu$ M). The viability of this cells and NO production were measured by MTT and Griess assay, respectively. Results showed that 2.5  $\mu$ M of CA inhibited LPS-induced NO production and the cell viability assays revealed that CA was not toxic to the cells at this concentration. This study provides a new insight in application of phenolic acids for the treatment of the activated microglia at the early stages of neurodegenerative disorders.

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**THE EFFECT OF SUCROSE ON THE PRODUCTION OF METABOLITES AND  
PHYSIOLOGICAL TRAITS IN BLACK CUMIN (*NIGELLA SATIVA* L.)  
CELL CULTURE**

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*Nigella Sativa* medicinal plants being used so far away from past time to now. This herb is used to treat many diseases such as asthma, diabetes, cough, inflammation, cancer, epilepsy. So finding a new method to increase its constituents is very important. tissue culture is the Perfect replacement to growth and proliferation of medicinal plants and their effective production. In this study, physiological and phytochemical traits were investigated at sucrose concentrations of 30, 45 and 60 grams per liter on cell culture *Nigella sativa*. The carbon source has controlled the synthesis of many compositions and functions as building blocks of macromolecules and evolutionary processes in cells. The results showed that sucrose increased H<sub>2</sub>O<sub>2</sub> and malondialdehyde, protein and decrease Peroxidase, Polyphenol oxidase Compared to the control sample at high concentration. Sucrose associated with the plant metabolism and evolutionary processes. So carbon sources have important role on the growth and morphogenesis of plants by different ways of using the osmotic potential influenced on cell division and degree of cell morphogenesis.

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**THE EFFECTS OF *CANNABIS SATIVA* LEAVES EXTRACT ON BEHAVIORAL  
PARAMETERS (STL AND TDC) IN ALZHEIMERIC ADULT  
MALE WISTAR RATS**

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Cannabis (*Cannabis sativa* L.) has long been known to have analgesic, immunomodulatory and anti-inflammatory effects. Cannabinoids are a group of C<sub>21</sub> terpenophenolic compounds uniquely produced by cannabis plant (1,2,3). In the present study, the effect of cannabisethanolic extract on neurodegeneration induced by intracerebroventricular (ICV) administration of streptozotocin (STZ), was investigated in adult male Wistar rats. The rats were randomly divided into 9 groups: normal control, Sham-operated control (saline, ICV), cannabisextract (0.05, 0.1, and 0.2 g/kg intragastrically, daily) alone, alzheimeric control rats (STZ, 110 mg/ml, 3 µl/site, ICV) (4), cannabisextract (0.05, 0.1, and 0.2 g/kg intragastrically, daily) together with STZ (5), and treatment was performed accordingly. Animals were injected with STZ bilaterally, on the 1st and 3rd days. Administration of cannabisextract (0.05, 0.1 and 0.2 g/kg) was started 1 h before the first dose of STZ and continued up to 30 days. The learning and memory behavior was assessed by a passive avoidance test 30 days after the first dose. Our data indicated that administration of cannabis extract (0.1 and 0.2 g/kg) significantly increased STL (Step through latency) and decreased TDC (Time in dark compartment). Our results showed that administration of cannabisextract (0.1 and 0.2 g/kg) significantly improved STZ-induced cognitive impairment. These results indicate that cannabisextract is effective in providing protection against memory deficit induced by STZ.

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**THE EFFECT OF DIFFERENT LEVELS OF DIETARY HARMALA SEED POWDER ON CARCASS AND INTERNAL ORGAN CHARACTERISTICS OF LAYING JAPANESE QUAILS**

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Currently, there is primary and obligatory requirement to identify and introduce new and effective plants for producing natural antibiotics with high biological potentials and low side effects. Medicinal plants and phytobiotics which are compounds of plant origin, can be replaced like probiotics and prebiotics with growth promoter antibiotics [1]. Medicinal plants and their effective compounds can develop the useful microbial populations (e.g. lactic acid bacteria) and inhibit pathogenic and non beneficial microbes' colonization in the gastrointestinal tract, increase the length of villi and improve the performance of broiler chickens [2]. Harmala with the scientific name of *Peganum harmala* is a perennial and non fluff plant from the family of Nitrariaceae. Alkaloids are the active compounds of harmala. They include Harman, Norharman, Harmine, Harmalol, Harmaline, Vasyzin and Vasyzinun [3]. It has been reported that harmala extract increased the relative weight of liver in broilers. In this study, 160 laying Japanese quails at 50 weeks of age were used in a completely randomized design with 4 treatments and 4 replicates of 10 birds in each. The experimental treatments included control diet (with no feed additive), diet containing 0.02 percent Virginiamycin as growth promoter antibiotic, diet containing 0.25 percent *Peganum harmala* seed powder and diet containing 0.50 percent *Peganum harmala* seed powder. At the end of experimental period (60 weeks of age), two birds from each cage with the closest body weight to the cage mean weight were selected and slaughtered after recording their live body weights and their carcass component weights including breast, thigh, back, neck and abdominal fat and also internal organ weights including heart, liver and gizzard were measured in proportion to live body weight. The data were analyzed in a completely randomized design using GLM procedure of SAS. Comparison of means was conducted by Duncan's multiple range test. The results of the present study showed that the experimental treatments had no significant effect on breast, thigh, back, neck and abdominal fat percentage. Also, the effect of dietary treatments on heart, liver and gizzard percentage was not significant. According to the results of this study, it seems that *Peganum harmala* seed powder can be used at level of 0.25 percent in diet of laying Japanese quails without any adverse effect on carcass and internal organ characteristics.

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INVESTIGATION ON AUTECOLOGY, DISTRIBUTION AND GENETIC  
DIVERSITY OF *DOREMA AITCHISONII*

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Planning for sustainable utilization of natural resources is possible by understanding the relationships between plants and environmental factors. The relationships between plant species and their environment are very complex and different multivariate analysis method was used to understand these relationships. In this study, the principal components analysis was used to study the relationship between soil and vegetation in habitat of *Dorema aitchisonii* in East of Iran. Sampling of soil and vegetation was done by stratified- randomized method from 20 releves in Sijavand, Ghonchy, Robat-e Sefid, Attaiyeh and was Golbou. Result of components analysis indicated that among soil properties amount of calcium, potassium, sodium (indicating the amount of soil electric conductivity), the amount of clay, silt and sand (representing soil texture), the amount of the material organic and soil acidity (indicates the status of soil fertility) have the greatest impact on the total variance. Correlation between clay, Na and P with Biomass, plant coverage, and species diversity were positive but Correlation between Ca content with pH, species diversity and biomass were negative. The data indicate that the highest frequency of *D. aitchisonii* was measured in releves with pH of about 6.07 to 6.27, electrical conductivity of about 0.268 to 0.365 dS/m, organic carbon about 1.26 to 1.28%, loamy- sandy to sandy- loam soil texture and it appears that the plant in this range of soil conditions have shown a better response.



**EFFECT OF DIFFERENT DOSES OF IAA(0, 75, 150, 250, 500 AND 1000 PPM) ON LEMON BALM (*MELISSA OFFICINALIS* L.) ROOTING**

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Lemon balm has been used in a variety of practical applications in medical science. Due to its economic importance, this plant is produced in large fields in several European countries. The aim of the study was to determine the effect of IAA on rooting of Lemon balm (*Melissa officinalis* L.) cuttings. The trial was established as a randomized block design with 3 replications during 2015, in greenhouse of the Agronomy Department, Faculty of Agriculture of Urmia University, Iran. At first, one stock plant was selected from experimental fields of Urmia University. Stem cuttings were taken from the stock plant. Before placing in the media the cuttings were treated with IAA(0, 75, 150, 250, 500 and 1000 ppm). According to the results the average stem height ranged 17.80-21.45 (cm); number of nodes ranged 8.2-10.4 (pcs); number of leaves ranged 15.30-22.2 (pcs); number of roots ranged 12.30-23.40 (pcs); the highest root height ranged 5.45-8.40 (cm); root fresh weight ranged 0.11-0.52 (g); leaf fresh weight ranged 1.41-1.82 (g); stem fresh weight ranged 1.20-1.47 (g); total fresh weight ranged 2.80-3.62 (g); root dry weight ranged 0.011-0.055 (g); leaf dry weight ranged 0.31-0.39 (g); stem dry weight ranged 0.26-0.32 (g); total dry weight ranged 0.62-0.76 (g); ratio of root fresh weight/shoot fresh weight ranged 0.037-0.169; ratio of root dry weight/shoot dry weight ranged 0.018-0.08. In terms of highest root height, root number, root fresh weight, total fresh weight, ratio of root weight/shoot weight (fresh), root dry weight, stem dry weight IAA 75 ppm; in terms of number of leaves and node, stem height, stem fresh weight and leaf fresh weight IAA 150 ppm; in terms of total dry weight and leaf dry weight IAA 250 ppm were the best.

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**BIOCHEMICAL COMPOSITION AND ANTIBACTERIAL ACTIVITY OF  
*MENTHA PIPERITA* ESSENTIAL OIL AGAINST METHICILLIN-RESISTANT  
*STAPHYLOCOCCUS AUREUS***

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In this study, biochemical composition and antimicrobial activity (MIC) of *Mentha piperita* essential oil were evaluated against 20 strains of methicillin-resistant *Staphylococcus aureus*. The bacteria were investigated using standard biochemical tests such as catalase, mannitol fermentation, coagulase and Dnase and samples of resistant to methicillin were identified by using cefoxitin disc. Essential oils from *Mentha piperita* were prepared by water-distillation and cleverger. The biochemical composition and antibacterial prosperities of this essential oil were determined by the Gas chromatography/ mass spectrophotometer (GC/MS) and micro dilution method respectively. The chemical analysis of the essential oil by Gas chromatography/ mass spectrophotometer (GC/MS) revealed the presence of 20 substances, mainly including L-Menthol one (23.85%), Menthol (21.82%) and Menthoforan (9.60%). Results of this study showed that essential oil of *Mentha piperita* was active against methicillin-resistant *Staphylococcus aureus*. The minimum inhibitory concentration values of the essential oils were in the range of 0.25-32  $\mu$ l/ml against tested bacteria. The results indicated that essential oil of *Mentha piperita* has shown strong antimicrobial activity which could be potential candidates for preparation of antimicrobial drug preparation [1,2].

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## EFFECT OF FENUGREEK EXTRACT ON PERFORMANCE OF LAYING HENS IN SECOND PRODUCTION CYCLE

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Fenugreek (*Trigonella foenum-graecum* L.) is widely distributed throughout the world (especially in Iran) and which belongs to the family Fabaceae [5]. The plant including of active constituents such as alkaloids, flavonoids, steroids, saponins etc [3]. Fenugreek has antioxidant, antifungal, antiviral and anticarcinogenic properties [2]. The present study was carried out to determine the effects of fenugreek extract on production performance laying hens in second production cycle. One hundred fifty Hy-Line W-36 leghorn (from 65 to 73 week of age) were used in completely randomized design with 5 treatments, 5 replicates to receive diets supplemented with 0 (control), 0.1 and 0.2 % of fenugreek extract for 8 weeks. The hens performance including hen-day egg production (EP,%), feed intake (FI,gr), egg mass (EM,gr/ hen/ day), and feed conversion ratio (FCR) were measured. The results of this experiment showed that except FCR other parameters such as FI, EM, EP and EW were not affected by inclusion of fenugreek extract in laying hens diets ( $P < 0.05$ ). Feed conversion ratio in 0.1% inclusion was lower than 0.2% but was not differ with control group ( $P < 0.05$ ). Results of this experiment were agreement with the finding of Bayati Zadeh, *et al.*, (2015) who demonstrated that the adding fenugreek water extract had significant effect on feed conversion ratio [3]. Abaza, (2007) and Mona, (2005) reported that fenugreek can inhibit 85-90% of aflatoxin formation which leads to improving feed conversion ratio [1,4]. From the results of present experiment it can be concluded that use of fenugreek Hydro-alcoholic extract at 0.1% level could be useful for improving the production performance of laying hens in second production cycle by lowering feed conversion ratio.

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**EFFECTS OF SUNNY AND SHADY AND SALINITY REGIMES ON SOME  
BIOCHEMICAL PARAMETERS AND DISTRIBUTION OF CERTAIN MACRO  
ELEMENTS ON YOUNG AND OLD PARTS OF STEM OF  
BERMUDAGRASS (*CYNODON DACTYLON* L. PERS.)**

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In this study, effects of sunny, shady and salinity regimes were investigated on some biochemical parameters, such as proline, soluble and non-soluble carbohydrates contents and chemical parameters, such as  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$  in young and old stems of *Bermuda grass* plant. Soil samples were taken from sampling locations and it was considered in  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ , P and N amounts, density electrical conductivity (EC), soil cation exchange capacity (CEC) and soil texture. The results showed that  $\text{Na}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$  and phosphorous amounts in saline soil were higher than soil sampled from two other locations, so that  $\text{Na}^+$  and  $\text{Mg}^{2+}$  contents in saline soil were higher two times than soil from sunny environment and P content was 5 times than it form sunny environment and 1.5 times than soil from shady environment. Soil density in sunny and shady environment was higher than it in saline soil. Soil texture was loam-sand. Saline soil CEC due to higher clay percentage was greater than sunny and shady environment and saline soil due to having EC 4.64 m.mouse.Cm<sup>-2</sup> had mild salinity. In the stem of *Bermuda grass* grown under three different regimes, the difference between means of element contents except for  $\text{Na}^+$  and N were significant at  $P=0/05$ . In young part of the stems of the plants grown under the mentioned regimes, except for  $\text{Ca}^{2+}$  content in shady and salinity grown plants and for those grown under sunny regimes, difference between means was statistically significant. In old part of stems of the plants grown under sunny and shady regimes, except for  $\text{K}^+$ . The means of the other elements did not be different statistically significant. Regarding to the difference between means related to the content of soluble and non-soluble carbohydrate of young and old part of the stem of the plants grown under the mentioned regimes were significant at  $P =0.05$ . In relation to the content of proline of young and old part of stem of *Bermuda grass* except for shady plant in other ones, the difference between means was significant. The content of proline of old part of stem of plants grown under sunny regimes was higher than of that of other plants collected from shady and saline sites soil.

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ESSENTIAL OIL COMPOSITION OF *ONOSMA MICROCARPUM* DC. FROM  
WEST AZERBAIJAN

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The genus *Onosma* belonging to Boraginaceae family, comprises 150 species that mainly distributed in Eurasia and Mediterranean area, having its center of distribution and maximum concentration of species in Iran. *Onosma* is also the largest genera of Boraginaceae in Iran. A total of 59 species have been reported in flora Iranica. As the traditional medicine, the genus *Onosma* has been found to be effective as an anti-oxidant, anti-inflammatory, and anti-microbial agent and promotes healing in burns, foot ulcers and wounds. The plants are traditionally used as laxative, anthelmintic and for alexipharmic effects. The plants are also used in blood diseases, bronchitis, abdominal pain, strangury, thirst, itch, fever, wounds, burns, piles and urinary calculi [1]. There are special and important components found in the genus *Onosma* such as naphthoquinones, naphthazarins, and pyrrolizidine alkaloids [2]. Several bioactivities were also reported for these plants such as hepatotoxic, pulmotoxic, hemolytic, antimutagenic, teratogenic, mutagenic, cytotoxic, anti-inflammation, anti-tumor, antimicrobial, anti-thrombotic, and wound healing properties. At the present work, the essential oil composition of *Onosma microcarpum* from Iran was investigated for the first time. The essential oil was isolated using a Clevenger apparatus. The oil yield was 0.1%. Thirty eight volatile compounds were identified in the oil containing 86.6% EO. n-heptacosane (21.9%), hexahydrofarnesyl acetone (17.8%), trans-phytol (7.3%), and (Z)-nerolidyl acetate (7.1%) were demonstrated as major compounds. Identified compounds belong to mono and sesquiterpenoids and also alkanes.

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**ANTIBACTERIAL ACTIVITY OF *ZATARIA MULTIFLORA* ESSENTIAL OIL  
AGAINST METHICILLI-RESISTANT *STAPHYLOCOCCUS AUREUS*  
VERSUS VANCOMYCIN**

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The aim of this study was to compare the antibacterial effects of *Zataria multiflora* essential oils in comparison with vancomycin antibiotic. A number of 50 clinically cases of *Staphylococcus aureus* were collected. Sensitive strains were confirmed by disk diffusion method compared to commonly used antibiotics. The samples resistant to methicillin were identified by using cefoxitin disc. Chemical composition of the essential oil of part aerial was determined by gas chromatography-mass spectrometry (GC-MS). The study was carried out using microdilution broth assay to determine minimum inhibitory concentration of *Z. multiflora* essential oil and vancomycin against 20 strains of methicilli-resistant *S. aureus*. According to the results of GC-MS analysis, 15 components were identified, accounting for 99.99% of the whole essential oil. The main components were Thymol (33.33%) and Carvacrol (28.69). A total of 20 strains (40 percent) were resistance to cefoxitin and were identified as resistance in methicillin-resistant *Staphylococcus aureus* strains. All bacterial isolates were found sensitive to vancomycin (MIC < 1 µg/mL). The minimum inhibitory concentration values of essential oil of *Z. multiflora* were in the range of 0.25-8 µl/ml against methicilli-resistant *Staphylococcus aureus*. The essential oil of *Z. Multiflora* might be exploited as natural antibiotic for the treatment of infectious diseases caused by methicilli-resistant *Staphylococcus aureus*.

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**THE EFFECTS OF EXPLANT TYPE AND DIFFERENT CONCENTRATIONS OF AGAR ON *PEROVSKIA ABROTANOIDES* KAREL CALLUS INDUCTION FOR PRODUCTION OF ROSMARINIC ACID**

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The concentrations of agar and explant type are not only effective on callus induction and its morphology but also play role in the production of secondary metabolites (SMs) via callus culture. In the present work, the effects of explant type and different concentrations of agar in culture medium were investigated on callus induction in *Perovskia abrotanoides* Karel. as well as production of rosmarinic acid (RA). *P. abrotanoides*, belongs to the family Lamiaceae, is an Iranian folk medicinal herb with the common Persian name of Brazambel [1]. *P. abrotanoides* is reported to contain several classes of phytochemicals including terpenoids, phenolic acids as RA and lipophilic abietanebiterpenoids which called tanshinones [2,3]. The foliar explants (leaf, shoot tip and internode) were cultured for callus induction on Murashige and Skoog (MS) medium containing 2 mg/l 6-benzyladenin (BA) and 1 mg/l indole-3-butyric acid (IBA). Callus induction of shoot tip and internode explants was quicker than leaf explant. In addition, calli obtained from shoot tip and internode showed better and lighter color and more RA content (12.5 mg/g DW) than leaf induced calli. In order to grow of produced calli, they were transferred to MS medium supplemented with different concentrations of agar (7.5, 8.5, 9.5 and 10.5 g/l). Data were recorded after 21 days. According to the ANOVA results, the effect of agar concentration was significant on fresh weight (FW) and growth index (GI) but it was insignificant on dry weight (DW). Comparison of mean values showed significant ( $P < 0.05$ ) differences among different concentrations of agar. Soft and light calli with the highest FW ( $14.2 \pm 1.7$  g), DW ( $439 \pm 78$  mg) and GI ( $4.7 \pm 0.7$ ) were obtained in MS medium supplemented with 8.5 g/l agar.

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**EFFECT OF CADMIUM ON THE RELATIVE EXPRESSION OF *FNSII* GENE IN  
*MATRICARIA CHAMOMILLA* L.**

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*Matricaria chamomilla* is a well-known medicinal plant species from the Asteraceae family often referred to as the "star among medicinal species". Nowadays it is a highly favored and widely used medicinal plant in folk and traditional medicine. However, recent researches show these properties are partly due to its phenolic compounds such as Flavones. Flavones are a large class of plant secondary metabolites. Epidemiology studies suggested that a high dietary intake of flavonoids, including flavones, which may be linked to a reduced risk of several cancers (e.g., lung and colon cancer), coronary heart disease, chronic inflammation, and osteoporosis. Apigenin is one of the major flavones found in *matricaria chamomilla*. The biosynthesis of apigenin is catalyzed by *flavone synthase II* proteins (FNSII) in *matricaria chamomilla*. Cadmium is one of the most common heavy metal contaminant in the environment. Induction of oxidative stress is a result of the presence of heavy metals in plant cells. Due to the problem of heavy metal pollution and the dangers of pollution to plant in this study, the effects of oxidative stress caused by the presence of cadmium on flavone synthase II enzymes in *matricaria chamomilla*. In the current study, Real Time PCR method was used to evaluate the gene expression and of *flavone synthase II* (*FNS2*) under different concentration of cadmium in the nutrient solution. To this aim, the plants were treated with different concentrations of cadmium (0, 90, 180 and 360  $\mu$ M) for 72h at flowering stage. The results indicated that different concentrations of cadmium differently affected the expression level of *flavone synthase II* gene. Accordingly, an increase in gene expression of *flavone synthase II* was observed in plants that treated with 90 and 180  $\mu$ M concentration of cadmium. The relative expression of *flavone synthase II* gene was significantly higher (5%) for 180  $\mu$ M-treated plants compared to the corresponding control plants. However a decrease in gene expression of flavone synthase II in plants treated with 360  $\mu$ M concentration of cadmium was observed. Here, we suggest that the application of excessive cadmium in the nutrient solution elevates the expression level of *flavone synthase II* gene that is involved in the biosynthesis pathway. Nevertheless, the extent and stability of this gene expression elevation are varied between different concentrations of cadmium treatment.

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**CHANGES IN PROTEIN AND CARBOHYDRATE CONTENT AFTER  
TREATMENT WITH SODIUM CHLORIDE AND NITRIC OXIDE ALONE OR IN  
COMBINATION *CALENDULA OFFICINALIS* L.**

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*Calendula officinalis* L. is a plant in the genus *Calendula* of the family Asteraceae [1]. Among the various species of the genus *Calendula*, *C. officinalis* is the only one, which is extensively used clinically throughout the world [2]. NO can directly or indirectly interact with a wide range of targets leading to the modulation of protein function [3]. Calcium is an essential plant nutrient. It is required for structural roles in the cell wall and membranes, as a counteraction for inorganic and organic anions in the vacuole, and as an intracellular messenger in the cytosol [4]. In this study, we evaluated the effects of sodium chloride and nitric oxide alone and in combination on the carbohydrate and protein contents of shoot and root. It was performed with 5 levels of NaCl (0, 50, 100, 150 and 200 mM) and 2 levels of nitric oxide (0 and 0/2 mM) alone or in combination. Measuring of protein contents was carried out using the method described by (Bradford,1976) [5]. The Carotenoid content was evaluated according to the method by (Kochert,1987)[6]. The experimental data were analyzed by analysis of variance (ANOVA) and the differences were compared by Duncan's multiple range test at alpha 0.05. It was shown that carbohydrates and proteins content of plant were affected by various levels of both sodium chloride and nitric oxide alone. Carbohydrate contents were increased and protein content was decreased significantly by the evaluated levels of salinity. We concluded that addition of sodium chloride might increase carbohydrates and decrease protein contents. Furthermore, nitric oxide could modify the destructive effect of salinity.

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**EFFECT OF HYDROGEN PEROXIDE ON CELL GROWTH, ANTIOXIDANT POTENTIAL AND SOME SECONDARY METABOLITES PRODUCTION IN *NIGELLA SATIVA* L. CELL CULTURE**

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*Black cummin (Nigella sativa)* has been widely used for centuries in the treatment of various ailments throughout the world [1]. It is an important drug in the Iranian traditional system. Plant cell culture in addition to various other applications is highly regarded in the field of pharmaceutical active ingredients [2]. Using elicitors in cell culture is of the basic strategies for induction of valuable plant metabolites [3]. For this purpose, cell culture of black cummin established and the effect of hydrogen peroxide concentrations (0, 0.25, 0.5 and 1 mM) in a completely randomized design with three replications were studied. Cell response in relation to the growth and some biochemical parameters were evaluated. Results showed that the effect of hydrogen peroxide on cell growth was not significant. But the production of anthocyanins, phenols, flavonoids, antioxidant potential and polyphenol oxidase activity was significantly increased by increasing concentrations of hydrogen peroxide. Terpenoids analysis by GC-MS showed that the quantity and quality of them were affected. The amount of terpenoids such as beta-myrcene, limonene, pulegon, caryophyllene oxide, beta-selinene, chavicol and menthol increased in treated cultures with hydrogen peroxide compared to control cultures. According to the findings of this study, black cummin cell culture can be a promising source for producing valuable compounds.

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**THE EFFECT OF AQUEOUS EXTRACT OF ROSE DAMASCENAON CATALASE  
LEVELS IN RAT BRAIN TISSUE**

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It has been shown that phenolic compounds have protective effects against reactive oxygen species and strengthens immune system and stimulates the nervous system and reduce depression and improve performance and eliminate fatigue and the prevention of many diseases. In this study, effect of catalase levels in the brain tissue of rats wasevaluated. Female Wistar rats (200-250 gr) were randomly divided in to 4 groups: The control, gavage and two experimental groups (at doses of 500 and 1000 per kg oral).After the end of the period under ether anesthesia brain tissue were removed.Catalase activity (CAT) using hydrogen peroxide decomposition was done at 240 nm. Our results indicate that administration of aqueous extract of rose in the catalase (CAT) in brain tissue than the control group and thegavage group was not significant difference.

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**EFFECT OF FUNGAL ELICITOR ON IN VITRO PRODUCTION OF SECONDARY METABOLITES PRODUCTION IN HAZEL (*CORYLUS AVELLANA* L.) CELL CULTURE**

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Hazel (*Corylus avellana*L.) is considered as a new plant material for in vitro production of taxol rather than other compounds. Taxol as aditerpenoid compound is one of the most effective drugs against cancer. Elicitors are molecules with ability to cause physiological or morphological changes in plant cell cultured in vitro. In this study, the effect of different concentration of yeast extract (0, 0.25, 0.5 and 1 % v/v) as an elicitor on hazel cotyledon cell suspension cultures was investigated by evaluation of cell growth rate, protein content, lipid peroxidation, enzymes activity (peroxidase, polyphenol oxidase, phenylalanine ammonia lyase) and secondary metabolites production including total polyphenols content, total flavonoids content, anthocyanin and amount of taxol. The experiment was performed incompletely randomized design in three replication. The results showed that highest dry weight was obtained in lowest concentration of yeast (0.25%). Elicitation increased the amounts of protein, polyphenols, flavonoids, anthocyanin and taxol compared to control. However, there was no direct relationship between elicitor concentration and mentioned parameters. The yeast elicitor influenced the enzymes activity as well. In this regard, all enzymes showed enhanced activity depends on elicitor concentration.



**EFFECT OF NANO-ZINC OXIDE ON SOME PHYOCHEMICAL CHARACTERISTICS OF *HYOSCYAMUS RETICULATUS* L. HAIRY ROOTS**

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The medicinal plant *Hyoscyamus reticulatus* L. is a rich source of hyoscyamine and scopolamine, the tropane alkaloids. Hairy root cultures have introduced a significant attention to produce important metabolites because of stable tropane alkaloids production. Recently hairy roots culture as a sustainable resource for the production of metabolites has been proposed. So, Elicitation is an effective approach to induce the secondary metabolites biosynthetic pathways in hairy roots. Hairy roots derived from Cotyledon explants inoculated by *Agrobacterium rhizogenes*. Then 23 days old roots were elicited by zinc oxide nanoparticles at different concentrations (0, 50, 100 and 200 mg L<sup>-1</sup>) in different exposure times (24, 48 and 72 h). The growth rate of hairy root was recorded after (5 weeks) and also total phenolics measured using a spectrophotometer at a wavelength of 765 nm. Also Activity of antioxidant enzymes such as ascorbate peroxidase at a wavelength of 240 nm, Guaiacol peroxidase and catalase using a wavelength of 470 nm and catalase at a wavelength of 240 nm by spectrophotometer were recorded. The results indicated that the growth rate of hairs roots was increased during 5 weeks but the best time to induce with elicitor is around 3 to 4 weeks after cuture in MS media. The results showed that nano-zinc oxide had significant effect on total phenol, ascorbate peroxidase, Guaiacol peroxidase and catalase. The highest and lowest of total phenol contents ( 1.76 mg/gr , 0.89 mg/gr ) were detected in nano-zinc oxide (100 mg L<sup>-1</sup>, 200 mg L<sup>-1</sup>). The highest and lowest ascorbate peroxidase activity (100 mg L<sup>-1</sup> 48h, 200 mg L<sup>-1</sup> 24h), Guaiacol peroxidase activity (200 mg L<sup>-1</sup> 72h, 50 mg L<sup>-1</sup> 48h) and catalase activity (50 mg L<sup>-1</sup> 48h, 200 mg L<sup>-1</sup> 48h) was observed respectively.

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**INVESTIGATION OF SOME MORPHOLOGIC CHARACTERISTICS OF  
*PAPAVER ORIENTALE* L. IN OSHNAVIYEH, WEST AZERBAIJAN, IRAN**

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The genus *Papaver* L. is of commercial interest because of its medicinally important components. Among the species of the genus *Papaver orientale* L. is one of the important medicinal plants which its main alkaloids are oripavine (20%) and thebaine (9%). The demand for the natural alkaloids such as thebaine and oripavine continued to be high in 2013, in line with the trend of the preceding 20 years, although with some adjustments. Now there is a danger of the lake drying out, which will affect the region and its inhabitants. In order to encourage farmers to change cropping patterns, and introduce new crops, the right incentives must be given, and help to find overseas product markets through bilateral agreements. The aim of this study was to evaluate some morphologic characteristics of *P. orientale* and its performance in collecting region. The study has been carried out in Oshnaviyeh, West Azerbaijan, Iran. The Capsules of the 52 plants in the region were collected in August 2015. Furthermore dried plant specimens have been transferred to laboratory and after providing herbarium labels were identified in the Herbariums of Genebank, Agricultural Researchcenter, Ministry of Agriculture, West Azerbaijan, using available literature such as the Colored Flora of Iran. According to the results, the average of plant height, capsule number, carpel number, capsule length, capsule diameter, ratio of capsule length/capsule diameter, capsule weight per plant, seed weight per plant and ratio of seed weight per plant/capsule weight per plant were recorded as 85.72 (cm), 13.09 (pcs), 13.80 (pcs), 2.69 (cm), 1.94 (cm), 1.39, 13.37 (gr), 4.63 (gr), 0.35 respectively. In conclusion, ecological condition of the region is suitable for economic production of the plant as dry farming. The plant can be introduced to the farmers such as a new crop to reduce water consumption in agriculture.

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**EVALUATION OF GROWTH AND PRODUCTION OF SOME TERPENOIDS AND SECONDARY METABOLITES UNDER THE EFFECT OF NITRIC OXIDE IN *NIGELLA SATIVA* CELL CULTURE**

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*Nigella sativa* has long been known for its medical use as an antispasmodic, especially against gastrointestinal disorders or respiratory ailments, in many countries. The plant contains thymoquinone, monoterpens such as *p*-cymene and  $\alpha$ -pinene, nigellidine, nigellimine and a saponin [1]. Plant cells and tissues culture provides secondary metabolites production in *in vitro* conditions. Cell suspension cultures are now recognized as important model for studying natural products biosynthesis. Manipulating cell cultures by elicitors is one of the important strategies for induction of valuable metabolites in plant biotechnology [2]. In this study the effect of nitric oxide on cell growth and secondary metabolites production including terpenoids in cell culture of black cumin was evaluated. The experiment was conducted in a completely randomized design with three replications. The cell cultures treated by sodium nitroprusside (a nitric oxide donor) various concentrations (0, 25, 50 and 100  $\mu$ M). The parameters such as cell growth and some biochemical and phytochemical characteristics were evaluated. The results showed that nitric oxide had no significant effect on cell growth. Production of phenolics, anthocyanins and flavonoids, as well as the membrane lipid peroxidation, antioxidant potential and catalase and polyphenol oxidase enzymes activity significantly increased under the effects of nitric oxide. Terpenoids analysis by GC-MS showed that variation in their composition and content. Production of terpenoids such as beta-pinene, limonene, beta-selinene, menthol, pulegone and squalene in treated cultures was significantly increased compared to control cultures. Therefore, black cumin cell culture and its elicitation can be a good source for the production of terpenoids and other useful compounds.

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**CHEMICAL COMPOSITION, ANTIOXIDANT AND ANTIMICROBIAL  
ACTIVITIES OF *FERULAGO ANGULATA* ESSENTIAL OIL AND EXTRACTS**

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The volatile constituents in the essential oil of *Ferulago angulata* roots, growing wild in Kurdistan, Iran were investigated by capillary gas chromatography and gas chromatography–mass spectrometry for the first time. The major components of essential oil were  $\alpha$ - pinene, limonene and  $\alpha$ -phellandrene. The roots plant material was macerated successively in Hexane, Ethyl acetate, Methanol and Water for 3 days at room temperature. Essential oil and different extracts were tested by different methods (DPPH, FRAP, ABTS, MIC and Disc Diffusion) for their in vitro antioxidant and antimicrobial activities. Polar extracts exhibited high antioxidant activity comparing to non-polar extracts. Also the essential oil and different extracts exhibited moderate to high antimicrobial activities. Essential oil and ethyl acetate extract demonstrated significant activity against *Escherichia coli* and *Bacillus cereus* strains in concentration of 20 mg/ml. The high antioxidant activity and good antimicrobial inhibitory effect of the essential oil and extracts of the plant supports its uses as a prospective source of antioxidant and antimicrobial agents in pharmaceutical and food industries.

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PHYTOCHEMICAL CONTENT AND ACUTE TOXICITY ASSESSMENT OF  
*ULMUS MINOR* MILL'S GALL

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*Ulmus minor* mill's gall produces by *Ulmus* tree due to effects of *Eriosoma lanuginosum* Hartig and due to literature review, there is no phytochemical as well as toxicity study on this gall. This study aimed to identify the phytochemical composition and quantification of main components of it as well as its acute toxicity in mice to determine its LD<sub>50</sub> and target organ toxicity. Phytochemical analysis was performed via pre phytochemical tests<sup>2</sup> on the main components including tannins, phenol, flavonoids<sup>4</sup>, sterol<sup>5</sup>. In vivo studies were done on both genders of mice according to OECD<sub>423</sub> guidelines<sup>6</sup> by oral administration of aqueous suspension of the extract in doses up to 2000 mg/kg. Due to phytochemical study on hydro alcoholic extract, the levels of condensed tannin and sterol were determined noticeable in comparison all previous studies. In acute toxicity study the LD<sub>50</sub> was determined in upper levels of 2000 mg/kg in both genders but according to histopathological studies organ toxicities and severe ischemia were detected in the kidney, liver, spleen and cerebral tissues of females and males. This study clarified for the first time that *Ulmus minor's* galls caused by *Eriosoma lanuginosa* Hartig contains noticeable amounts of condensed tannin according to the quantification tests. It seems that characterized gallotannin concentration is very lower than condensed tannin too. From histopathological results, ischemic injuries in primary organs were detected but repeated dose oral toxicity studies is highly recommended to determine its No Observed Adverse Effect Levels (NOAEL).

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**THE EFFECT OF *CALENDULA OFFICINALIS* ON SPERM PARAMETERS**

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Oxidative stress as one of diabetes compliants can be altered spermatogenesis quality [1]. Antioxidant can improve the balance in oxidant and antioxidant status. *Calendula officinalis* (Asteraceae) is a profound antioxidant medicinal plant [2]. The aim of present study was to evaluate the effect of CO extract on sperm parameters as terms of testis weight, sperm count, motility, morphology and viability on diabetic male rats. Thirty two male wistar rats were randomly divided into 4 groups. Normal Control, diabetic control, normal treated with CO extract and diabetic treated with CO extract. Induction of diabetes was done by intra peritoneal injection of STZ [2]. The treatment period lasts for 8 weeks by normal saline or CO in control or treatment group, respectively. At the end of experiment animals were anesthetized and sperm samples were analyzed. Diabetes altered all parameters in comparison to normal rats. Administration of CO, to both of normal and diabetic rats can alleviate altered levels of all parameters.

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**EFFECT OF CADMIUM ON ANTIOXIDANT ENZYMES AND PHENOLIC COMPOUNDS IN *MATRICARIA CHAMOMILLA* L. FLOWERS**

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*Matricaria chamomilla* L. (*Asteraceae*) is often used as a medicinal plant, due to its anti-inflammatory, analgesic, sedative, antimicrobial, anti-allergic, anti-hyperglycemia and anti-spasmodic effects. Recent researches showed that these properties are partly due to its phenolic compounds. On the other hand, cadmium is one of the most common heavy metal contaminant in the environment. Induction of oxidative stress is a result of the presence of heavy metals in plant cells at high levels. In this study, due to the detrimental effects of heavy metal pollution on plant growth and development, the effects of oxidative stress caused by the presence of cadmium on the activity of antioxidant enzymes and the content of phenolic compounds were assayed in *matricaria chamomilla*. To this aim, the plants treated with contaminated hydroponic in four levels of cadmium (0, 90, 180, 360  $\mu$ M) for 21 days at vegetative stage. At the end of experiment, as the activities of superoxide dismutase (SOD), catalase (CAT), peroxidase (POD), ascorbate peroxidase (APX), glutathione peroxidase (GPX) as well as the contents of malondialdehyde (MDA), anthocyanins and total flavonoid were measured. The obtained results showed that the activities of superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (APX) initially increased in the 180  $\mu$ M-treated plants and then decreased at the 360  $\mu$ M-treated plants. In addition, the anthocyanins content increased in concentrations of 90 and 180  $\mu$ M and then decreased at 360  $\mu$ M. The total flavonoid content significantly increased in all the treatments compared to the control plants. This indicates that the cadmium treatment increased the content of phenolic compounds. Our data suggest that the high concentrations of cadmium in the nutrient solution appear to have undesirable outcomes on the growth and productivity of *M. chamomilla*.

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**GREEN SYNTHESIS OF COPPER (I) OXIDE NANOPARTICLES USING  
*OROBANCHE CERNUA* ROOT EXTRACT**

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Development of biologically inspired experimental processes for the synthesis of nanoparticles is evolving in important branch of nanotechnology. In recent years, Copper (I) oxide nanoparticles have attracted much attention of researchers due to its application in wound dressings, anti-bacterial and biocidal properties, potential industrial use such as gas sensors, catalytic process, high temperature superconductors and solar cells [1]. However, up to now, the reports on the biopreparation and characterization of nanocrystalline copper oxide are relatively few compared to some other metal oxides [2]. *Orobanchaceae* family. In this paper, we report for the first time the use of *O. cernua* as a bioreducer and a stabilizer agent in the biosynthesis of copper (I) oxide nanoparticles (CONPs). The aqueous *O. cernua* root extract was mixed with copper sulphate solution by heating to a temperature of 80°C and under optimum condition at pH 10. The reduction reaction was studied by observing the color change from brown to dark brown. Synthesized CONPs were characterized by UV-visible Spectrophotometer, Transmission Electron Microscopy (TEM), X-ray diffraction (XRD) and Fourier transform infrared Spectroscopy (FTIR). The formation of copper (I) oxide nanoparticles was confirmed by an absorption peak at 260 nm. TEM and XRD analysis showed the average particle size of 40-45 nm as well as revealed their cubic structure. FTIR results showed the role of compounds phenols, carbohydrates and proteins in synthesis of Cu<sub>2</sub>O nanoparticles. The biological approaches for synthesis of nanoparticles using plants and their extract are better than chemical and physical procedures because of low energy and time expenditure. Green synthesis of nanoparticles is an eco-friendly method and uses natural solvent.

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**EFFECT OF FREEZING STRESS AND ON THE ESSENTIAL OIL CONTENT OF MEXICAN MINT (PLECTRANTHUS AMBOINICUS)**

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The paleotropical oil-rich genus, *Plectranthus* belongs to the family Lamiaceae and the subfamily Nepetoideae. More than 300 species of *Plectranthus* are reported all over the tropical and warm regions of the old world, including Asia, Africa and Australia [1]. Mexican mint (*Plectranthus amboinicus* (Loureiro) Sprengel, syn. *Coleus aromaticus*) is one of the most documented species especially for its medicinal properties, accounting for 68% of all customary applications of this genus [1]. *P. Amboinicus* is a tender perennial plant with an oregano-like flavor and odor, native to Southern and Eastern Africa. It is widely cultivated because of its attractive aroma and easiness for propagation by cuttings. The leaves are fleshy, aromatic and tomentose. The plant has numerous applications in pharmaceutical, food and spice in many countries throughout the world. This herb is widely used by indigenous people of tropical rain forests, either in folk medicine or for culinary purposes. This is mainly due to its natural production of an essential oil with high amounts of bioactive compounds such as carvacrol, thymol,  $\beta$ -caryophyllene,  $\alpha$ -humulene,  $\gamma$ -terpinene, and etc., identified in the oil component of its leaves. The plant essential oil exhibits various biological properties and are widely used in folk medicine to treat conditions like cold, asthma, constipation, headache, cough, fever and skin diseases [2]. *P. amboinicus* is reported to contain several classes of phytochemicals including monoterpenoids, diterpenoids, triterpenoids, sesquiterpenoids, phenolics, flavonoids and esters. In the present study, the effect of freezing stress on the essential oil content (v/w%) of the plant was studied. Our results show that the essential oil content significantly affected by freezing stress. The oil content of the plant was 1.4% after the stress while fresh leaves gave 1.0% of the oil. The increased value in essential oil is probably due to freezing resistance in this plant. In conclusion, it can be suggested to increase the oil in the plant freezing tolerance applied.

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**INVESTIGATING THE POLYPHENOL COMPOUNDS AND ANTIOXIDANT  
PROPERTIES OF *FERULAGO ANGULATA* MEDICINAL PLANT IN  
MAMASSANI COUNTY, FARS PROVINCE**

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The phenol compounds include vitamins, pigments and flavonoids; that due to having anti-ejection property are as the anti-cancer and have role in reducing blood sugar. Antioxidants are polyphenol compounds that cause the removal of these harmful compounds from the body. *Ferulago angulata* is very fragrant plant that belongs to the Apiaceae family. According to the properties of this plant, it seems necessary that a research to be conducted on its phenolic and antioxidant compounds. For this purpose, after harvesting the plant from the region of Doshman-zyarii of Mamassani County, its methanol extract was injected into the HPLC system; and the antioxidant property of mentioned plant was obtained by using DPPH method. The results showed that this species consists of 18 compounds that the most important of them were such as Hesperedin, Sinapic acid, Coumarin, Trans-ferulic acid, Chloregenic acid and the p-Coumaric acid. In addition, the IC<sub>50</sub> index for methanol extract of this plant was obtained 655/3 milligrams per milliliter. Accordingly, it can be concluded that due to existence of phenolic compounds in *F. angulata* plant and as the plant has antioxidant effects, it can be used in the treatment of diseases.



**THE EFFECT OF LINDEN (*TILIA PLATYPHYLLOS*) EXTRACT ON MEMORY RETENTION IN ALZHEIMERIC MODEL ADULT MALE RATS**

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Trees from *Tilia* species are used around the world for their medicinal properties. In folk medicine, the linden (*Tilia platyphyllos*) flower is used as a diuretic, stomachic, antispasmodic, and sedative agent. Several phytochemical studies have been carried out on linden, in which terpenoids, phenolic acids and flavonoids were identified in flowers, bracts, and leaves. The phenolic compounds identified in linden are flavonoids, mainly quercetin glycosides (rutin, quercitrin, and isoquercitrin), kaempferol glycosides, and phenolic acids (caffeic,  $\rho$ -coumaric, and chlorogenic acids). In the present study, the effect of linden ethanolic extract on neurodegeneration induced by intracerebroventricular (ICV) administration of streptozotocin (STZ), was investigated in adult male Wistar rats. The rats were randomly divided into 9 groups: normal control, Sham-operated control (saline, ICV), linden extract (0.05, 0.1, and 0.2 g/kg intragastrically, daily) alone, alzheimeric control rats (STZ, 110 mg/ml, 3  $\mu$ l/site, ICV), linden extract (0.05, 0.1, and 0.2 g/kg intragastrically, daily) together with STZ, and treatment was performed accordingly. Animals were injected with STZ bilaterally, on the 1st and 3rd days. Administration of linden extract (0.05, 0.1 and 0.2 g/kg) was started 1 h before the first dose of STZ and continued up to 28 days. The rats were sacrificed on day 29 and parameters of oxidative stress, superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPX) activity, were measured in brain homogenate. Histopathological changes were examined by Bielschowsky staining. Linden extract increased the levels of antioxidant enzymes, including SOD, CAT and GPX. Histopathological examination showed that linden extract decreased cell loss in cerebral cortex and hippocampus in alzheimeric rats. Our results showed that administration of linden extract (0.1 and 0.2 g/kg) significantly improved STZ-induced cognitive impairment. These results indicate that linden extract is effective in providing protection against memory deficit, oxidative stress, and neuronal damage induced by STZ.

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**THE EFFECT OF AQUEOUS EXTRACT OF *ROSE DAMASCENA* ON SOME BLOOD PARAMETERS IN RATS**

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Rose plants contain large amounts of compounds glycosides, flavonoids and antioxidant. Due to the increasing use of medicinal plants in the treatment of diseases and their side effects on different organs, this study was to evaluate the effect of rose damascena on some blood parameters in rats has been done. 40 male and female Wistar rats 200-150 grams. The rats were randomly assigned to four groups; control, sham received saline and two extract groups that received 500, 1000 mg/kg of *R. damascena* orally once a day for 4 weeks. At the end of the test period, blood samples were taken and samples were analysed for red blood cell (RBC) count, hematocrit (HCT), hemoglobin (Hb) by automated Cell Counter. The number of red blood cells, hemoglobin and hematocrit in males and females to the effects of aqueous extract of Rose damascena has been a significant increase ( $P < 0.05$ ). It seems that the nature of laxative effect of rose damascena extract lead to dehydration, but generally we can say Rose damascena aquatic extract positive affect hematopoiesis and bone marrow.

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**THE STUDY OF TOTAL FLAVONOIDES, TOTAL PHENOL AND ANTIOXIDANT  
ACTIVITY OF *RHAMNUS CATHARTICA***

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Flavonoids from plants always show a wide range of biological activities. *Rhamnus cathartica* is a member of the Rhamnaceae. *R. cathartica* bitter taste and unpleasant and sap are that it is a strong laxative. Geographical distribution of plant in the Iranian province of Mazandaran, Golestan and Ardabil. *R. cathartica* a rich source of polyphenols, which have not been considered yet. This study was carried out to investigate total flavonoids and phenolic contents and antioxidant activity of the aqueous extract of *R. cathartica* fruits from Iran, for the first time. The total antioxidant activity of the extract compounds was determined by DPPH assays. The extract showed significant antioxidant activities. *R. cathartica* also contain large amounts of phenolic compounds and flavonoids.

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**EFFECT OF KNO<sub>3</sub> ON SEED DORMANCY BREAKING OF TWO  
MEDICINAL PLANTS**

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*Satureja hortensis* L. as an aromatic plant which has many applications such as remedy for muscle aches, nausea and infectious disease and flavor of food materials. *Thymus daenensis* is endemic species of Iran that used as an antispasmodic, antitussive, expectorant. The purpose of this study was to evaluate the effect of priming on germination of two medicinal species including esphahan ecotypes of *Satureja hortensis* L and *Thymus daenensis*. A factorial experiment on the base of completely randomized design was conducted with three replications. Factors are four concentration levels (0, 50, 100 and 200 ppm) of KNO<sub>3</sub> and three priming time levels (0, 24, 48 hours). The result of ANOVA showed that priming time is more effective than priming concentration in esphahan ecotype of *Satureja hortensis* L but seeds priming with 50 ppm KNO<sub>3</sub> for 24 and 48 hours had the greatest effect on root & shoot dry weight and mean germination time respectively. In general, it can be concluded that determination of the optimal time and concentration of priming is an important factor for using the positive effect of seed priming.

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**ESSENTIAL OIL YIELD OF *ARTEMISIA ABSINTHIUM* IN DIFFERENT PLANT PARTS AND PHENOLOGICAL STAGES**

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The genus *Artemisia*, mostly small perennial herbs and shrubs, belongs to the important family Compositae (Asteraceae), and comprises over 500 species, which are mainly found in Asia, Europe and North America. It is one of the largest and most widely distributed genera of the Compositae family. Members of this genus have a characteristic scent or taste and use in tradition and modern medicine, and in the cosmetics, perfumes, food and pharmaceutical industry. *A. absinthium* L. (wormwood) is a yellow-flowering perennial plant and used as an antiparasitic, antihelmintic, antiseptic, antipyretic, diuretic and tonic and for the treatment of anorexia, stomachache [1-3]. This study was conducted in order to determine the influence of different phenological stages and plant parts on essential oil yield of *A. absinthium* under the agronomic conditions of Karaj (Alborz province). Plants were harvested at different phenological stages including vegetative, full flowering (leaves, stems and flowers) and fruit set stages. For extraction of the essential oil, the air dried samples (50 g) was separately hydrodistilled using a Clevenger-type apparatus for 3 hours according to the method recommended in the British Pharmacopoeia. There were significant differences among the essential oil contents of *A. absinthium* collected in different phenological stages and parts. During the stage of full blooming, the stem contains low amount of essential oil, compared with essential oil yields of leaves and flowers (inflorescences). The highest essential oil content among studied samples was leaves sample which collected in full flowering stage.

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**IDENTIFICATION OF CAFFEIC ACID DERIVATIVES OF PURPLE  
CONEFLOWER *ECHINACEA PURPUREA* L. MOENCH SHOOT IN  
SPRING TIME PLANTING DATE AND DENSITY**

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The genus *Echinacea* (Asteraceae) originates from North America. In North America and Europe, various preparations of *Echinacea* are popular herbal medicines for preventing and treating the common cold, flu and upper respiratory tract infections [1]. One of the main active compounds of *Echinacea* spp. is caffeic acid derivatives such as caftaric acid, chlorogenic acid, cynarin, echinacoside and cichoric acid [2]. To find out the effect of planting date and plant density of purple coneflower (*Echinacea purpurea*) on some caffeic acid derivatives of shoot, a randomized complete block design in split plot arrangement with three replications was conducted in research farm of Sari Agricultural Sciences and Natural Resources University in 2013. Experimental treatments included three planting dates (April 9, May 9 and June 8 2013) and three planting density (7, 10 and 16 plant/m<sup>2</sup>). Result of this study showed that early cultivation of the crop with the higher plant density (16 plant/m<sup>2</sup>), had the highest content of flower and stem caftaric acid (5.9 and 6.1 mg/g DM) and chlorogenic acid (2.4 and 0.57 mg/g DM), respectively. In leaf, the highest amount of caftaric (4.3 mg/g DM) and chlorogenic acid (2.2 mg/g DM) was measured in delayed planting until June 8. Also, lower plant density (7 plant/m<sup>2</sup>) resulted to increase of echinacoside content in *Echinaceae* leaf (1.3 mg/g DM), flower (3.9 mg/g DM) and stem (0.67 mg/g DM) with 4.5, 6.5 and 1.6 fold more than measured lowest content of echinacoside in all of planting dates, respectively. Cynarine not detected in shoot of *Echinacea*. Overall, the results showed that higher planting density of *Echinacea* resulted to increase in amount of shoot caftaric and chlorogenic acid and lower plant density resulted to increase in amount of shoot echinacoside at full bloom stage.

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**EFFECTS OF (*ZHUMERIA MAJDAE* RICH. F. AND WENDELBO.) ESSENTIAL OIL  
ON TOLERANCE TO THE ANTICONVULSANT EFFECT  
OF MORPHINE ON PENTYLENETETRAZOLE-INDUCED SEIZURES IN MICE**

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Opioids like morphine are extensively used in the management of extreme pain. Many studies have previously demonstrated the anticonvulsant effects of morphine [1,2]. However, chronic use of these drugs usually has undesirable side effects like tolerance to analgesia and dependence with different mechanisms. *Zhumeria majdae* (Lamiaceae) is a unique plant endemic to Iran. It has long been used in traditional medicine as antimicrobial, antispasmodic, anti-inflammatory and anticonvulsant agent. The GC/MS analysis of the Essential Oil (EO) of the aerial parts of the plant indicated the presence of terpenoids like Linalool and Camphor as major components. Previous studies showed that linalool probably attenuate tolerance with inhibitory effect on NOS and NMDA receptors and stimulation of Adenosine receptors. Morphine tolerance in mice was induced by injecting morphine sulfate (2.5 mg/kg, S.C.) twice a day for 4 days and 1 injection on the fifth day 45 min before test. To evaluate the effects of EO on the tolerance, in expression group, morphine was injected as above. On the fifth day, EO (20 mg/kg, I.P.) administered 15 min before morphine injection and 1 hour before infusion of PTZ (0.5%). In development group, both morphine and EO were injected. On the fifth day, the same dose of EO was administered as the same. CST (Clonic Seizure Threshold) was assessed 45 min after morphine and 1 hr after EO administration. The EO 20 mg/kg decrease tolerance in development and expression groups significantly ( $p < 0.001$ ). We demonstrated that *Z. majdae* essential oil could attenuate tolerance to the anticonvulsant effects of morphine with a forementioned mechanisms.

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**INVESTIGATION ON SOME AGRONOMIC PROPERTIES AND ESSENTIAL OIL  
CONTENT OF THREE SPECIES OF ORIGANUM IN ANKARA CONDITIONS**

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*Origanum onites* L. is the most exported (80%) and it is known as Izmir Oregano or Turkish Oregano. *Origanum vulgare* subsp. *Hirtum* (Link) Ietswaart as another species of the genus widely distributed in North Africa and in temperate and arid zones of Eurasia. Syrian oregano (*Origanum syriacum* L.) is native to the Eastern Mediterranean, Southern Europe and Western Asia. The aim of the study was to evaluate some agronomic properties and essential oil of the species and their performance in Ankara condition. The trial was carried out at the Experimental Fields and medicinal and aromatic plant laboratory of the Field Crop Department, Faculty of Agriculture of Ankara University, Turkey during 2009-2011. The experiment was established with three replications in fall of 2009. The harvest was done in flowering stage (50%) in summer 2011. According to the results, the average of height, branch number, nod number, leaf/stem rate (fresh weight), leaf/stem rate (dry weight), fresh herb yield ha<sup>-1</sup>, dry herb yield ha<sup>-1</sup> of *Origanum onites* in three replications, were recorded as 47 cm, 153.37 pcs, 15.67 pcs, 2.18, 2.67, 55332.8 kg ha<sup>-1</sup>, 16666.5 kg ha<sup>-1</sup> respectively. The average of essential oil was recorded 3.4%. In *Origanum vulgare* mentioned properties were recorded as 47.74 cm, 63.82 pcs, 14.38 pcs, 1.31, 1.49, 42666.66 kg ha<sup>-1</sup>, 14999.99 kg ha<sup>-1</sup> respectively. The average of essential oil content was recorded 4.21%. In *Origanum syriacum* mentioned properties were recorded as 47.8 cm, 69.83 pcs, 14.17 pcs, 1.40, 1.32, 23333.33 kg ha<sup>-1</sup>, 7133.33 kg ha<sup>-1</sup> respectively. The average of essential oil was recorded 2.66%.



**THE EFFECT OF DIFFERENT TEMPERATURE CONDITIONS ON MICROBIAL CONTENT IN *GLYCYRRHIZA GLABRA* L.**

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Licorice (*Glycyrrhiza glabra* L.) is a perennial plant of the family Fabaceae. Using licorice can be dated back to several thousand years ago. It was widely used as gastritis, peptic ulcers, respiratory infections, tremor, etc. in traditional Persian medicine and as the global paradigm of medicine in medieval age. Medicinal plants may be associated with a broad variety of microbial contaminants, which are represented by bacteria, fungi and viruses. Inevitably, this microbiological background depends on several environmental factors and exerts an important impact on the overall quality of herbal products and preparations. In order to compare microbial load in shade, sun and 55 degree Celsius oven dried licorice root, aerobic bacteria, fungi, *E. coli* and *Salmonella* presence was examined. A 1:10 suspension of licorice root and TSB (Tryptic Soy Broth) culture medium was prepared. To examine the presence of aerobic bacteria and fungi, different concentrations of TSB was added to PDA and NA culture media. One milliliter of licorice root suspension and TSB incubated for 24 hours at 37 degrees Celsius was added to 100 milliliters of MacConkey Broth culture medium to examine the presence of *E. coli*. The mentioned medium was incubated at 42 degrees Celsius for 24 hours and added to EMB (Eosin Methylene Blue) for *E. coli* detection. For detection of *Salmonella* presence, 100 microliters of licorice root suspension and TSB incubated at 37 degrees Celsius for 24 hours was added to 10 milliliters of Rappaport Valliliadis *Salmonella* Enrichment medium. The resulting medium was incubated at 31 degrees Celsius for 24 hours and subcultures were transferred to XLD (Xylose Lysine Deoxycholate Agar medium). A significant difference was observed among shade, sun and oven dried roots in terms of bacterial and fungal load. *E. coli* was present in samples and drying method did not have a significant effect on its presence. *Salmonella* spp. was not observed in any of the examined samples.

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**LARVICIDAL ACTIVITY OF WILD AND CULTIVATED TYPES OF *BUNIMUM PERSICUM* FRUITS AGAINST *ANOPHELES STEPHENSI***

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Several species of mosquitoes are involved in transmission of serious parasitic and viral diseases to human, such as malaria, filariasis, yellow fever, chikungunya, dengue and etc. Despite progresses made over the past decades to decline the mortality rate of malaria, it is still prevalent in some tropical parts of the world. In Iran, it is limited to the southern east parts, including Sistan and Baluchestan, and southern areas of Kerman and Hormozgan provinces. Larviciding, a form of larval source management, as a supplementary approach to vector control, could cost-effectively help to eliminate vector mosquitoes [1]. The mosquito *Anopheles stephensi* is one of the six main vectors of human malaria in mentioned areas in Iran. Natural insecticides provide a safer alternative to synthetic ones. Toxicity of essential oil, total extract, petroleum ether fraction and methanol fraction of a wild type (purchased from Kerman bazaar) and a cultivated type (supplied from agricultural research fields of Ferdowsi University of Mashhad) of *Bunium persicum* fruits toward *An. stephensi* larvae was assessed according to the method described by WHO [2]. Among the samples, essential oils from both cultivated and wild types with LC<sub>50</sub> values of 21.3823 ppm and 27.4284 ppm showed strong lethality. Furthermore, total extracts of cultivated (LC<sub>50</sub> 63.2580 ppm) and wild (LC<sub>50</sub> 64.9933 ppm), and petroleum ether fractions of cultivated (LC<sub>50</sub> 62.7814 ppm) and wild (LC<sub>50</sub> 85.9933 ppm) showed considerable larvicidal effects. Methanol fractions with LC<sub>50</sub> values of 152.6357 ppm for cultivated type and 255.7486 ppm for wild one, exhibited least larvicidal activity among the examined samples. Comparison of lethal concentration values reveals there is no difference in efficacy of tested samples between wild and cultivated types except for methanol fractions. The extract and fractions from *B. persicum* fruits, especially petroleum ether fraction, beside the essential oil, have shown significant larvicidal effects on *An. stephensi*, and can be a great candidate to develop an eco-friendly insecticide to combat malaria vector breeding.

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ANTIOXIDANT CAPACITY OF *ECHINACEA* [*ECHINACEA PURPUREA* (L.)  
MOENCH] SHOOT EXTRACTS IN RESPONSE TO PLANTING  
DATE AND DENSITY

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Among the various *Echinacea* species, *E. purpurea* is an herbaceous perennial and a member of the Asteraceae family with a long, well-established tradition of medicinal use in North America, Europe and Australia [1]. Antioxidants affect the human metabolism in general and have, based on more or less well-documented investigations, been suggested for the treatment of various types of illnesses [2]. Most recently, have shown that all investigated *Echinaceae* species did possess radical scavenging activity, *E. purpurea* being the most efficient [3]. To find out the effect of planting dates (April 9, May 9 and June 8) and plant densities (7, 10 and 16 plant/m<sup>2</sup>) of medicinal plant purple coneflower on shoot antioxidant capacity and flavoneid content, a randomized complete block design in split plot arrangement with three replications was conducted in Research Farm of Sari Agricultural Sciences and Natural Resources University in 2013. Results of experiment showed a significant increment of shoot antioxidant capacity in the higher planting densities (10-16 plant/m<sup>2</sup>) and earlier planting dates (April 9 to May 9). The highest antioxidant capacity content (0.99 %) was related to flowers. The lowest amount of leaf, flower and stem antioxidant capacity (0.86, 0.91 and 0.83 %, respectively) were achieved in coneflower plants were cultivated in delayed planting until June 8 with low density of 7 plant/m<sup>2</sup>. Also, plants grown in the higher planting density and earlier planting date resulted to the highest amount of total flavoneid in leaf (11.1 mg of quercetin/ g DM), flower (10.7 mg mg of quercetin/ g DM) and stem (7.6 mg of quercetin/ g DM). In conclusion, these results showed that the higher density and early cultivation of the purple coneflower in spring can lead to an increase in the amount of antioxidant capacity in shoot of this plant at full bloom stage.

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**HYPOGLYCEMIC AND HYPOLIPIDEMIC EFFECT OF HYDROALCOHOLIC EXTRACT OF PISTACIA ATLANTICA IN STREPTOZOTOCIN-INDUCED DIABETIC MICES**

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Diabetes mellitus is an important metabolic disorder that is of increasing concern, because it frequently leads to complications such as retinopathy and cardiovascular diseases. *Pistacia atlantica* plant is known for their medicinal properties since antiquity. In the present study, we examined the effects of hydroalcoholic extract of *Pistacia atlantica* plant on glucose and serum lipids profile in Streptozotocin (STZ)-induced diabetic mice. 36 male mice were divided into six groups randomly, including vehicle group, STZ group (180 mg/kg), *Pistacia atlantica* group (200 mg/kg), and three diabetic groups that received different dosages of *Pistacia atlantica* extract (50, 100, and 200 mg/kg) for two weeks. At the end of treatment, blood sample was collected and then the changes of glucose and serum lipid profile were evaluated. The results showed that STZ cause significant increase in serum levels of glucose, triglyceride (TG), total cholesterol and low-density lipoprotein (LDL). Following *Pistacia atlantica* administration, a significant decrease was observed in glucose, triglyceride (TG), cholesterol and LDL levels in diabetic mice. Our findings suggested that hydroalcoholic extract of *Pistacia atlantica* possess compounds with anti-diabetic properties.

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**THE EFFECT OF METHYL JASMONATE AND VERMICOMPOST ON SOME  
PHYSIO-MORPHOLOGICAL TRAITS OF *DRACOCEPHALUM MOLDAVICA*  
UNDER LEAD STRESS**

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Today, progression of industry and civilization lead to existence of high concentration of heavy metals in sources of soil and water that is a serious danger for environmental and human health. In order to investigate the effect of methyl jasmonate and vermicompost on some physio-morphological traits of *Dracocephalum moldavica* under lead stress, an experiment was conducted as factorial based on completely randomized design with three replications. Treatments were four levels of lead (0, 100, 200, 300 and 400 ppm), four levels of methyl jasmonate (0, 50, 100 and 150 Mm.lit<sup>-1</sup>) and under application and without application of vermicompost. The measured traits were fresh and dry weight of shoot and root, shoot and root length, leaf number and leaf area. The results indicated that with increasing lead concentration in the soil, all traits decreased. Applying vermicompost and methyl jasmonate decreased the negative effects of lead on physiological and morphological traits of *Dracocephalum moldavica*. The highest dry weight of shoot and root was observed in 0 ppm lead, 300 Mm.lit<sup>-1</sup> and vermicompost application.

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**INSECTICIDAL ACTIVITY OF SPINACH SEED EXTRACT ON DIAMONDBACK MOTH, *PLUTELLA XYLOSTELLA* L.**

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Diamondback moth, *Plutella xylostella* L. is a dangerous pest of cruciferous plants throughout the world as well as Iran. The use of synthetic pesticides is the most common method for controlling this pest. Resistance to pesticides because of high capacity of fecundity and rapid increasing pest populations is the major issue, so that studies for toxicity of newer pesticides are necessary. In this research, oral toxicity of spinach seeds methanolic extract was investigated against *P. xylostella*. Powdered seeds soaked for 48 hours in 80% methanol then filtered and extra solvent was removed by rotary evaporator. The study carried out by leaf dip method, using third instar larvae of *P. xylostella* in 3 and 5% extract concentrations [1]. Then 24 and 48 hours mortality, total larval mortality and total premature mortality was counted. The results showed that mortality was significantly increased over the time of pest feeding on leaves. Maximum larval and premature mortality was 96.7% and 93.4% at 5% respectively. According to the results, it could be concluded that spinach seed extract have potential toxic effect on *p. xylostella* that can be a promising alternative to synthetic pesticides. Also further research is necessary to find a reasonable formulation method to enhance the insecticidal activity.

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**THE EFFECT OF POTASSIUM NANO FERTILIZER APPLICATION ON  
PROLINE AND TOTAL SOLUBLE SUGARS CONTENT IN *MENTHA PIPERITA*  
UNDER SALT STRESS**

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Salinity is one of the most important factors affecting plant growth and the production of secondary metabolites. Primarily, salinity damages plants by the osmotic effect, the effect of specific ion toxicity and subsequently by nutritional stress. In order to fight the stress effects, plants synthesize and accumulate substances which can be adjusted with osmotic pressure. Proline and soluble carbohydrates are known as osmolyte compounds, play an important role in osmotic adjustment of plant cells. Moreover, the application of potassium helps the plant to cope with the hazardous effects of salinity by improving the morphological, physiological and biochemical attributes. Among various macro-nutrients, potassium ( $K^+$ ) occupies an important role in the survival of plants under salt stressed conditions. A well balanced  $K^+ : Na^+$  ratio is crucial for the proper adjustment of stomatal function, activation of enzymes, protein synthesis, cell osmotic regulation, oxidant metabolism, photosynthesis and turgor maintenance. A pot experiment was carried out using *completely randomized* design and three replications to study the effect of potassium nano fertilizer application on proline and total soluble sugar content in *Mentha piperita* under salt stress. Foliar application of potassium nanofertilizer with four concentrations (0, 1, 2, 3 g/l) began when the plants had about six leaves. The plants were irrigated with four levels of salinity solution (0, 40, 80 and 120 mM NaCl) for 3 months. Proline content was measured according to Bates method, while total soluble sugar analysis was done using Anthrone method. The results showed that salinity stress, foliar application of potassium nano fertilizer, and their interaction significantly increased total soluble sugar of peppermint. The highest level of total soluble sugar (59.46 mg/gfw) was obtained at 80 mmol NaCl and the lowest amount (31.43 mg/gfw) was in control. Although, application of 120 mmol NaCl, decreased the amount of this parameter significantly. Salinity stress had significantly increased proline content in peppermint, but foliar application of potassium nanofertilizer did not show significant effect on this parameter. Although, the salinity stress and nanofertilizer interaction was significant for this trait. The highest amount of proline (33.9  $\mu$ g/gfw) was observed at 120 mmol salinity level with 3 g/l nanofertilizer concentration. The least amount of proline (2.23  $\mu$ g/gfw) was at 0 mM salinity level with 3 g/l nanofertilizer. In all levels of salinity (except for 120 mM NaCl) proline content decreased while increasing nanofertilizer concentration.

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## EVALUATE MUCILAGE PERCENTAGE OF ALTHEA UNDER EFFECT DIFFERENT FERTILIZER AND INOCULATION WITH MYCORRHIZA

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Medicinal and ornamental hibiscus with the scientific name *Althaea rosea* L., has the polysaccharide with high molecular weight is called mucilage. Mucilage acts on the plant as energy storage, protection against pathogens and wounds, transfer and store water. To evaluate the mucilage rooted percent of *Althaea rosea* L. this study was carried out in Research Farm of the Ferdowsi University of Mashhad in the crop year of 2013-2014. The experimental design of the study was factorial fashion based on a complete block of three replications. The type of fertilizer was the first factor included control (without fertilizer), blood fertilizer (20 kg/ha), Farmyard manure (40 T/ha rotted cow manure), Municipal solid waste compost (20 T/ha) and chemical fertilizer (200 kg/ha Triple superphosphate, 114 kg/ha Urea and 200 kg/ha Potassium sulfate) and the second factor was inoculation with mycorrhiza (*Glomus intraradices*) and without inoculated. Analysis of variance showed the effect of organic fertilizers, chemical and biological, inoculated seed with mycorrhizal fungi and interactions fertilizer and inoculated with mycorrhiza significant effect on the percentage of mucilage rate at 5%. The Results comparing means with interactions fertilizer treatments for two levels with mycorrhizal and non-mycorrhizal revealed increased mucilage significantly in the manure with mycorrhizal compared to control, but there was no significant difference compared to other treatments. However, mucilage significant increase in blood fertilizer levels without mycorrhizal and with compost treatment was not significantly different, but compared to other treatments significant difference was observed and the total performance was at the level of mycorrhizal more than non-mycorrhizal. In plants symbiotic mycorrhizal fungi, in order to increase root biomass could increase the percentage of mucilage root cause. Mycorrhizal fungi to direct methods such as improving plant nutrition through nutrient absorption and also indirectly increase water uptake by plants such as reducing biotic and abiotic stresses are increased plant growth [1]. The biofertilizers on increasing the quantity and quality of medicinal plants have positive effects [2]. Generally, the use of biofertilizers can be combined with mycorrhizal fungi increase the yield quality and quantity was *Althaea rosea* L.

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**INVESTIGATING THE EFFECT OF GROWTH STAGES ON THE CHEMICAL COMPOSITION OF *SALVIA MIRZAYANII* MEDICINAL PLANT IN FARS PROVINCE (CASE STUDY: PARDIS MOUNTAIN OF LAAR CITY)**

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*Salvia mirzayanii* plant is one of the species of sage that has many medicinal uses from the past. This research was conducted with the purpose of determining the amount and compounds of *Salvia mirzayanii* plant leaf in three stages of vegetative, flowering and seeding. For this purpose, after gathering the plant from the region of Pardis Mountain of Laar County in the south of Fars province, the essence extraction was done by Clevenger extraction method and using GC/MS and GC devices. By investigating the compositions, it was found that totally, there are 20 compounds in this plant. The essential oil efficiency in three stages of vegetative, flowering and seeding was 63.07, 80.92 and 29.66% respectively. In three stages of vegetative, flowering and seeding, 20, 17 and 13 secondary compound were observed respectively; in a way that in all three stages the Spatheulenol, Linalol and 1.8 Cineole compounds had the most amount; and were known as the main compounds of plant. The obtained results showed that the growth stages is effective on the chemical compositions of *Salvia mirzayanii* plant; and the best efficiency of essential oil was seen in the flowering stages of plant.



***SALVIA CANDIDISSIMA* VAHL. SSP. *CANDIDISSIMA*: THE 64<sup>th</sup> IRANIAN  
*SALVIA* SPECIES**

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The genus *Salvia* L. (Salviniaceae, Nepetoideae, Lamiaceae) with around 1000 species worldwide, after *Nepeta* L. is the second largest genus of the family in Iran. Containing 17 endemic ones, *Salvia* represents in Iran by 63 species. Traditionally well-known genus in medicine, is rich in bioactive flavonoids and terpenoids [1]. Furthermore, *Salvia* displays cardiotoxic, neuroprotective, antimicrobial, antioxidant, anticholinesterase, anti-apoptotic, antiglycating, antitumor, and antimalarial activities [2]. While *Salvia candidissima* ssp. *candidissima* was first known from eastern Turkey, Northern Iraq and Armenia [3], the present study reports it as a new record from Iran for the first time. The studied specimens, collected from a lime-stony mountainous habitat around the Marmisho Lake, were identified as a new species for the flora of Iran and deposited in medicinal plant herbarium (MPH-1755) of Shahid Beheshti University of Tehran. Morphological investigation as well as anatomical studies were performed on the herbarium specimens. The morphological characteristics of the newfound species are as follows: Rhizomatous, aromatic perennial herb. Stems 25-70cm, erect, quadrangle. Leaves simple, ovate to broadly-ovate, 5-16× 3-12 cm, petiole 3-7cm. Inflorescence paniculate, and yellowish-green, multiflorous, verticillasters 2-6 flowered, distant. Bracts broadly ovate-acuminate. Calyx campanulate-tubular, 12-14mm long, 13-veined. Corolla white, middle lobe of the lower lip yellow, 22-28 mm, tube 12 mm, ventricose, squamulate. Stamens exerted. Nutlets rounded-trigonous, smooth, darkly-veined light brown. Based on the leaf shape, corolla color and indumentum *S. candidissima* is subdivided into two taxa. Subsp. *candidissima* as an Irano-Turanian element is an easterner taxon compared with subsp. *occidentalis* which is dominant in the European parts of Turkey, Greece, Albania and Germany. By the present species, the number of *Salvia* species known in Iran reached to 64, showing near 27 % endemism rate.

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STUDY OF SAME KARYOTYPIC PARAMETERS IN IRANIAN *THYMUS* SPP. AS AN IMPORTANT MEDICINAL PLANT

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*Thymus*, an aromatic medicinal plant, is one of the most important genera of the Lamiaceae family. For evaluation of karyotypic parameters of 6 *Thymus* sp (daenensis and kotschyanus species) ecotypes, seeds of six Iranian *Thymus* were cultured and then Root-tip meristems was pretreated, fixed and then colored by solutions of  $\alpha$ -bromo naphthalin, levitzky and hematoxilin respectively. At least five metaphase cells were evaluated for each accession. Some different traits such as; TL, LA, SA, AR, CI, %TF, DRL, A1 and A2 were calculated. The karyotypic studies showed that all ecotypes were diploid ( $2n=2x=30$ ) with karyotypic formula  $15m$ . The basic chromosome number for all species were  $X=15$ . Based on symmetric parameters in table, *Thymus daenensis* code 18209 with  $TF\%=45.46$  is symmetric and code 10126 is asymmetric karyotypes.

A2	A1	%TF	DRL	VRC	Name	Code	No
0.163557	0.161286	45.46951	3.831448	1.103604	<i>Thymus daenensis</i>	18209	1
0.194435	0.17231	45.14133	4.781819	1.074859	<i>Thymus kotschyanus</i>	27800	2
0.175974	0.166197	45.44979	4.136049	1.25382	<i>Thymus kotschyanus</i>	27814	3
0.188669	0.163995	45.31642	4.671066	1.123059	<i>Thymus sp.</i>	15656	4
0.176639	0.187502	44.90456	4.123802	1.033681	<i>Thymus daenensis</i>	27221	5
0.190489	0.183541	44.86932	4.633932	1.217778	<i>Thymus daenensis</i>	10126	6

DRL: Difference of Relative Length; VRC: Value of Relative Chromatin; TF%: Total Form Percentage; A1: Intrachromosomal Asymmetry Index; A2: Interchromosomal Asymmetry Index

The *Thymus* ecotypes under study occupied classes 1A and 1B of Stebbins' karyotype classification, indicating the presence of a primitive symmetrical karyotype in these ecotypes. Finally we find significant different between all ecotypes.



ASSESSMENT OF *IN VITRO* ANTIOXIDANT CAPACITY AND POLYPHENOLIC COMPOSITION OF VARIOUS SOLVENT EXTRACTS OF *DRYOPTERIS CAUCASICA*, *ATHYRIUM FILIX-FEMINA* AND *DRYOPTERIS PALLIDA*

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Ferns are a rich source of natural products with therapeutic potential. Different species of ferns have been used for wide medicinal purposes and have great potential due to their diverse pharmacological properties, but scientific knowledge of the phytoconstituents of these plants is limited. They are traditionally used for the treatment of skin tumefaction, protect the liver and treat the hepatitis and also being used as antipyretics. According to the last studies on the pteridophytes of Iran, occurrence of 52 species in 26 genera and 15 families are confirmed. Although there is a wide application of ferns in Iran, but very few systematic reports regarding to their biological activities could be found. In this study, the antioxidant activity, total phenolic and flavonoid content of ethanol, methanol and aqueous methanol extracts of three species of ferns (*Dryopteris caucasica*, *Athyrium filix-femina* and *Dryopteris pallida*) were evaluated. Antioxidant activities of the samples were determined by 2,2-diphenyl-1-picrylhydrazyl (DPPH) method. In the DPPH test, methanol extract of *Dryopteris pallida* showed the highest radical scavenging activity with an IC<sub>50</sub> value of 70.49±1.26 µg/mL, about 85% of the potency of synthetic standard butylated hydroxyanizole (BHA) as positive control (IC<sub>50</sub> = 60.17±0.54 µg/mL). The total phenolic content of the different extracts was determined using the Folin-Ciocalteu reagent. Among the extracts, methanol extract of *Dryopteris pallida* was containing the highest amount of phenolic compounds (75.66±0.92 mg gallic acid /g dry extract). There was a significant linear correlation between antioxidant activity and total phenolic content for ethanol, methanol and aqueous methanol extracts (R<sup>2</sup>=0.7281, 0.9766 and 0.9958, respectively). Large differences in the amount of flavonoids of three species of ferns in ethanol, methanol and aqueous methanol extracts were detected. Ethanol extract has been found to be rich in flavonoids with a value of 118.14±1.97 (*D. caucasica*), 108.74±1.65 (*A. filix-femina*) and 104.60±1.13 (*D. pallida*) mg quercetin/g dry extract. The results suggest that the potent antioxidant activities are justified by the high concentration of phenolic constituents present in the extracts. The results of this study revealed the extracts of selected ferns may be an alternative additive in foods and pharmaceuticals preparations instead of more toxic synthetic antioxidants.

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THE EFFECT OF METHYL JASMONATE AND VERMICOMPOST ON SOME  
PHOTOSYNTHETIC TRAITS OF *DRACOCEPHALUM MOLDAVICA*  
UNDER LEAD STRESS

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Heavy metals have adverse effects on soil microbial populations. In order to investigate the effect of methyl jasmonate and vermicompost on some photosynthetic traits of *Dracocephalum moldavica* under lead stress, an experiment was conducted as factorial based on completely randomized design with three replications. Treatments were four levels of lead (0, 100, 200, 300 and 400 ppm), four levels of methyl jasmonate (0, 50, 100 and 150 Mm.lit<sup>-1</sup>) and under application and without application of vermicompost. In this study, assimilation, transpiration and stomatal conductance were measured. The results indicated that with increasing lead concentration in the soil, assimilation and transpiration and stomatal conductance decreased, significantly. Vermicompost and methyl jasmonate decreased the negative effect of different levels of lead and moderate the effects of heavy metal stress. The highest assimilation and transpiration was obtained in 0 ppm lead, 300 Mm.lit<sup>-1</sup> methyl Jasmonat and vermicompost application.

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**THE EFFECT OF BORON APPLICATION AND MYCORRHIZAL FUNGI ON  
GUAR (*CYAMOPSIS TETRAGONOLOBA* L.)**

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In order to explore the possibility of extending guar cultivation, an experiment was carried out in Ramin Agriculture and Natural Resources University of Khuzestan with the aim of evaluating the total dry weight, SPAD and plant height affected by arbuscular mycorrhizal fungi (inoculation and no inoculation of *Glomus intraradices*) and boron (0, 3, 6, 9 and 12 kg/ha). The experimental factors was investigated by factorial trial in the basis of randomized complete blocks design with three replications. The results showed that boron application had a significant effect ( $p < 0.01$ ) on increasing dry weight and plant height while mycorrhizal inoculation had not significant effect compared to without application. The highest dry weight and plant height obtained in 9 kg/ha boron application. Also the highest SPAD obtained in inoculation with mycorrhizal fungi and 3 kg/ha boron application.



**EVALUATION THE EFFECT OF PLANT GROWTH REGULATOR (NAA)  
CONCENTRATION ON CALLUS INDUCTION IN HYSSOP  
(*HYSSOPUS OFFICINALIS* L.)**

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Hyssop (*Hyssopus officinalis* L.) belonging to the Lamiaceae family is an important medicinal plant with anti-fungal and anti-bacterial properties that is effective in treatment of diseases such as laryngitis, asthma, wound healing and, etc. Given the importance of this herb, This study was conducted to optimize the conditions of callus induction in hyssop. Callus induction experiment was conducted as a factorial experiment in a completely randomized design with three replications on MS medium. In this experiment, different levels of plant growth regulator NAA and two explants (hypocotyl and leaf) were compared. The results showed significant differences between levels of hormones and two explants and their interactions. The highest percentage of callus induction achieved in the hypocotyl explants and hormone levels of one and two mg.l<sup>-1</sup>.



**PHYSIOLOGICAL RESPONSES OF *ONCORHYNCHUS MYKISS* TO ALEO VERA  
ORAL ADMINISTRATION**

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Natural compounds of *Aloe vera*'s gel are well-known for their medical ingredients including immunostimulants, antimicrobial and growth promoter properties. The physiological effect of *Aloe vera* in mammals has been documented, but there are few work done on effect of *Aloe vera* on fish physiological response. Then in this study the effect of oral administration of *Aloe vera* on growth indices, hematological parameters and immune responses of rainbow trout were investigated. One thousand two hundred rainbow trout fingerling ( $21 \pm 2$  g, Mean  $\pm$  SD) were divided in two groups, each in triplicate, in farm condition. Groups 1 were fed with food supplemented with 0.5% *Aloe vera* whereas group 2 were fed with control food without supplementation. Experiment last for 60 days and growth indices calculated in day 30 and 60. At the end of experiment blood samples of 6 fish in each replicate were taken and hematological (PCV, Hb, RBC, WBC, MCH, MCV, MCHC) and immunological parameters (Lysozyme and serum bactericidal activity, total protein and globulin) were compared between groups. Results showed that growth indices (SGR, FCR, FER and PER) and some immunological parameters were significantly increased in fish fed with Echinacea supplemented food compare to control group, But hematological parameters and total protein and globulin didn't show any significant difference between groups ( $P > 0.05$ ). It can be concluded that Although oral administration of *Aloe vera* to rainbow trout in farm scale stimulate some growth and immunological indices, hematological parameters didn't affect by this supplementation.



**ANALGESIC AND ANTI-INFLAMMATORY EFFECTS OF ESSENTIAL OIL OF  
*FERULA PERSICAGUM* (SAGAPENUM) IN MALE RATS AND MICE**

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Non-steroidal anti-inflammatory drugs are one of the most commonly drugs for treating pain, fever and inflammation; however, they are limited in use due to their adverse effects [1]. In this study, we decided to evaluate the analgesic and anti-inflammatory effects of essential oil of *Ferula persica* gum (sagapenum) in male rats and mice, followed the proven analgesic effects of other species of genus *Ferula* [2]. Acetic acid-induced writhing test and hot plate method were used to evaluate analgesic effects and acute anti-inflammatory activity was assessed by inflammatory paw edema in rat. according to results, all of the mice that received sagapenum (2.5, 5, 10, 20 mg/kg) had significant differences ( $p < 0.001$ ) with control groups in writhing test that indicates peripheral analgesic effects. In hot plate method, dosage of 20 mg/kg of sagapenum showed significant difference ( $P < 0.001$ ) with control groups 15 and 60 minutes after injection. And at 30 and 45 minutes of injection had difference with  $P < 0.01$ . dosage of 10 mg/kg at the time of 30 minutes after injection with  $P < 0.05$  and at 45 and 60 minutes with  $P < 0.01$  had significant differences compared to control group. About the carrageenan test, dosage of 20 mg/kg at both phases (the first phase up to 1hr and second phase 1-6 hours after the carrageenan injection) and dosage of 5 and 10 mg/kg at the second phase had significant differences compared to control group and exhibited the anti-inflammatory effects. The results suggest that sagapenum have significant analgesic and acute anti-inflammatory effects. This oleo gum resin could be used in management of pain and inflammation in future.

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**THE EFFECT OF PRIMING AND VERMICOMPOST ON MORPHOLOGICAL CHARACTERISTICS MARIGOLD (*CALENDULA OFFICINALIS* L.)**

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To study the effect of different levels of Vermicompost and priming on morphological characteristics of Marigold (*Calendula officinalis* L.), an experiment was conducted during 1393-94 growing season. In this experiment, Vermicompost fertilizer improved the physical, chemical and biological properties of soil and priming treatments were used to speed up the germination, establishment and seedling growth. The type of design was completely randomized block in factorial arrangement with 9 treatments and 3 replications. Priming treatments included three levels: without priming, Priming with potassium nitrate and Hydropriming, vermicompost consisted of three levels, 0%, 20% and 40% vermicompost by weight. Analysis of variance showed that vermicompost and priming treatments have significant effects on morphological characteristics of Marigold. Rising of Vermicompost level up to 40 percent increased plant height, fresh weight, dry weight, yield of flowers. Flower diameter and thousand seed weight factors in 20% treatment vermicompost had the greatest amount and the rise of Vermicompost more than this rate decreased the amount of above mentioned factors. Priming also had the significant impact on height, yield of flower, thousand seed weight so that height and thousand seed weight factors in Hydropriming, yield of flowers in prime control. Interactions between priming and vermicompost had significant impact on fresh weight and dry weight.



THE RELATION OF AT3G47570 GENE TO MEDICINAL PROPERTY  
OF BRASSICA

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Glucosinolates (a large group of sulfur-containing secondary plant metabolites) are responsible for medicinal property of all economically important Brassicaceae as well as the model plant *Arabidopsis thaliana*. In recent years, glucosinolates and their breakdown products have been the subject of extensive studies due to their role in human [1]. It has been studied the beneficial impact of some glucosinolates and their breakdown products on carcinogenesis, cardiovascular and neurological diseases [2]. Based on the precursor amino acid used, glucosinolates are classified into three major groups namely aliphatic, indolic and aromatic [1]. The glucosinolate content and composition may be affected by pathogen attack, nutrient supply, especially sulfur and nitrogen [3], but also by environmental factors such as temperature, length of the photoperiod, season, drought and salinity. During biotic and abiotic stresses, glucosinolate biosynthesis is further controlled by a complex network of transcription factors. Our previous investigation, proteomic data and *in silico* analysis, suggested that *AT3G47570* gene may display a role in glucosinolate biosynthesis pathway. Indeed, the possible role of *AT3G47570* in plant defence [4] and nitrogen starvation response [5] have already been documented. *In silico* analysis, using diverse biological databases facilitates functional analysis, directs lab experiments and provides valuable insight about biological relationship among genes/proteins. These biological databases have been embedded in Gene MANIA algorithm, such as protein-protein interaction, co-localization, gene-gene interaction and co-expression revealed biological connections between *AT3G47570* and glucosinolate biosynthesis pathway genes. *AT3G47570* gene is co-expressed with *SOT16*, *CYP83B1* and *MYB28*. It has been also co-localized with *SUR1* and *SOT17*. *In silico* analysis suggested that *AT3G47570* gene as a candidate gene which probably regulate glucosinolate biosynthesis pathway.

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**ANTIBACTERIAL ACTIVITY OF HERBAL EXTRACTS AGAINST FOUR  
COMMON BURN WOUND PATHOGENS**

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There are numerous historical records and practical evidences that herbal preparations have been considered as cure for wounds and burns in Iranian system of traditional medicine [1,2]. The present study deals with the evaluation of antibacterial effects of the ethanolic extracts of several selected herbs against four standard bacterial strains as the major causes of burn infections and determination of their relevant minimum inhibitory concentrations (MIC). The *in vitro* antibacterial activity of a group of selected herbal extracts including *Tecomella undulata* Seem., *Marrubium vulgare* L., *Parrietaria judaica* L., *Ocimum basilicum* L. and *Zataria multiflora* were evaluated against *Staphylococcus aureus* (ATCC25923), *Pseudomonas aeruginosa* (PTCC 1570), *Klebsiella pneumoniae* (KP7881) and *E.coli* (ATCC 25922) using the microdilution broth susceptibility test method. After incubation, the activity of each extract was detected by loss of turbidity, which showed the inhibition of bacterial growth. The extracts MIC values were found to be in the range from 0.040 - 0.162 mg/ml against *S. aureus*, *P. aeruginosa*, *K. pneumoniae* and respectively and *E. coli* was found to be highly sensitive to *Z. multiflora* and *M. vulgare* while remarkable sensitivities were observed for *T. undulate*, *P. judaica* and *Ocimum basilicum* towards all tested bacterial strains. The results obtained in the present investigation deserves attention and hence there is a need for further *in vivo* studies to shed light on the antibacterial efficacy of these plant extracts and verify the exact active concentrations and the phytochemical constituents involve in the manifestation of bacteriostatic/bactericidal properties.

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TANSHINONE COMPOSITIONS IN WILD GROWING *SALVIA XANTOCHEILLA*  
BOISS. OF IRAN

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Genus *Salvia* is one of the largest members of the Labiatae family, comprising more than 900 species, many of them collected from the wild and a few of them cultivated [1]. Over 58 species of the genus *Salvia* are found in Iran, 17 of which are endemic [2]. It has been reported that tanshinones are the most abundant and important bioactive compounds in the roots some of *Salvia* species [3]. Tanshinones, abietane-type norditerpenoidquinones, have been shown to exhibit diverse pharmacological activities, including, anti-platelet, cardioprotective, antibacterial, antioxidant, antidiabetes, anti-cancer and anti-inflammatory effects [3,4]. This study was focused on identification and determination of some tanshinones in the extracts of roots of *S.xanthocheila* present in Iranian flora by HPLC and LC-MS methods. Based on our results, there were tanshinone I, tanshinone IIA and cryptotanshinone in the roots of *S.xanthocheila*. This is the first report about tanshinone composition of extract of *S. xanthocheila* and also the first report of these compositions in Iranian *Salvia* species. The natural occurrence of these compounds can be conclusive for the chemotaxonomic characterisation of this genus. In conclusion, some Iranian *Salvia* species could be introduced as new potent sources of rosmarinic acid and its derivatives. In the end, the roots of *S. xanthocheila* could be introduced as new potent sources of tanshinone and its derivatives and also potent natural sources for medicinal, food and industrial purposes.

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**ANTIBACTERIAL EFFECTS OF SOME HERBAL EXTRACTS ON *AEROMONAS* SPP. ISOLATED FROM CYPRINID FISH MORTALITY SYNDROME**

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*Aeromonas spp.* are considered to be one of the most important bacterial groups among the etiological agents of bacterial fish diseases. Many kinds of herbs possess antibacterial and antifungal activity that can be used to control different diseases. But very little attempts have been undertaken for treating fish diseases through herbal extracts. So, in the present study antibacterial effect of four hydroalcoholic herbal extract including: *Satureja bachtiarica* and *Mentha piperita* against a total of 19 *Aeromonas sp.* isolates were evaluated. Standard microdilution method were used for evaluation of Minimum Bactericidal Concentration value (MBC) and Minimum Inhibitory Concentration value (MIC) of each extract. Results showed that only the extract of *satureja bachtiarica* had the antibacterial effects with MIC value of 35 mg/ml and bactericidal property with 70 mg/ml concentration almost in all isolates. The MIC value of *Mentha piperita* against all 19 *Aeromonas* isolates showed no or very slight antibacterial activity. It can be concluded that 1- susceptibility of these aeromonads pathogenic bacteria to antibacterial agents (such as herbal extracts) is incredibly similar among 19 isolates. 2- *satureja bachtiarica* possess an acceptable antibacterial potency and regarding to its high antibacterial power, it can be used for curing the bacterial fish disease as an environmental friendly and natural origin alternative to antibiotics. And 3- the eventual toxicity and physiological side effects of *satureja bachtiarica* in fish should be evaluated before economical production.



**SALVIA L.: IMPORTANT PHARMACEUTICAL COMPOUNDS AND APPLICATIONS**

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The genus *Salvia* is the largest member of Lamiaceae or mint family containing over 900 species throughout the world [1]. Iran with 58 species is one of the best countries for growing these plants in the world [2]. *Salvia* species are known for their several therapeutic properties in folk medicine to treat tuberculosis, bronchitis, pyretic, rheumatoid arthritis, colds, wounds and skin infections, headache, cerebral ischemia and memory disorders, as well as hepatitis [2,3]. Various species of *Salvia* are also a natural source of flavonoids and polyphenolic compounds (e.g. carnolic acid, rosmarinic acid and caffeic acid), tanshinones and essential oils possessing strong antioxidant, radical-scavenging and antibacterial activities [1,4]. In recent decades, herbal medicines derived from these plants have found to be very effective in control and treat many complicated diseases such as diabetes, Alzheimer's and cancer. This study also presents the important pharmaceutical compounds of *Salvia* genus and their medicinal uses in traditional and modern medicine.

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**THE EFFECT OF CADMIUM ON THE DEVELOPMENT AND STRUCTURE OF  
VASCULAR BUNDLE IN *MATRICARIA CHAMOMILLA***

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German chamomile with the scientific name *Matricaria chamomilla* L., is one of the herbs plant from Asteraceae family. From a long time ago, this plant has high medicinal properties and nowadays so much lands were dedicated for cultivation of it. Cadmium is one of the most important environmental pollutants which absorption by plants and entering to the food chain, seriously threatens human and animals health. The presence of heavy metals cause oxidative stress and increased production of reactive oxygen species, which can cause toxic effects in plants. The effect of cadmium on physiological and developmental characteristics of chamomile has been studied. According to previous studies, 240 mM concentration of cadmium selected, harvesting from the greenhouse (after 21 days), transferring to hydroponic conditions and placed under cadmium treatment. The results of the current review in Chamomile indicate that dry weight, growth, and the diameter of the vascular bundles of phloam and xylem decreased. Also the soluble protein concentration reduced and SOD activity increased.



**EFFECT OF POTASSIUM AND BRASSINOSTEROID ON SOME  
MORPHOLOGICAL CHARACTERISTICS OF PURPLE CONEFLOWER  
MOENCH *ECHINACEA PURPUREA* L. UNDER DROUGHT**

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Purple coneflower (*Echinacea purpurea* L.) belongs to the family of Asteraceae is one of the most important medical herb with enormous pharmacological and aesthetic properties [1]. *E. purpurea* has been reported to act as an immunoregulator, antioxidant, and promoting wound healing. It has an effect against several viral and bacterial infections, and on preventing tumor cell growth [2]. In order to evaluate the effect of potassium fertilizer and spraying brassinosteroid on some agronomic characteristics in response to drought stress experiment split plot in a randomized complete block design with three replications during 94-95 was conducted in the Medicinal Plants research field of Research Institute of Forests and Rangelands. Treatments consisted of three levels of drought stress (irrigation control or normal level with 90% of field capacity, moderate stress or 60% field capacity and severe stress or 30% of field capacity) and potassium fertilizers (control, 50, 100 and 150 kg pure potassium per ha from potassium sulfate (K<sub>2</sub>SO<sub>4</sub>) source) and spraying brassinosteroid (zero, 1.0 and 1 mM). The results showed that drought stress reduced plant height, number of branches, number of leaves and stem diameter ( $P \leq 0.05$ ). Soil application of potassium fertilizer significantly ( $P \leq 0.05$ ) increased on all of traits except leaf number. Also, spraying brassinosteroid on all traits except plant height had a significant effect ( $P \leq 0.05$ ).

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**INVITRO EFFECT OF SOME HYDROALCOHOLIC HERBAL EXTRACTS ON  
*AEROMONAS SP.* ISOLATES COLLECTED FROM DISEASE AFFECTED FISHES**

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*Aeromonads* are gram-negative, facultative anaerobic bacteria that cause diseases in terrestrial and aquatic animals and also in human. Medicinal plants are important elements of traditional medicine in virtually all cultures and promise a cheaper source for therapeutics, greater accuracy than chemotherapeutic agents and a viable solution for several problems. So, in the present study we screened the antibacterial effect of hydroalcoholic extract of *Zataria multiflora* and *Salvia officinalis* against a total of 19 *Aeromonas sp.* isolates. At first to determine the positive control for each bacteria, an antibiogram was done then the minimum inhibitory and bactericidal concentration of extracts was determined by the macrodilution method. According to the antibiogram, oxytetracycline was chosen as the positive control. Based on the results, only *Zataria multiflora* extract had a broad spectrum antibacterial effect, while other herbal extracts didn't show any objective efficacy. *Zataria multiflora* extract showed bactericidal properties with 35 mg/ml concentration and bacteriostatic properties with 17.5 mg/ml concentration. According to the results of this study, the hydroalcoholic extract of *Zataria multiflora* was effective on *Aeromonas sp.* but more work should be done on its safety and toxicity. Other studied extracts that had no effect on bacteria, should be prepared in higher concentrations or with other methods (alcoholic or aqueous); because the type of solvent or the method of preparation can affect the antibacterial activity of the extract.



**ANTIBACTERIAL EFFECTS OF *SILENE CHLORIFOLIA* BOISS. AGAINST BACTERIAL SPECIES: THE CAUSATIVE AGENTS OF WOUND INFECTIONS**

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Many plant extracts have so far been recognized as effective antimicrobial agents. However, few investigations have compared large number extracts using methods that are directly comparable. In the present study, to evaluate the antibacterial effect of *Silene chlorifolia* ethanol extract and determine their minimum inhibitory concentration (MIC) against standard bacterial strains. The *in vitro* antibacterial activity of *Silene chlorifolia* ethanolic extract were evaluated against *Staphylococcus aureus* (ATCC25923), *Pseudomonas aeruginosa* (PTCC 1570), *Klebsiella pneumoniae* (KP7881) and *E.coli* (ATCC 25922) using the microdilution broth susceptibility test method. After incubation, the antibacterial activity of *Silene chlorifolia* ethanol extract was detected by a loss of turbidity, which showed the inhibition of bacterial growth. The *Silene chlorifolia* extract MIC values were found to be 0.040 mg/ml, 0.081 mg/ml, 0.162 mg/ml and 0.081 mg/ml against *S. aureus*, *P. aeruginosa*, *K. pneumoniae* and *E. Coli* respectively. This study revealed antibacterial effects of *Silene chlorifolia* against standard bacterial strains in relatively low concentrations. Further detailed *in vivo* studies may lead to characterisation of the active antibacterial principles of this plant and their possible effectiveness against other standard and clinical pathogenic bacterial strains.

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**THE EFFECT OF FULVIC ACID ON TOTAL PHENOL AND FLAVONOID  
CONTENT OF LEMON BALM *MELISSA OFFICINALIS* L.**

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Medicinal plants are rich sources of phenolic compounds which are the most important natural antioxidants. Lemon balm (*Melissa officinalis* L.) is one of the most important of medicinal plant species of lamiaceae family. Fulvic acid is one of the component of humic substances that recently researchers pay more attention to it due to being organic. The aim of this study is investigation of fulvic acid different concentrations (0, 200, 400 mg/lit) on total phenol and flavonoid compounds of lemon balm in field condition. This research was done as a completely randomized design with three replications in Gorgan. The result showed that fulvic acid had significant effect of measured parameters. Based to mean comparison the maximum total phenol content (629.74 mg/g<sub>DM</sub>) was recorded in 400 ppm fulvic acid treatment and also the highest amount of total flavonoid (381.25 mg/g<sub>DM</sub>) was related to 200 ppm fulvic acid treatment.

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**PHYTOCHEMICAL INVESTIGATION OF *FRORIEPIA SUBPINNATA* (LEDEB.)  
BAILLIN TWO DIFFERENT HABITATS IN GOLESTAN  
(KORDKUY AND GALIKASH)**

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*Froriepia subpinnata* (Ledeb.) Baill medicinal plant *Froriepia subpinnata* (Ledeb.) Baill belonging to umbeliferae (Umbelliferae) One of the most important medical species northern Iran. Most of the cars on the roadside and ditches for a wide distribution of Golestan and Mazandaran provinces grows in wet areas [1]. In this research due to comparative of ecological requirements, anti oxidant activity in different parts of *Froriepia subpinnata* (Ledeb.) Baillin Golestan province, the plant parts (leave, flower, fruit, seed and fruit pulp) Ethanolic extracts were obtained by percolation method and their anti oxidant activity were evaluated by DPPH test against free radicals of DPPH (P<0.05). The results of the study showed that the flavonoid of plant Anaryjh at two sites in the region GALIKESH amount of these compounds to the region had increased significantly Kordkoy Probably due to the diversification and intensification of tensions ecological climate, lighting, height, temperature difference between vegetative and are the fact that biological effects of flavonoids and antioxidants such as phenolic compounds, inhibit free radicals and anti-inflammatory properties are Can confirm the effects of optimization and documentation of traditional uses of medicinal plants in the study area is debatable.

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**THE INVESTIGATION OF TEMPERATURE EFFECT DURING POST HARVEST  
PROCESS ON ESSENTIAL OIL OF SOME MEDICINAL PLANTS  
OF LABIATAE FAMILY**

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Iran is favorable for the cultivation of medicinal plants due to the climatic and geographical characteristics and it has great potential in this field. The active ingredients of medicinal plants can be affected by environmental factors and post-harvest processes. In this experiment, the effect of different temperatures (drying in the shade and in oven with temperatures of 35, 45, 55 and 65 Celsius degree) during post harvest process of 4 medicinal plants of Labiatae family (*Ziziphora clinopodioides*, *Melissa officinalis*, *Thymus vulgaris*, and *Mentha piperita*) were studied as factorial based on completely randomized design with three replications in research laboratory of specialized plants, Ferdowsi University of Mashhad. The results indicated that essential oil was affected by plant species and temperature. The highest essential oil percentage under drying in the shade condition was observed in *Ziziphora clinopodioides* and *Mentha piperita* with 0.48 and 0.4%, respectively. The investigation of the interaction effect of species and drying temperature on essential oil of different species of Labiatae family showed that the highest amount of this qualitative characteristic was obtained in *Ziziphora clinopodioides* under 35 Celsius degree. Therefore we can alter the quality of medicinal plants by optimum management of post harvest condition, significantly.

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## THE ROLE OF *F22O13-24* GENE IN THE BIOSYNTHESIS OF GLUCORAPHANIN

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Glucoraphanin is a kind of aliphatic glucosinolates found almost exclusively in broccoli. Glucoraphanin is converted into sulphoraphane by the beneficial bacteria that live in human digestive systems. Many studies around the world have been documented broccoli with reducing the risks of developing certain chronic diseases such as cancer and heart disease as well as having antioxidant defences [1]. Glucosinolates are biosynthesized from amino acids. Aliphatic glucosinolates are mostly derived from methionine. The biosynthesis of aliphatic glucosinolates starts with chain elongation of methionine which performs by MAM enzymes (MAM1 and MAM3). Then the biosynthesis is continued with formation of a core glucosinolate structure, and secondary modification [2]. *In silico* analysis, using diverse biological databases such as protein-protein interaction, co-localization, shared protein domain and co-expression, facilitates functional analysis and provides valuable insight about biological relationship among genes/proteins [3]. Our *in silico* analysis by Gene MANIA algorithm [4] displayed protein-protein interaction between F22O13\_24 and two other proteins (MAM1 and MAM3). Since both MAM1 and MAM3 are involved in aliphatic glucosinolate biosynthesis, therefore, F22O13\_24 may have a role in biosynthesis of glucoraphanin.

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**EFFECT OF DIFFERENT FERTILIZER AND INOCULATION WITH MYCORRHIZA ON REPRODUCTIVE CHARACTERISTICS OF *ALTHAEA ROSEA* L.**

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*Althaea rosea* L. is one of the most important medicinal plants from Malvaceae family. All parts of this plant are used in traditional medicine [1]. In order to evaluate Althea reproductive traits affected type of fertilizer and inoculation with mycorrhiza, this study was carried out in Research Farm of the Ferdowsi University of Mashhad in the crop year of 2013-2014. The experimental design of the study was factorial fashion based on a complete block of three replications. The type of fertilizer was the first factor included control (without fertilizer), blood fertilizer (20 kg/ha), Farmyard manure (40 T/ha rotted cow manure), Municipal solid waste compost (20 T/ha) and chemical fertilizer (200 kg/ha Triple superphosphate, 114 kg/ha Urea and 200 kg/ha Potassium sulfate) and the second factor was inoculation with mycorrhiza (*Glomus intraridices*) and without inoculated. The Althea reproductive characteristics were measured. According to the results of variance analysis, the interaction of fertilizer and inoculated with mycorrhiza significant effect on the flower diameter rate at 1% and flower length, bud length and number of capsules rate at 5%. The interaction of fertilizer and inoculated with mycorrhiza had not significant effect on 1000-seed weight and number of seeds per capsule. Most flower diameter and number of seeds per capsule was observed in the treated manure. Maximum flower length was in control but with other treatments did not show significant differences. The highest amount of bud length and number of capsules had on blood fertilizer treatment. Inoculation with mycorrhizal significantly increases the flower diameter, flower length and number of capsules, but they had no significant effect on the bud length. Symbiosis with soil microorganisms because of the increased speed and duration of photosynthesis, cause to increases the efficiency of assimilate into the reservoir that leads to the higher performance components has been [2]. The results of this study showed that the consumption of different fertilizers and inoculation with mycorrhiza significantly, affecting the yield components of Althea, So that the best results were obtained for the integrated treatment of blood fertilizer and inoculation with mycorrhizal.

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**THE EFFECT OF TEA COMPOST AND MYCORRHIZAE ON TOTAL PHENOL AND FLAVONOID OF LEMON BALM (*MELISA OFFICINALIS* L.)**

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Medicinal plants are rich sources of phenolic compounds which are the most important natural antioxidants. Lemon balm (*Melissa officinalis* L.) is one of the most important of medicinal plant species of lamiaceae family. Mycorrhizae is one of the most important symbiotic fungi which has effect on 95% of plants. Tea compost is a liquid extract of compost material that contains organic and inorganic nutrient solution. In this research the effect of two level of mycorrhizal fungi (0, 5 gr) and three level of tea compost (0, 10, 20 ml/lit) was investigated in completely randomized design with three replications on Gorgan. The result showed that different treatments of mycorrhizae and tea compost had significant effects on traits. Based on mean comparison the maximum amount of total flavonoid (291.62 mg/g<sub>DM</sub>) was recorded in (10 ml/lit) of tea compost and the minimum amount was related to control. Also the highest amount of total phenol (659.93 mg/g<sub>DM</sub>) was observed in mycorrhizae fungi and the lowest (524.92 mg/g<sub>DM</sub>) was seen in control. mycorrhizae could increase total phenol of plants via increasing plant growth.

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## INFLUENCE OF HUMIC ACID APPLICATION ON IMPROVEMENT OF YIELD CHARACTERISTICS OF SAFFRON

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Saffron (*Crocus sativus* L.) is considered as the most expensive spice in the world. Although Iran has the highest world saffron production, but its yield is less compared with other producing countries [1]. Humic acid as a nutrition supplement is affect in improvement of micro and macro elements uptake by root and increase of yield [2]. In order to evaluation the effects humic acid and corm size on improvement of yield characteristics of saffron, an experiment was conducted as factorial in a RCBD with two factors included application of humic acid and different corm sizes with three replication in 2016-2017 at the research farm of College of Aburaihan, University of Tehran, located in Pakdasht, Iran. Investigate factors include four levels humic acid (0, 25, 50 and 100 L.ha<sup>-1</sup>) that was used with first irrigation at 15 October and two different corm sizes (3–5 g) as small corm and (8-10 g) as large corm that was used for planting at 30 June. Evaluation of characteristics included fresh weight of flower, fresh weight of stigma and dry weight of stigma. Results showed that evaluated factors had significant effects on fresh weight of flower and dry weight of stigma. Highest fresh weight of flower (15.71 g.m<sup>-2</sup>) and the lowest fresh weight (9.72 g.m<sup>-2</sup>) were obtained under application of 25 litres humic acid and large corm and interaction effects of control condition and used small corm respectively. Results of this study also showed that highest fresh weight of stigma (0.89 g.m<sup>-2</sup>) and lowest fresh weight of stigma (0.67g.m<sup>-2</sup>) were in used large and small corms respectively. In addition, results indicated that the highest dry weight of stigma (0.23 gm<sup>-2</sup>) and the lowest (0.14 g.m<sup>-2</sup>) were obtained under application of 25 litres humic acid and used of large corm and control and used large corm respectively. In general the result stated that application 25 litres of humic acid and used corm with 8-10 grams weight led to improvement of yield characteristics in saffron.

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**ANALGESIC AND ANTIINFLAMMATORY ACTIVITIES OF *CITRUS JAPONICA*  
PEEL ESSENTIAL OIL**

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*Citrus japonica* popularly named kamquat, is a native plant in china. The *C. japonica* essential oil (EO) has been reported to have antioxidant, anti-carcinogenesis (3), and antimicrobial [4] activities. In this study we prompted to investigate analgesic and anti-inflammatory property of *C. japonica* peel EO collected from north of Iran. The analgesic activity of EO was assessed by acetic acid-induced writhing and Eddy hot plate model, while anti-inflammatory activity was investigated by carragenan-induced paw edema. EO significantly decreased the number of acetic acid-induced writhing in mice compared to the vehicle group. EO also exhibited a central analgesic effect as evidenced by a significant increase in the reaction time in the hot plate method in mice compared to the vehicle group. EO significantly reduced paw edema in rates compared to the vehicle group. The EO from peels of *C. japonica* was analysed by gas chromatography/mass spectrometry (GC/MS). The major components of the oil were characterized as limonene (97%). These result clearly showed the analgesic anti-inflammatory effect of *C. japonica* EO. Further studies are suggested to clarify the mehcanism of tested EO for the observed pharmacological effects.

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**EFFECT OF SOWING DATE AND THE AMOUNT OF NITROGEN AND PHOSPHORUS FERTILIZER ON YIELD AND MUCILAGE PERCENTAGE IN MEDICINAL PLANT BALANGU (*LALLEMANTIA ROYLEANA* BENTH).**

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Balangu medicinal plant with the scientific name *Lallemantia royleana* is a herbaceous annual plant of the family Lamiaceae (Abdollahi, 2014) Seed of Balangu contains 24 to 38% oil and it has mucilage in its seeds. Balangu is used for curing, sore throat, angina, migraine, types of headaches, nasal congestion opener, chest pain, relieve bleeding gums, shortness of breath and cough, mouth ulcers, controlling the high temperature constipation, gonorrhoea, dysentery, diarrhea used ( Karimi, 2016). In order to study the effect of planting date and the amount of nitrogen and phosphorus fertilizer on performance and yield of Balangu a factorial experiment in a randomized block designed in three replications was conducted in 2014. The first factor was autumn and spring planting date and the second one was three levels of nitrogen and phosphorus fertilizer including no fertilizer (control), 50 percent (50 kg N and 110 kg P<sub>2</sub>O<sub>5</sub>) and 100 percent of recommended fertilizer (100 kg N and 220 kg P<sub>2</sub>O<sub>5</sub>). The results showed that the highest yield obtained in 100% chemical fertilizer in autumn sowing date (371.4 kg per hectare) and the mucilage yield (6.5 kg per hectare) regardless of the date of sowing, affected by 100 percent fertilizer.

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**EFFECT OF *MENTHA PULEGIUM* AND *HYSSOPUS OFFICINALIS*  
IN CONVULSANT**

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Epilepsy is one of the most common central nervous system disorders, and uncontrolled seizures increase the comorbidities and the chance of mortality. In developed countries where drugs are easily available, epilepsy responds to treatment in up to 70% of the patients, but in developing countries 75% of people with epilepsy do not receive effective treatment. Complementary and alternative medications continue to offer therapeutic approaches to patients with neurologic disorders, including epilepsy. *Mentha pulegium*, one of the *Mentha* species commonly known as pennyroyal. The essential oil (EO) of pennyroyal is used in aromatherapy, and is also high in pulegone and the other plants, *Hyssopus officinalis* L. in traditional medicine, it is used in tea blends for reduction of coughing, to reduce catarrh and has anticonvulsant activity that the main constituents were limonene,  $\alpha$ -pinene,  $\beta$ -pinene, sabinene, myrcene, pinocamphone, isopinocamphone. The aim of this study is to clarify the effect of *Mentha pulegium* and *Hyssopus officinalis* in convulsant. This review article was carried out by searching studies in Pub Med, google scholar, Sciencedirect, and American Psychological Association databases. We used some keywords such as epilepsy, anticonvulsants, *Mentha pulegium*, pulegone, *Hyssopus officinalis*. Observation of the motor and behavioral activity of the animals after EO of pennyroyal administration revealed imbalance and reduced movement and the administration of pulegone to PTZ model of epilepsy was found survival percentage and seizure latency increased, PTZ appears to interact with the GABA receptor benzodiazepine chloride ionophore complex, decreasing the potency of GABA inhibition and leading to seizures. Hence, (R)-(+)-pulegone may be useful for the treatment of petit mal epilepsy and *Hyssopus officinalis* L. decrease number of clonic-tonic attacks but reduce latency period of PTZ-induced seizures. (R)-(+)-pulegone may be useful for the treatment of PTZ-induced seizure models but in some of studies, (R)-(+)-pulegone, could cause seizures if administered in high concentrations and *Hyssopus officinalis* were used to treat epileptic seizures; however, some essential oil of *H. officinalis*, such as pinocamphon and isopinocamphon, was shown to be proconvulsive therefore in formulation should be more complete about efficacy and toxicity of these plants [1-5].

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## GREEN TEA AND ITS THERAPEUTIC EFFECTS

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There is currently great interested in the use of plant chemicals as ingredients of foods and drinks their nutraceuticals. Green tea (from the *Camellia sinensis* plant) is one of the most popular beverages worldwide and its consumption effects on many diseases and populations have been examined in several clinical and preclinical studies. It has been revealed the green tea catechins not only possess anti-inflammatory and anti-oxidative stressactivities, but also they have shown anti-carcinogenic, anti-microbial, anti-obesity and anti-diabetic properties. The main catechins found in green tea are EGCG, epicatechin gallate (ECG), epigallocatechin (EGC) and epicatechin (EC), gallocatechin gallate (GCG), catechin gallate (CG) and catechin (CT). EGCG is the most abundant and active catechin in green tea, accounting for 50–80% of the catechin content. Green tea polyphenols inhibit cell proliferation and apply a strong antiradical activity. Some evidence indicated that EGCG could protect cells from tumor development via enhancing gap junctional communication between cells. It observed that polyphenols and various components present in Green tea exert their effects by various mechanisms. One of the main mechanisms is blocking the promotion of tumor growth by sealing receptors in the affected cells. Another one implies that this substance may aid direct binding to some carcinogens. Some reports indicated that EGCG is able to induce cell growth arrest and apoptosis via regulation of the expression of some regulatory proteins, suppressing NF-kB activation, and activating killer caspases. In addition, it has observed that EGCG could inhibit matrix metalloproteinase activity. Matrix metalloproteinase could contribute to tumor cell invasion and angiogenesis [1,2].

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**EVALUATING THE EFFECT OF COLD STORAGE PHYTOCHEMICAL CONTENTS AND ANTIOXIDANT ACTIVITY OF HOLY BRAMBLE FRUIT (*RUBUS ULMIFOLIUS* SUBSP. *SANCTUS*)**

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In recent years, because of harmful effects of chemical drugs on human safety and their relatively higher costs, the trend of people to use medicinal plants is increasing. Various types of berry fruit are rich in necessary phytochemicals such as phenolics and antioxidants. These fruits contain high amounts of pigments including anthocyanins and natural antioxidants such as vitamins A, B and C. Crops of *Rubus* family are considered as medicinal plants and used for treating several diseases, particularly diabetes. It is important to know if the fruit phytochemical contents are affected by cold storage or not. In order to study the effect of cold storage on fruit phytochemical contents, the fruit of wild grown holy bramble were at ripe stage collected from the suburb of Urmia, West Azerbaijan, and evaluated for phytochemical contents and total antioxidant activity. After primary evaluations the fruit were stored at 2 °C for 3, 6 and 9 days and were subjected to quality evaluations. Fruit total phenolics, flavonoids, and total antioxidant activity (as DPPH scavenging potential) were evaluated just after harvest and on days 3<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> of cold storage. The highest total phenolics, total antioxidant activity and total flavonoid contents were recorded after 9 days of cold storage. The lowest contents of all these phytochemicals were seen at harvest time. Interestingly the results of this study indicate that, phytochemical contents of fruit were increased during cold storage demonstrating that not only the nutritional quality of holy bramble fruit does not decrease but also it may be enhanced during short cold storage periods.

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**EVALUATION OF QUANTITATIVE AND QUALITATIVE TRAITS OF MOOSEER  
(*ALLIUM HIRTIFOLIUM* BOISS.) USING DIFFERENT DRYING METHODS**

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This study was carried out in order to determine the moisture percentage, drying rate, dry matter percentage, fatty acid amount, mineral elements and the microbial load value at two media of PDA and PCA, as well as colorimetric samples of dried mooseer. The experiment was performed as completely randomized design with six treatments (the oven at temperatures of 40, 50 and 60°C, sun, shade and laminated pages), in 3 repetitions and 3 observations. Results showed that the effect of drying methods was significant on dry matter and drying rate. The macro nutrients and micro nutrients elements results showed that the highest amount of magnesium and iron was related to the shade treatment, the highest amount of potassium was related to the sun treatment and the highest amount of zinc and manganese was related to the sun and shade treatments. The highest amount of copper element was belonged to the laminated pages. The colorimetric results showed that the drying method on oven had many impact in the real color stabilization in mooseer samples. Results of colonies formed on the media PDA and PCA were showed that the highest amount of colonies were observed in the sun and shadow method. The identified fatty acids in the mooseer were included palmitic acid (the highest in the shade), stearic acid (the highest in an oven at temperature of 50°C), oleic acid (the highest in the sun), linoleic acid (the highest in an oven at temperature of 60°C) and linolenic acid (the highest in the sun and oven at temperature of 60°C) [1, 2, 3, 4].

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## YEILD AND PHYSICOCHEMICAL PROPERTIES OF INULIN FROM CHICORY ROOTS UNDER VERMICOMPOST AND HUMIC ACID TREATMENTS

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*Cichorium intybus* as a member of Asteraceae family is one of the most important plants in the medicinal, nutritional and cosmetic industry. Different reports about chicory beneficial properties are available in the literatures. In this research, the effect of different amount of vermicompost and humic acid on the Yeild and physicochemical properties of inulin from Chicory roots were studied. Vermicompost levels were 5, 7.5, and 10 ton/ha and a control and the levelsof humic acid were 0.3, 0.6, and 0.9 kg/ha and control. The experience were performed on factorial based on Randomized Complete Block Design with 16 treatments and 3 replications. Physicochemical analysis were performed to determinethe Inulin percent and its qualitative properties (total and reducing sugar and polymerization degree). The results showed that vermicompost at 10 ton/ha (Plus humic acid at 0 kg/ hectare) resulted the highest percentage of total sugar (74.49%) and inulin yield (71.87%). The highest content of reducing sugar (2.86%) were obtained at 7.5 ton/ha vermicomposttreatment while the lowest amount attained to control (2.47%).

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**NUTRIENT UPTAKE, YIELD AND GROWTH CHARACTERISTICS OF  
AFFECTED BY ORGANIC FERTILIZERS IN CHICORY  
(*CICHORIUM INTYBUS* L.)**

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The aim of this research was to determine the effect of humic acid (0, 0.3, 0.6 and 0.9 kg/ha) and vermicompost (0, 5, 7.5 and 10 ton/ha) fertilizers on mineral elements N, P, K, Fe, Zn, Mn, Cu uptake and yield characteristics (dry and wet aerial parts yields, plant height, leaves width, length, area index and specific leaf area) of Chicory. Experimental design was randomized complete blocks with factorial arrangement. The results indicated that the highest concentration of N (4.64%) and P (0.83%) were related to vermicompost at 10 ton/ha plus humic acid 0.6 kg/ha treatment. The highest concentration of potassium (11.05%) was obtained by application of 0.6 kg/ha humic acid and vermicompost (7.5 ton/ha). Humic acid and Vermicompost had no significant effect on Mn content in aerial parts. In addition, humic acid and vermicompost treatment significantly improves plant yields, plant height, leaves width and length, leaf area index and specific leaf area. The results indicated that organic fertilizers had desirable effect on nutrient uptake, yield and growth characteristics of Chicory.

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**EFFECTS OF HUMIC ACID AND VERMICOMPOST ON PHENOLIC COMPONENTS OF CHICORY (*CICHORIUM INTYBUS* L.) AERIAL PARTS**

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This study was conducted to evaluate the effect of humic acid (HA) and vermicompost on phenolic components of Chicory. The experiment was factorial based Randomized Complete Block Design (RCBD). Plants were grown under 4 humic acid treatments (0, 0.3, 0.6 and 0.9 kg/ hectare) and 4 vermicompost levels (0, 5, 7.5 and 10 ton/ hectare) with three replications. The measurement traits were: total and individual phenolic and flavonoids (caffeic, gallic, ellagic and p- coumaric acid, catechin, flavones and flavonols). Results showed that humic acid and vermicompost improve chicory phytochemical properties such as total phenolic and flavonoids contents. The highest phenol and flavonoids contents were obtained by humic acid at 0.9 kg/ hectare plus vermicompost at 7.5 ton/ Hectare. The content of caffeic acid was highest among the determined phenolic components. Additionally, this study confirmed the impact of the used organic fertilizers on the individual phenolic acids such as caffeic, gallic, ellagic and p- coumaric acid and flavonoids.

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SCREENING ANTIBACTERIAL CHARACTERISTICS OF  
*CELTIS CAUCASICA* BOISS.

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In the framework of traditional exploitation of *Celtis caucasica* in wound healing we prompted to assess the antibacterial effects of its ethanolic extract and various fractions. In the present study the minimum inhibitory concentration (MIC) were determined against several standard bacterial strains. The *in vitro* antibacterial activity of *C. caucasica* were evaluated against *Staphylococcus aureus* (ATCC25923), *Pseudomonas aeruginosa* (PTCC 1570), *Klebsiella pneumoniae* (KP7881) and *E.coli* (ATCC 25922) using the microdilution broth susceptibility test method. After incubation, the antibacterial activity of *C. caucasica* ethanol extract was detected by a loss of turbidity, which showed the inhibition of bacterial growth. The *Celtis caucasica* extract MIC values were found to be 0.162 mg/ml, 0.081 mg/ml and 0.162 mg/ml against *S. aureus*, *P. aeruginosa*, *K. pneumoniae* and respectively and *E. coli* strain highly resistant to *C. caucasica*. This study revealed antibacterial effects of *Celtis caucasica* against standard bacterial strains in a low concentrations. There is a need for further *in vivo* studies to shed light on antibacterial efficacy of this plant with high concentrations.

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**ANATOMICAL AND HISTOCHEMICAL ASPECTS OF *TRIGONELLA PERSICA* SEED DURING GERMINATION AND EARLY STAGES OF SEEDLING GROWTH**

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*Trigonella persica* is an endemic species in Iran, which is well-known for its medicinal properties such as antidiabetic, anticarcinogenic, hypocholesterolemic, antioxidant, and immunological activity. On the other hand, the fenugreek seeds are a rich source of gum, fiber, alkaloid, flavonoids, saponins, mucilage, protein, lipids and free amino acids. This study aimed at identifying anatomical and histochemical aspects of *T. persica* seeds during germination as well as initial early stages of seedling growth. Histochemical studies of the *T. persica* seedlings were performed during the germination period (0 to 6 days after sowing-DAS) using a light microscopy. The histochemical reactions were carried out as following: Sudan black B for lipids, Periodic acid/Schiff (PAS) reagent for polysaccharides, Coomassie brilliant blue for proteins, Wagner and Dittmar reagents for alkaloids, and Lugol reagent for starch. The results of histochemical tests showed that metabolites such as lipids, starch, and alkaloids compounds are present in the early stages of seedling growth of *T. persica*. In addition, the highest levels of starch and lipids were observed in endosperm and cotyledons, respectively. Besides, the highest level of mucilage compounds was recorded in endosperm. The anatomical results showed that the *T. persica* seeds composed of multiple distinct layers, including epidermis, hypoderms, mucilage-secreting cells, mucilage compounds, aleurone layer, endosperm, and cotyledons, respectively. Nevertheless, our data suggest that the biosynthesis and accumulation of primary and secondary metabolites were altered during different seedling stages of *T. persica* according a stage-dependent manner [1,2,3].

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**NECTAROSCORDUM TRIPEDALE BOISS. AGAINST WOUND BURN  
BACTERIAL INFECTIONS**

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The antimicrobial activity of plant extracts has been recognized for many decades. However, few investigations have compared large numbers of oils and extracts using methods that are directly comparable. In the present study, evaluate the antibacterial effect of the aerial parts of *N. tripedale* ethanol extract were evaluated against several standard bacterial strains and their minimum inhibitory concentration (MIC) determine. The *in vitro* antibacterial activity of *N. tripedale* were evaluated against *Staphylococcus aureus* (ATCC25923), *Pseudomonas aeruginosa* (PTCC 1570), *Klebsiella pneumoniae* (KP7881) and *Escherichia coli* (ATCC 25922) using the microdilution broth susceptibility test method. After incubation of the prepared culture media, the antibacterial activity of the ethanolic extract of the plant was assessed by the loss of turbidity, which showed the inhibition of bacterial growth. The *N. tripedale* extract MIC values were found to be 0.040 mg/ml, 0.081 mg/ml, 0.081 mg/ml and 0.081 mg/ml against *S. aureus*, *P. aeruginosa*, *K. pneumoniae* and *E. coli* respectively. This study revealed antibacterial effects of *Nectaroscordum tripedale* against standard certain bacterial strains in a relatively low concentrations. Therefore there is a need for further *in vivo* studies in order to shed light on overall antibacterial efficacy of fractions and/or the active constituents of this plant and the relevant effective concentrations.

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**THE EFFECT OF SPACING AND SIZE OF SEEDLING ON ESTABLISHMENT  
AND GROWTH OF SUMMER SAVORY (*SATUREJA HORTENSIS* L.) IN  
COMPETITION BYWEED**

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Summer savory comes from the Mediterranean and the Middle East (Iran). The green leaves and herbaceous part of stems are used fresh and dried as flavoring. Maximum increase of herb mass is observed until flowering period. Summer savory is a plant with a short vegetation period. Warm and sunny weather has a positive effect on greater plant mass formation. To evaluate establishing and growth of Summer Savory (*Satureja hortensis* L.) a factorial experiment based on a randomized complete block with treatments such as spacing on the rows 15, 20 and 25 cm, transplant length, 5 and 10 cm and the presence or absence of weeds was done. In two stages in early and late March 2014 Summer savory seeds which supplied from Pakan Bazr company were planted in greenhouses of International University of Imam Khomeini and in the second half of May 2014 transplants were transferred to the field of University. Row distance were 50 cm and spacing on the rows 15, 20 and 25 cm and irrigation intervals were 8 to 10 days. Nutrition by fertilizer had done equal for all plots. Savory harvesting was at flowering stage. Fresh weight, dry weight, weight of leaf and stem and plant height was measured. Data analysis was performed by using Genstat statistical software and to comparison of means Duncan's multiple range test was used at 5% level. The results showed that transplant length had created significant difference on plant leaf weight, stem weight, dry weight per plant and plant height. Effect of weeds on plant leaf and stem weight were also significant. Harvest of Savory had significant effect on plant fresh weight, plant height and leaf dry weight. Interaction between harvesting and transplanting on were significant on plant height and leaf dry weight and stem weight. Effect of spacing and harvesting on dry weight of leaf and interaction of harvesting and transplanting had created significant difference on Savory system. Comparison of means showed that the highest plant height resulted by interaction of first harvesting and 5 cm transplanting. Highest leaf dry weight were achieved by interaction of first harvesting and seedling with 5 cm length. Effect of spacing on leaf dry weight, 15 cm length of seedling had produced the highest leaf. Highest leaf dry weight was achieved in interaction between harvesting and seedlings of with 5 cm length. In absence of weeds more stem weight were produced and also maximum stem dry weight was produced in interaction between the first harvesting and transplanting with 5 cm length.

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**COMPARATIVE EVALUATION OF THE EFFECT OF NOLPAZA  
(PANTOPRAZOLE) AND *ALOE VERA* IN THE PREVENTION OF  
EXPERIMENTAL INDOMETHACIN AND ALCOHOL INDUCED  
GASTRIC ULCERS IN RATS**

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Gastric ulcers are the most important diseases in medicine and veterinary. NSAIDs are used in veterinary and medicine in the treatment of various diseases such as arthritis and Tendonitis etc. The side effects of NSAIDs are peptic ulcers. Proton pump inhibitors (PPI) such as Nolvaza (pantoprazole) are consumed for treatment of peptic ulcers such as gastric ulcer, duodenal ulcer, gastritis and reflux. Today, the general trend of the use of herbal drugs and natural products in general, especially in recent years has been on the increase, that the most important reason, prove destructive side effects of chemical drugs, and the special attention to the healing properties of Aloe Vera with regard to it. The aim of this study was evaluation of the effect of Nolvaza (pantoprazole) and aloe vera in the prevention of experimental indomethacin and alcohol induced gastric ulcers in rats by histopathology. In this study, 24 male Wistar rats were randomly distributed in 4 groups were used. To the first group 5ml/kg DMSO 5% was injected (IP) and to the second one 50mg/kg indomethacin in 5ml/kg DMSO 5% was injected (IP), and 1 ml alcohol was administered. To the third group 5ml/kg hydro-alcoholic extract of *Aloe Vera* was injected (IP) and after an hour, 50 mg/kg indomethacin in 5ml/kg DMSO 5% was injected (IP) and 1 ml alcohol was administered. In the fourth, 20mg/kg Nolvazain 5ml/kg DMSO 5% was injected (IP) and after an hour, 50mg/kg indomethacin in 5ml/kg DMSO 5% was injected (IP) and 1 ml alcohol was administered. Histopathological evaluation to assess tissue of rats after 4 hours, using H and E staining was performed. Although both groups Nolvaza and aloe vera compared to the first and second groups have significant difference in the prevention of gastric ulcers seen with indomethacin and alcohol, but there was no significant difference between the two latter groups. Aloe vera compared with Nolvaza in the prevention and healing of gastric ulcers in rats due to side effects that can be useful.



**INVESTIGATION OF COMPETIVENESS POSITION OF IRAN IN EXPORTS OF  
MEDICINAL PLANTS**

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IRAN has great potential in production of medicinal plants. The effect of export development of these products has an important role in entering foreign currency to country and employment. In order to investigate export competitiveness of Iran, this study had calculated Revealed Comparative Advantage (RCA) for 2006-2013 in major exporters of Anise, badian, fennel and coriander. Results showed the major competitors in export of these crops are India, Syrian Arab Republic, Bulgaria. And the major target markets are United Arab Emirates, USA, Malaysia and Indonesia. Calculated RCA 16.04, 16.41, 12.83, 7.13, 18, 15.5, 4.4 and 2.06 for Iran in these years. Although Iran has comparative advantage in export of these crops; growth of this index is being negative in these years that has caused decrease in position of Iran in major exporters in these years. It has reasons such as instability exchange rate and shortage programming for export in medicinal plants.



## INVESTIGATION ON ANTIMICROBIAL ACTIVITIES OF THREE DIFFERENT ALGAL SPECIES FROM IRAN

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The rapid emergence of resistant bacteria is occurring worldwide, endangering the efficacy of antibiotics [1]. Antimicrobial resistance could adversely affect the community especially in developing countries. According to World Health Organization (WHO) fact sheet (October 2016) antibiotic resistance is one of the biggest threats to global health, food security, and development today. Consequently there is an increasingly need for new antibiotics, particularly those directed against multi-resistant bacteria in hospitals [3]. Currently WHO published a list of bacteria for which new antibiotics are urgently needed. Intensive research studies are currently devoted to find novel sources of these compounds. Owing to their antibacterial activity, algae could become an important source of new antibiotics. In this study the antimicrobial activity of methanolic extracts of three algal species *Cladophora* sp., *Laurencia* sp. and *Dictyota* sp. isolated from Iran was assessed by determination of minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC) of the extracts on bacterial strains *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus*. The antimicrobial activity tests were performed according to performance standards for antimicrobial susceptibility testing [3]. According to the results, among the tested extracts, methanolic extract of strain 2 has the highest antimicrobial activity with MIC of 2 mg/ml on *B. subtilis*. The MICs for methanolic extract of 1, 2 and 5 on bacterium *E. coli* were 62, 32 and 128 mg/ml, on *B. subtilis* were 32, 4 and 2 mg/ml, and on *S. aureus* were 32, 8 and 8 mg/ml, respectively. However the MBCs for all extracts and on all strains were 128 mg/ml or above.

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**STUDYING OF PHYSIOLOGY AND BIOCHEMICAL PARAMETERS IN  
*FERULA GUMMOSA* L.**

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Galbanum (*Ferula gummosa* L.) is a perennial monocarpic plant that bears only rosette leaves in the first year but produces stems, flowers and fruit in the last year of its life, following which the roots rot and the plant dies. Root nodes are rich in a gum resin called galbanum or yellow gum that, in addition to its use for curing digestive problems (intestinal gas, poor appetite), has numerous pharmaceutical and industrial properties including its antispasmodic, analgesic, disinfectant, laxative, anti rash, anti-influenza, and antioxidant feature, and its applications in industry include production of adhesives for gluing precious gemstones such as diamonds and production of hygienic and cosmetic products and stabilizers for perfume and cologne. This research intended to assess contents of proteins, antioxidant enzymes, and malondialdehyde (MDA) in galbanum plants of various ages that were collected in Semnan Province by using a spectrophotometric method. Results indicated that the content of proteins reached its maximum in the leaves of eight-year-old plants when they entered the reproductive phase and the minimum in two-year-old plants. Moreover, the largest contents of the antioxidant superoxide dismutases (SOD) were found in the roots of four-year old plants and the smallest in the leaves of eight-year old plants. Furthermore, peroxidase (POX) reached its maximum content in the leaves of two-year old plants and its minimum in the other vegetative periods (declining to zero in the gum). Catalase (CAT) shifted towards negative potential values in the roots of two- and eight-year-old leaves, in the leaves of four-year-old plants, and when the plants entered the reproductive phase, but it had positive potential values in the other growing periods. Finally, the plants exhibited the highest MDA concentrations in the gum and leaves of eight-year old plants.

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**INTERACTION EFFECT OF THE DROUGHT STRESS AND CURCUMIN ON  
SOME PHYSIOLOGICAL PARAMETERS OF MARJORAM  
(*ORIGANUM MAJORANA* L.)**

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*Origanum majorana* L. (Lamiaceae) is a plant species that is used in gastronomy and natural medicine. *O. majorana* has strong antioxidant activity, mainly because of its high content of phenolic acids and flavonoids, which is useful in health supplements and food preservation. The aim of this study is to investigate the effect of interaction between curcumin and drought stress on the content of total phenols, flavonols and flavonoids. Plants were exposed to drought stress by four levels of polyethylene glycol (0%, 5%, 10% and 15%) and 0.01 g/l curcumin. The study was performed as a factorial experiment in a completely randomized design with three replicates. The results showed a positive interaction between curcumin and drought stress up to 10%, regarding content of total phenols, flavonols and flavonoids and a negative interaction at PEG 15%. In summary the interaction of drought stress and curcumin improved antioxidant activity in *O. Majorana* [1,2].

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**ATTENUATION OF HIGH GLUCOSE-MEDIATED OXIDATIVE DAMAGE IN  
HEK293 CELLS BY AQUEOUS EXTRACT FRACTIONS  
OF *CORIANDRUM SATIVUM***

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A plethora of studies have indicated that chronic highglucose (HG) condition leads to renal cell oxidative damage. *Coriandrum sativum* L. has been shown to have antioxidant properties [1]. In this study we investigated the protective effect of aqueous extract fractions of coriandrum sativum against high glucose (HG)-elicited oxidative damage in HEK (human embryonic kidney) cells as an in vitro model for diabetic nephropathy. The aqueous extract was fractionated with n-butanol to give n-butanol and water residue fractions. The water residue fraction was then applied to silicagel column chromatography to obtain five fractions. The water residue fraction was also fractionated with sephadex LH-20 as a stationary phase. Consequently, the water fraction isolated with sephadex LH-20 was applied to TLC and three fractions were obtained. The activity of superoxide dismutase (SOD), catalase (CAT) as well as the levels of malondialdehyde (MDA), glutathione (GSH), intracellular reactive oxygen species (ROS), cell viability and DNA fragmentation were measured in HG-treated HEK293 cells with and without herbal extractsco-treatment. Pretreatment of HEK293 cells with the fraction (a) isolated by TLC procedure, prior to HGexposure, was associated with a marked diminution in DNA fragmentation, intracellular ROS and MDA levels. Additionally, the cell viability, GSH level, SOD andCAT activity were increased by this fraction. The results suggest that aqueous extract of *CoriandrumSativum*has possibly protective effects on HG-induced cytotoxicity in HEK293 cells.

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**INHIBITION OF ADVANCED GLYCATION END PRODUCTS (AGE)  
FORMATION BY POMEGRANATE (PUNICA GRANATUM L.) STEM BARK  
METHANOL EXTRACT**

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Advanced glycation end products (AGEs), are generated through non-enzymatic binding of glucose to free amino groups of an amino acid. Carboxymethyllysine (CML), as a non-fluorescent AGE, is recognized as a biomarker of formation AGEs compounds. Accumulation of AGEs in tissues promotes diabetic complications. Various parts of pomegranate tree possess polyphenol antioxidants. The study was conducted to examine the inhibitory potential of crude extract of pomegranate stem bark on formation of CML. Therefore, The glycation of bovine serum albumin (BSA) was carried out according to the usual method (Peng et al., 2008). BSA (20 mg/ml) was dissolved in phosphate buffer saline (pH=7.4) and incubated at 37 °C in the presence of D-glucose (5.5 or 250 mM) with/without different concentrations of methanol extract of pomegranate stem bark as 85, 170 and 250 µg/ml. Aminoguanidine (AG) 1mM was used as positive control. In addition, the final solution of the reaction mixtures received 0.2 g/L sodium azide (NaN<sub>3</sub>) to assure an aseptic condition. The reaction mixtures were incubated at 37°C for 30 days. The Effect of extract and positive control on formation of advanced glycation end products was assessed by competitive ELISA Kit (Catalog number STA-817). The AGE-BSA adduct was quantified in the samples by comparison of their absorbance with that of a known AGE-BSA standard curve. The results demonstrated compared to control extract inhibited formation of CML in BSA-glucose system in concentration dependent manner. Once BSA was incubated with glucose<sub>5.5</sub> mM, the extract in concentrations of 85, 170, and 250µg/ml reduced AGE formation by 43.66%, 69.58%, and 77.66 respectively compared to BSA-Glu<sub>5.5</sub> as control. All mixture reactions containing samples showed markedly difference with BSA-Glu<sub>5.5</sub> as a control. In diabetic model (BSA+Glu<sub>250</sub>) experiment, the results revealed that extract reduced AGE formation in concentration dependent manner. Extract in concentration of 250µg/ml with 77.51% reduction in CML formation had no statistically differences with aminoguanidine as positive control.

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**HAKIM JORJANI'S VIEW ABOUT SNIFFLE (ZOKAM) AND  
CATARRH (NAZLEH)**

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With knowledge of every season's features, we can make better decision for healthy life. In autumn and winter the days are shorter and the duration of sunshine is shorter than other seasons. Zokam and post nasal drip in autumn will be increased. Zokam and Nazleh are the most common and questionable diseases those are discussed deeply in Iranian traditional medicine and modern medicine. In these disorders, substance of Nazleh from brain fall downward and can make many problems with involving other organs or retention in brain. So, in some references, Nazleh or Zokam are named as "mother of diseases". Zokam and Nazleh are including wide spectrum of definitions in traditional medicine and it cannot consider a definite equivalent in modern medicine. It seemed that common cold, rhinitis, sinusitis, post nasal drip and their complications have strict relationship with Zokam and Nazleh. In this article review, we evaluated some valid traditional references and with focus on Seyed Ismail Jorjani in ZakhireKharazmshahi, this topic is reviewed and some classic descriptions are summarized here.



**ZATARIA MULTIFLORA BOISS. (SHIRAZI THYME) MOLECULAR  
ANTI-INFLAMMATORY EFFECTS**

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*Zataria multiflora* Boiss. (ZM) that named Avishan-e-Shirazi (Shirazi thyme) is one of herbs with several traditional uses by its antioxidant and anti-inflammatory effects [1]. ZM is extensively used as a flavor ingredient in a wide variety of foods. It has a long history of medicinal uses in its native regions. The human immune system involves highly complex and coordinated processes in which small proteins named cytokines play a key role. Cytokines have been implicated in the pathogenesis of a number of inflammatory and autoimmune diseases [2]. Cytokines are small glycoproteins produced by a number of cell types, predominantly leukocytes, that regulate immunity, inflammation and hematopoiesis. In this study we investigate ZM hydro alcoholic extract effects on IL1 $\beta$ , IL6, TNF $\alpha$  and resistin genes expression level as an inflammatory cytokines in mesenchymal stem cells. Mesenchymal stem cells were cultured and treated in 7 groups by 2 doses 50 and 100 $\mu$ gml<sup>-1</sup> in 3 times 2, 16 and 24 h. RNA was extracted, cDNA synthesized and IL6 gene expression level evaluated by real-time PCR. Expression fold change were detected by 2- $\Delta\Delta$ Ct and statistically analyzed by T-Test. expression level of TNF $\alpha$  and resistin mRNAs were decreased after 2, 16 and 24 treatment with all doses of treatment but IL6 expression were increased after 16h treatment and decreased after 24h and 50 $\mu$ gml<sup>-1</sup> extract treatment was more effective. Expression level of IL1 $\beta$  after 2h increased and after 16 h decreased and 100 $\mu$ gml<sup>-1</sup> extract treatment decreased more than 50 $\mu$ gml<sup>-1</sup>. results shown that ZM extract affected inflammatory cytokines expression level and could reduce them dose and time dependently. Reduction of inflammatory factors sometimes could improve inflammation and its side effects.

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## DIRECT SHOOT REGENERATION OF *WITHANIA SOMNIFERA*

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*Withania somnifera* known as *Ashwagandha* or Indian ginseng is an evergreen, perennial shrub belonging to the Solanaceae family [1]. It is an important medicinal plant that has long been used as sedative, diuretic, antispasmodic, sexual stimulant, antioxidant and anti-inflammatory agent. *Withaferin A*, a bioactive compound isolated from *W. somnifera*, has recently become a promising medicine for the treatment of cancer [2]. *W. somnifera* is a critically endangered species in Iran due to limited natural distribution and over-harvesting. *In vitro* regeneration is an effective approach for conservation by mass propagation. In this study, we established an efficient and rapid *in vitro* plant regeneration protocol for *W. somnifera* L. using shoot tip and nodal segment explants. Explants were excised from aseptic seedlings and were cultured on MS media containing 6-benzyladenine (BA) (0, 0.5, 1, 2, 2.5 mg/l) and kinetin (KN) (0, 0.5, 1, 2, 2.5 mg/l) alone and in combination. Shoots were transferred to half strength MS (½ MS) medium supplemented with IBA 2 mg/l or 0.4 mg/l IBA+ 0.4 mg/ml IAA, as root-inducing media. This study was carried out in a factorial experiment with a completely randomized design (CRD) with 3-5 replications. Shoot number per explant, rooting and survival percentage was recorded. The results showed that explants type, KN and BA had a significant effect ( $P < 0.05$ ) on *W. somnifera* number of shoots. Nodal segments produced more shoots than shoot tips. By increasing concentration of KN and BA, the shoot number was significantly increased but no significant difference was observed between 2 and 2.5 mg/l of BA. The highest *in vitro* rooting was obtained at on ½ MS media containing 0.4 mg/l IBA in combination with 0.4 mg/ml IAA.

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**STUDY THE ANTIDEPRESSANT EFFECT OF LIMONENE IN  
AN ANIMAL MODEL**

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Begin Depression is an extremely common psychiatric condition, about which a variety of neurochemical theories exist and a number of synthetic antidepressant drugs are available in practice, however their effectiveness does not hold true with the entire range of population suffering from this disorder. But research in the area of herbal antidepressant has increased markedly over the past decades. In this study fifty male mice were divided into five groups of 10 each: group I mice received normal saline only as the control group; group II to V mice were injected intraperitoneally with 5, 10, 25 and 50 mg/kg limonene. antidepressant activity of limonene were measured with tail suspension test. The results showed a significant reduction in depression in groups receiving 25 and 50 mg limonene according to the standard pattern of tail suspension test in mice. herbal medicines such as limonene are widely used across the globe due to their wide applicability and therapeutic efficacy coupled with least side effects, which in turn has accelerated the scientific research regarding the antidepressant activity. possible mechanism of antidepressant action of the limonene According to the previous research related to induction of the significant differences in the concentrations of norepinephrine, dopamine, and serotonin in the prefrontal cortex, striatum, and hippocampus [1,2,3].

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**A DRUG CONTROLLED STUDY OF ANALGESIC EFFECT OF  
THE *BACOPA MONNIERI* EXTRACT**

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*Bacopa monnieri* L. Pennell (family: Scrophulariaceae) is a reputed drug of Ayurveda. It is used in traditional medicine to treat various nervous disorders; it is also used as a stomachic, a digestive, rejuvenate, for promoting memory and intellect, for skin disorders, and as an antiepileptic, antipyretic, and analgesic. The crude hydroalcoholic leaf extract of *Bacopa monnieri* (L) Penn. (family: crophulariaceae) was evaluated for analgesic activity. thirty male mice were divided into three groups of 10 each: group I mice received normal saline only as the control group; group II to III mice were pretreated orally with extract of *B. monnieri* (250 mg/kg and 500 mg/kg body weight). The antinociceptive activity was evaluated by an injection of dilute formalin (1% in saline) under the skin of the dorsal surface of the right hindpaw. The extract of *B. monnieri* at the dose of 250 mg/kg and 500 mg/kg of body weight, produced analgesia in test animals respectively. The results were statistically significant (and was comparable to the standard drug Diclofenac Na, at a dose of 25 mg/kg weight. Therefore, the obtained results tend to suggest the antinociceptive activity of crude hydroalcoholic extract of *Bacopa monnieri* leaves and thus provide the scientific basis for the traditional uses of this plant part as a remedy for pain. *Bacopa monnieri*, a renowned ayurvedic medicine has a strong antinociceptive effect, which is comparable to the effect of morphine via adenosinergic, opioidergic, and adrenergic mechanisms. BM has been also reported to be effective in neuropathic pains. Additionally, it has a strong anti-inflammatory effect mediated via COX-2 inhibitory mechanism. Apart from its effect of augmenting morphine analgesia, BM also inhibits opioid-withdrawal induced hyperalgesia, and acquisition and expression of morphine tolerance. BM is well documented to be safe and well tolerated herbal therapy in multiple clinical trials including various age groups. finding of this research approved potential of BM as a future candidate for clinical management of chronic pains[1,2,3].

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**THE STUDY OF *ZATARIA MULTIFLORA* HYDROALCOHOLIC EXTRACT ON INTERLEUKIN-1BETA IN MESENCHYMAL STEM CELLS**

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The Medicinal Plants such as *Zataria multiflora* (*Z. multiflora*) for the treatment of inflammatory and autoimmune diseases such as rheumatoid arthritis has been used in traditional medicine [1]. In inflammatory diseases increased expression of inflammatory cytokines such as interleukin-1beta (IL-1 $\beta$ ) [2]. In this study the effect of different doses of *Z. multiflora* hydro-alcoholic extract on changing the expression of IL-1 $\beta$  in bone marrow-derived mesenchymal stem cells (MSC) was investigated. MSC in both treatment and control groups were studied with 50 and 100 $\mu$ g /ml doses of *Z. multiflora* hydro-alcoholic extract in times of 2,16 and 24-hours, mRNA was extracted from cells and after cDNA synthesis. The IL-1 $\beta$  gene expression was evaluated by Real Time PCR and the results was evaluated by t-test. Samples treated with the extract of *Z. multiflora* in 50 and 100  $\mu$ g/ml doses for 2 and 16 hours showed up regulated in mRNA gene IL-1 $\beta$  and for 24 hours showed a significant decrease for IL-1 gene ( $p < 0.05$ ). Our results demonstrated that IL-1 $\beta$  gene expression is time-dependent. These findings suggest that in vitro control of cytokine factors under the influence *Z. multiflora* may be important in anti-inflammatory capacity. Presumably, this treatment can improve the inflammation caused by the use of cell therapy.

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***IN VITRO* FLOWERING AND PARTHENOLIDE ACCUMULATION IN  
MICROPROPAGATED *TANACETUM PARTHENIUM* (ASTERACEAE)**

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*Tanacetum parthenium* (L.) Sch. Bip., more commonly known as Feverfew, belongs to Asteraceae family. *T. parthenium* originated from south-east Europe and Asia Minor [1], and has been used for centuries as an herbal remedy for a wide variety of ailments especially in the treatment of fevers, headaches, vertigo, arthritis, menstrual disorders, toothache, stomach ache and insect bites [2]. The plant is a rich source of sesquiterpene lactones mainly parthenolide (PN) which has attracted attention because of its pharmacological activity especially for treatment of migraine. The growing demand for PN, due to a specific action mechanism, has made this valuable compound one of the most interesting target for biotechnological production. It has been reported that PN present in *T. parthenium* is particularly concentrated in the flowers [3]. Thus, the aim of the present work was to develop efficient *in vitro* flowering protocol to produce PN in the plant. The seeds were surface sterilized and cultured on Murashige and Skoog (MS) medium without any plant growth regulators (PGRs). *In vitro* *T. Parthenium* seedlings were then used as explant source. The nodal segments were cultured on MS medium without PGRs. *In vitro* plantlets were then cultured on MS medium supplement with gibberellin (GA3, 0.0, 0.3, 0.5 and 1.0 mg/l) and Salicylic acid (SA, 0.0, 0.5, 1.0 and 2.0 mg/l) to induce flowering. Plantlet high and capitulum diameter as well as PN content were recorded. PN content of *in vitro* studied samples was analysed by high performance liquid chromatography (HPLC). Induction of flowering took place on the MS medium free PGRs. The results show that *in vitro* flowering plantlets produced PN 2.3-fold (6.602 mg/g DW) than stock plant (2.811 mg/g DW). According to this, tissue culture can be a good method for this plant in order to increase the amount of PN but more studies and utilizes of technologies such as metabolic engineering is required.

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**CLONING AND EXPRESSION OF MENTHONE-MENTHOL REDUCTASE(MMR)  
ENZYME FROM PEPPERMINT IN *E. COLI* HOST CELLS**

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The essential oil of peppermint (*Menthapiperita*) is synthesized and accumulated in specialized anatomical structures called peltate glandular trichomes [1]. Menthol biosynthesis pathway contain several steps that each step is catalyzed by a special enzyme. The aim of this work was expression and characterization of menthone-menthol reductase (MMR) enzyme in *E. coli* host cells. This enzyme catalyzes the last step of menthol biosynthesis pathway, in *Menthapiperita* plant. Indeed, we would like to detect the enzyme's behavior in this plant by some techniques such as Mass spectrometry. A construct having codon optimized sequence of this enzyme was prepared by a Japanese research group in such a way being suitable for expression in prokaryotic cells. MMR sequence was cloned under regulation of T7 promoter in pET28(+) expression vector. The construct was verified using two suitable restriction enzymes (NdeI and BamH1) and also was transformed onto DH5 $\alpha$  cells to increase the copy of the vector. *E. coli* DE3 B121 was used for expression of the MMR protein and expression was optimized using different condition of culture and inducer (IPTG). SDS-PAGE analysis was performed for evaluation of expressed protein. Further analysis of MMR will be carried out using MALDI-TOF in ongoing studied.

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**EVALUATE THE PHENOL AND ANTI-OXIDANT CONTENT OF MARJORAM  
UNDER DROUGHT STRESS AND PENCONAZOLE**

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Marjoram (*Origanum majorana*) is cultivated for its aromatic leaves for culinary purposes and is often used in herb combinations. Its flowering leaves are used to produce a yellowish essential oil containing many chemical compounds including borneol, camphor and pinene. Either as essential oil, fresh or dried leaves, or powder, marjoram has many uses with numerous health benefits such as digestive benefits, protection against common illnesses, enhancement of cardiovascular health, anti-inflammatory effects, topical applications, as well as emotional and neurological benefits. This study was conducted to evaluate the phenol and anti-oxidant content of marjoram under drought stress and penconazole. The results showed that increasing drought stress runs in parallel with increased total phenolic compounds, total flavonols, as well as flavonoids when compared to control plants. Furthermore, penconazole treatment leads to further increase in total flavonols, total phenolic compounds and flavonoids. Results obtained from this trial demonstrated that penconazole enhances the drought tolerance in marjoram plants.

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**COMPARISON AND INVESTIGATION OF ANTI-MICROBIAL AND ANTI-  
OXIDANT EFFECTS SECONDARY METABOLITES OF *PORTULACA OLERACEA*  
L. TRANSFORMED BY GENE TRANSFERRING OF  
*AGROBACTERIUM RHIZOGENESIS***

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*Portulaca oleracea* L. is an annual plant with fresh, thick, and juicy stems and leaves. This plant has green and red stems and small yellow or white flowers and tiny black seeds which consist of many medicinal properties. This plant grows in most parts of the world. *P. oleracea* has a diuretic effect and also reduces the stomach pain and liver discomforts; the leaf extract is helpful in treating kidney pain [1]. *P. oleracea* L. has been used as a folk medicine in many countries, acting as a febrifuge, antiseptic, and so forth [3] It exhibits a wide range of pharmacological effects, including antibacterial [4], antioxidant properties. *oleracea* extract using three bacteria (Gram-positive and Gram-negative bacterial strains) which were resistant to standard antibiotics such as erythromycin, cefixime, ceftazidime, tetracycline, ampicillin and amikacin. Bacterial strains were obtained from a standard laboratory. *Agar Well Diffusion* Antibacterial activity of the plant crude extracts wastested using agar well diffusion method. The test inoculums(0.5 McFarland turbidity) were spread into Muller-Hinton agar using a sterile cotton swab. The wells were made by sterile well puncture and 20 µL of the extracts were added to each well and incubated at 37°C for 24 hours. The presence of inhibition zone was regarded as the presence of antimicrobial action. The average diameter of the inhibition zone was measured in millimeter [2]. The antibacterial results of the present study will suggest that *Portulaca oleracea* L bioactive compound is also having potential antibacterial activity indicating that it can be used for development of antibacterial drugs for the treatment of diseases associated with these pathogenic bacteria. Our results showed that *P. oleracea* had antibacterial effect on drug-resistant bacteria. showed that the ethanol extract of *P. oleracea* had the highest antimicrobial activity against *S. aureus*. As a conclusion, the leaves and seeds extract of *P. oleracea* has a remarkable antibacterial effect and it can be a good alternative agent when we are faced with drug-resistant bacteria. However, we need to more studies.

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**INTRODUCING MEDICINAL PLANTS USED IN SCIENTIFIC DYEING OF WOOL  
STRING IN LORESTAN PROVINCE**

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Nowadays is proven that imports color and textile materials in addition to the Get out of large amounts of currency from the country Because of causes cancer and various diseases is harmful properties as well as the environmental dimension of 700 tons of annual The color into the waters of the country as well as. Importance and value, useage of natural color in different industries was identifiec at very far time, and now a days besides the progress that carried out about the prepare and usage of chemical color, painting with phyto color is very beter for health of human as compare of chemical color. Besides regard the economic value of colored plant and regard this water that lorestan province have suitable different vegetation, but unfortunately don't be suitable used from these plants. This research carried out for indentification and introdence some colored plant in lorestan province that 37 number from species plant be surveyed by scientific method and for detection of color stable (examination the stable of light). From all of surveyed plants for painting the woll strink purpose 67.5 percent of them had color and medicinal properties and many of them belonged to important medicinal plants in lorestan province, that the tolerance of painted strink by different plants to test of light stable was different, that 73 percent of to difference of light againt the direct light of sun, and 27 percent of them had medium tolerance to light of sun, the plants of *Hypericum perforatum*, *Crocus sativus* *Prangus ferulacae*, *Tanacetum parthenium*, *Juglans regia*, *Quercus Brantii*, *panicum*, *Convoulvulus arvensis*, "that all of then belong to medicinal plant groups" had high tolerance against the direct radiation of sun light and the plants In this respect are important. surveyed plants were detected with 4 kind of tooteld (Fe, Cu, Cr, Al).



**THE EFFECT OF HUMIC ACID APPLICATION AND PLANT DENSITY ON  
PHYSIOLOGICAL AND MORPHOLOGICAL CHARACTERISTICS OF GUAR  
(*CYAMOPSIS TETRAGONOLOBA* L.)**

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To evaluate the growth and yield of guar to application of humic acid under different plant density, and experiment was carried out by using a split plot design with four replications in the basis of randomized complete block design. Treatments consisted of four levels of humic acid (0, 5, 10 and 15 kg/ha) as the main plots and four plant densities (35, 55, 75 and 95 plant/m<sup>2</sup>) as subplots. The results showed that the interactions of humic acid and plant density on LAI and leaves, plant height and spad was significant at 1% level. So that the use of humic acid at the level of 15 kg/ha increased the LAI significantly. 10 to 15 kg/ha consumption of humic acid plant height and spad became increased. Also increase of plant density of 35 to 95 plant/m<sup>2</sup> caused to LAI increased. Maximum LAI was observed in the rate of 15 kg/ha humic acid and density of 95 plant/m<sup>2</sup>.



**ANTIBACTERIAL EFFICACY OF OXYGEN PLASMA ON  
*GLYCYRRHIZA GLABRA***

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Plasma is an ionized gas including reactive molecule species, charged particles such as electrons, protons ions, and UV radiation. Application of this novel technology for sterilization of food products has gained huge interests in recent years and has some advantages than other methods like utilization of ozone and gamma rays. Ozone generating systems decrease the quality of foodstuffs and Gamma rays change the appearance of products. However applying of plasma for food sterilization doesn't any effect on quality and appearance of food products and require shorter time and less energy than other methods. In this study we investigate the effect of oxygen plasma on *Glycyrrhizaglabra* root to sterilize and disinfect of this medicinal plant. Total bacterial and fungal count of samples were determined before and after a variety of plasma treatments by standard dilution method for evaluation of cfu/g of samples. Results showed the efficacy of oxygen plasma for reduction of both total aerobic bacteria and total fungi. In the following we will evaluate this method regarding any possible effect on quality of *Glycyrrhizaglabra* root (1, 2).

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**SCREENING OF ANTIMICROBIAL PEPTIDES OF SOME ALGAE COLLECTED  
FROM PERSIAN GULF**

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Algae have a lot of secondary metabolites and active peptides that some of these peptides have antimicrobial activities. Antibiotic resistance of bacteria is an important problem worldwide and antimicrobial peptides are amongst hopeful candidate for new drug designs. In this study, a simple method was used for primary screening of antibacterial peptides in 5 different algae species from Persian Gulf. Water soluble proteins and peptides extraction from these alga (*Ulva fasciata*, *Cladophora* spp., *Dictyotacervicornis*, *laurenciaspp*, *cystoseiramyrica*) was conducted using a suitable extraction buffer and then clarified supernatants were subjected to SDS-PAGE for resolving their proteins and peptides. Then antimicrobial activities of these peptides against *Staphylococcus aureus* bacteria was investigated by using Agar-Overlay assay [1, 2]. Primary results showed the presence of some antibacterial peptides in assessed algal samples.

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**EFFECTS OF GAMMA IRRADIATION ON SEED GERMINATION AND GROWTH OF COMFREY (*SYMPHYTUM OFFICINALE* L.)**

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Comfrey (*Symphytum officinale* L.) is a perennial herb which belongs to the Boraginaceae family. It is a weed plant that is usually found in some parts of Asia, Europe and in North America. Previous studies have shown that comfrey possesses analgesic, anti-inflammatory, astringent, expectorant, antifungal and decongestant properties. But due to the presence of toxic pyrrolizidine alkaloids (PAs) in plant extract, medicinal uses of comfrey products for orally and open wounds is limited. Considering the medicinal importance of comfrey, investigation and identification of various mutants with low or without PAs is important. In this regard, preliminary experiment was carried out to determine the effective dose of gamma-ray radiation to induce mutation and to determine the average lethal dose (LD<sub>50</sub>), the effects of gamma irradiation with doses (0, 100, 200, 300, 400 and 500 Gy) of radioactive cobalt (Co60). Seed germination factors, root and epicotyl growth of comfrey were investigated in seedling trays and glasshouse conditions. The results showed that compared to the control, irradiated comfrey seeds do not keep their germination speed and growth, and also there was significant difference between gamma ray treatments and also between non-irradiated seeds with irradiated seeds. High doses of gamma ray, considerably decreased seed germination capacity and germination speed. The highest and lowest germination rates were recorded in 100 Gy and 500 Gy, respectively. The LD<sub>50</sub> was obtained using probit model of dose logarithmic regression and mortality 269 Gy. The results of such experiments could be used in breeding programs in comfrey with pyrrolizidine alkaloids content to directional selection and select mutants with decreased amounts of undesirable PAs.

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**CAMPARATIVE ANALYSIS OF ESSENTIAL OIL CONSTITUENTS OF *PRANGOS ACAULIS* USING MAHD AND HD TECHNIQES, AND ANTIOXIDENTIVE ACTIVITY OF ITS METHANOLIC EXTRACTS FROM IRAN**

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We have applied microwave assisted hydrodistillation (MAHD) and hydrodistillation (HD) techniques to extract essential oils from aerial parts of aromatic herb *Prangos acaulis* from Iran which is a highly advanced and homogeneous family, largely used in food preparation, perfumery and medicine. We make appropriate comparisons in term of extraction yields and rates, essential oil composition, and energy consumption. The microwave method offers important advantages over traditional alternatives, shorter isolation times, environmental impact and cleaner features as no residue generation and no water or organic solvent used. Chemical characterizations of volatile components were investigated by GC/MS. Seventeen components were characterized. The major components of the oils extracted using HD and MAHD were myrcene (7.60, 5.40%)  $\beta$ -pinene (7.85, 7.92%) and  $\alpha$ -terpinene (5.32, 13.26%) respectively. The methanolic extract of *Prangosacaulis*. also was examined for free radical scavenging activity. Antioxidant activity was examined using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay. The result indicated the free radical scavenging activity of MeOH extract (M) (IC<sub>50</sub>=65.7 $\pm$ 0.6  $\mu$ g/ml) and phenol content of sample (Gallic acid equivalent=129.2 $\pm$ 1.1 mg/l [1,2]).

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**COMPOSITION OF THE SDE PREPARED ESSENTIAL OIL OF  
*SATUREJA MACRANTHA.B***

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The volatile constituents of *Satureja macrantha.B.* cultivated in Lorestan Province, Iran, This essential oil was isolated by SDE and studied by GC/FID and GC/MS. Thirty-seven components were identified. The main components were Carvacrol(13.25%)Gamma terpinene(4.49%), 1,8-cineole (3.65%),bisabolol(2.17%). The content of sesquiterpenoid compounds was high, amounting to 70% of the total oil. SDE method showed a higher recovery of these compounds. The results indicated that SDE is more selective than the conventional steam distillation method in the extraction of oxygenated monoterpenes in essential oil [1,2,3].

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**EFFECT OF *CINNAMOMUM ZEYLANICUM* EXTRACT IN GENE EXPRESSION  
PATTERN OF PEROXISOME PROLIFERATOR-ACTIVATED  
RECEPTOR GAMMA 2**

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Peroxisome proliferator-activated receptor gamma 2 (PPAR $\gamma$ 2) expression is high in fat tissue or epithelial cells and has role in adipocytes differentiation, insulin sensitivity, energy metabolism (glucose regulation) immune response [1]. Mesenchymal stem cells by secreting cytokines and growth factors and restoring hemostasis, reducing local inflammation and differentiation into one or more cellular groups are under repair damaged tissue [2]. *Cinnamon zeylanicum* (*C.zeylanicum.*) is a natural compound for pharmaceutical use, such as inflammatory, anti-adipogenic, anti-glycemic, antioxidant [3]. The aim of this study is the *C.zeylanicum* hydroalcoholic extract effects on PPAR  $\gamma$ 2 gene expression in human bone marrow – derived mesenchymal stem cells. Mesenchymal stem cells were cultured and they treated by *C.zeylanicum* hydroalcoholic in 7 groups by 2 doses 10 and 100  $\mu$ g/ml in 3 times 2,16 and 24 h. After culture and treatments, mRNA was extracted and cDNA synthesized and then PPAR  $\gamma$ 2 gene expression level evaluated by Real-time PCR. Our results demonstrated gene expression was not significantly decreased in treated cells with doses of 10 with  $\gamma$ 2 primer in 16 hours, and the rest of the cell groups were significantly decrease. These findings suggest that in vitro control of this receptor nuclear, both in dose and time, may be important in Improving some diseases such as diabetes.

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## EFFECT OF SALICYLIC ACID-CORM PRIMING ON MORPHOLOGICAL CHARACTERISTIC OF SAFFRON

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Saffron (*Crocus sativus*) is most valuable crop that available on earth. At present more than %95 of safflower in world, produced at iran, however its yield average in comparison to world average stand in lower position (1). salicylic acid is a plant growth regulator that produced in plant and via increasing chlorophyll and sugar content led to improvement of growth and yield of plants (2). In order to study the effect of salicylic acid hormone on saffron, an experiment was conducted in 2016 at the Research Field of college of aburaihan, University of Tehran. The experimental design was factorial arrangement in randomized complete block design with three replicates. The first factor consist of salicylic acid in three levels (without application, application in 1 and 2 mM by priming of corms before planting and second factor was size of corm in two level that consist of small corm (3-5 gr) and large corm (8-10 gr). The traits that study consist of fresh weight of stigma, length of stigma and times to beginning of germination. Immediately after flowering, fresh weight of stigma calculated by balances with 0.001 accuracy. The length of stigma measurement by ruler. Also the times to beginning of germination in relation to date of sowing was recorded. The results of analysis of variance showed that effect of salicylic acid on fresh weight of stigma, length of stigma, times to beginning of germination wast significant. Also the effect of corm weight on fresh weight of stigma and length of stigma was significant. The results of mean comparison showed that the highest amount of fresh weight of stigma, highest amount of length of stigma, least time to beginning of germination belong to salicylic acid in 2 mM by 18.042, 29.958 gr and 37 days, respectively.

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923

**INVESTIGATION OF COMPETIVENESS POSITION OF IRAN IN EXPORTS OF  
MEDICINAL PLANTS**

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Iran has great potential in production of medicinal plants. The effect of export development of these products has an important role in entering foreign currency to country and employment. In order to investigate export competitiveness of Iran, this study had calculated Revealed Comparative Advantage (RCA) for 2006-2013 in major exporters of Anise, badian, fennel and coriander. Results showed the major competitors in export of these crops are India, Syrian Arab Republic, Bulgaria. And the major target markets are United Arab Emirates, USA, Malaysia and Indonesia. Calculated RCA 16.04, 16.41, 12.83, 7.13, 18, 15.5, 4.4 and 2.06 for Iran in these years. Although Iran has comparative advantage in export of these crops; growth of this index is being negative in these years that has caused decrease in position of Iran in major exporters in these years. It has reasons such as instability exchange rate and shortage programming for export in medicinal plants.

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**ANALYSIS OF USED ENERGY COSTS *MELISSA OFFICINALIS* IN  
MARKAZI PROVINCE**

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*Melissa officinalis* is one of the important products that are grown in Iran and Markazi provinces. This study was to evaluate and compare the cost of producing energy Melissa was done in the Arak city. Primary data were obtained using data questionnaire farmers Province. Data related to the inputs and outputs to produce income was equivalent energy and costs. The total energy cost equal to 106.41 million rials per hectare (47.19% direct energy, 52.81% energy indirectly, 80.82% renewable energy, 19.18% renewable energy) and income output of 210 million rials/ha. The results showed that the highest energy cost in the cultivation of melissa to the human resources (41%) and then seedlings were prepared (36%) and fertilizers (11%) belongs. So using optimization methods and mechanized planting and harvesting and transplanting prepared melissa can reduce labor costs and manage expenditures. In addition to the high cost of using chemical fertilizers and energy consumption, environmentally dangerous and recommended the use of manure.

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**ENERGY EFFICIENCY OF *ORIGANUM VULGARE* PRODUCTION IN  
MARKAZI PROVINCE**

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The effect of energy consumption in the production and processing of agricultural products on the value of the final product is very important. Energy in agriculture is important in terms of crop production and agro-processing for value adding. *Origanum vulgare* is one of important crop that is tilled in Iran and Markazi province. This study was conducted to evaluate and compare the energy efficiency of *Origanum vulgare* production in Arak city. Primary data were obtained with using statistics and information of questionnaire from alfalfa farmers in region. Data on inputs and output was converted to energy value and then energy efficiency was calculated. The amount of total input energy was 42138.35 (MJ/ha) (55.75% as direct energy, 44.25% as indirect energy, 39% renewable energy and 61% as non renewable energy) and amount of output energy was 55000 (MJ/ha). The amounts of energy efficiency, net energy, specific energy and energy productivity of *Origanum vulgare* production were 1.3, 1286.65 (MJ/ha), 19.153 (MJ/kg) and 0.05 (kg/MJ), respectively. The results showed that the most of used energy in cultivation of *Origanum vulgare* is related to seedling of *Origanum vulgare* (21.2%) and used fuel (20.89%).

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**ANTIOXIDANT ACTIVITY AND SOME MORPHOLOGICAL  
CHARACTERISTICS OF SAGE UNDER SPRAYED JASMONIC ACID AND  
TITANIUM DIOXIDE NANOPARTICLES**

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Sage (*Salvia officinalis*) is herbaceous perennial, herbaceous and from Lamiaceae Family, which has high application in pharmaceutical industries. Growth regulators, have a crucial role in the pharmaceutical industries, have many applications. Developmental processes of plants plays and their use the yield of crops can be improved. The most important plant growth regulators are widely used in pharmaceutical plants can be noted jasmonic acid. On the other hand, the tendency to use fertilizers with advances nano science, nano, special attention increased. Nano-titanium dioxide has beneficial effects on the growth, physiological processes and activities of the plant metabolism. In order to evaluate the effect of jasmonic acid and titanium dioxide spray on some characteristics of *Salvia* greenhouse experiment in 1395 as factorial in a completely randomized design with three replications. Foliar treatments consisted of three levels of jasmonic acid (control, 75 and 150 mg.l<sup>-1</sup>) and titanium dioxide (control, 50 and 100 mg.l<sup>-1</sup>), respectively. The studied characteristics were plant height, number of tributaries, fresh and dry weight of stem diameter and free radical scavenging antioxidant activity. The results of analysis of experimental data showed that the application of JA and TiO<sub>2</sub> was significant on all traits while their interaction was non-significant. Mean comparison showed that by increasing the amount of jasmonic acid plant height, number of tributaries, fresh and dry weight of stem diameter and free radical scavenging antioxidant activity increased significantly and the highest amount was observed in the treatment of 150 mg.l<sup>-1</sup>. The results showed that, by increasing the amount of nano Titanium trait, compared to control, and its highest increase was in foliar treatment with 100 mg.l<sup>-1</sup> of titanium dioxide. According to the results, sprayed jasmonic acid and titanium dioxide nano individually was effective in improving traits, while their combination did not show a significant effect. Therefore distinctive spraying jasmonic acid 150 mg and 100 mg nano titanium dioxide in vegetative stage *Salvia* is recommended.



**THE EFFECT OF PLANT GROWTH PROMOTING BACTERIA (PGPR)  
INOCULATION ON SOME GROWTH CHARACTERISTICS OF  
*NEPETA BINALUDENSIS* JAMZAD**

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*Nepeta Binaludensis* Jamzad is a rare medicinal plant of the Lamiaceae, which is used mostly to treat digestive diseases and nervous disorders. Plant growth promoting rhizobacteria (PGPR) are free-living soil bacteria, which enhance plant growth and development by a wide variety of mechanisms. The aim of this study is to investigate the effects of inoculation of PGPR on some growth characteristics of *Nepeta binaludensis*. The strains used in the present study include *Azotobacter chroococcum*, *Bacillus cereus* and *Pseudomonas putida*. *Bacillus cereus* in combination with *Pseudomonas putida* was considered as one treatment. An experiment was conducted based on factorial in a completely randomized design with four replications. Results indicated that all the selected bacteria improved plant growth characteristics such as shoot and root lengths, shoot and root dry weights, root diameter, surface area of roots and total leaf area. *Azotobacter* inoculation had the most effect on the shoot length, shoot dry weight, surface area of roots and total leaf area. Taking *Bacillus cereus* and *Pseudomonas putida* at the same time significantly, ( $P \leq 0.05$ ) increased leaf area and all of the root traits. According to our results, *Azotobacter* and the other examined bacteria could be applied as biofertilizer for improving the productivity of *Nepeta Binaludensis*.



**CORRELATION BETWEEN THE FLAVONOID PRODUCTION AND OXIDATIVE ENZYMES IN *NONEA CASPICA* CELL CULTURE**

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*Nonea caspica* is a medicinal plant of Boraginaceae family with ability to produce important flavonoids such as apigenin, luteolin and tricetin [1]. Flavonoids are strong natural antioxidants with interesting biological activities that can be exploited for treatment of various disorders such as cancer and cardiovascular diseases [2]. Callus induction in the root explants of *N. caspica* was successfully happened on Murashige-Skoog (MS) medium supplemented with 2,4-dichlorophenoxyacetic acid (2,4-D) and kinetin. The resulting callus was also proliferated on MS and modified-Lainsmaier-Skoog medium supplemented with sugar (30 g/L), 2,4-D ( $10^{-6}$  M) and kinetin ( $10^{-5}$  M) in darkness at 25°C. The calli produced flavonoids without any sign of browning during successive subcultures. Studies showed that the flavonoids production reached the maximum on the day 31 after the subculture on MS medium. The flavonoids production was supported by the activities of both antioxidant enzymes; catalase and peroxidase. However, catalase was the main antioxidant enzyme of the cells until day 15 and peroxidase became the main hydrogen peroxide decomposing enzyme after day 15 of the subculture showing the highest activity on day 21. The catalase and peroxidase activities were measured spectrophotometrically at 240 and 508 nm at 25°C in phosphate buffer solution (0.05 M) pH 7.

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## REGENERATION OF EREMURUS PLANT USING ZYGOTIC EMBRYO

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Eremurus roots have the medicinal effects of dispelling wind and eliminating dampness, kidney-rein and strengthen the forcing. The powder of Eremurus dry roots are used to treat the gastrointestinal illnesses. Despite high medicinal value of Eremurus plant, its propagation is still restricted. Sexual propagation of this plant using seeds has problems including: seed dormancy, pests attack, blight, drought and lack of survival till the seed production. Additionally, overharvesting has caused this plant to be classified in endangered class plants. According to medicinal and industrial importance of this native and endangered plant, it is essential to use tissue culture, genetic engineering and biotechnological procedures for breeding, germplasm conservation and increasing secondary metabolites production and is the first step for achieving the aim of massive and quick production of vigorous plantlets. In order to in vitro regeneration of Eremurus plant from zygotic embryos, an experiment was conducted based on randomized complete block design (RCBD) with four treatments and ten replications in Plant Tissue Culture Laboratory of Department of Horticultural Sciences, Tarbiat Modares University. Treatments were included Murashige and Skoog (MS) and Driver-Kuniyuki Walnut medium (DKW), half strength MS (1/2MS), half strength DKW (1/2DKW). Eremurus seeds were gathered of Shahreza, Isfahan province and were kept in appropriate conditions after winnowing. ANOVA results showed that the effect of culture medium on root length and also the effect of time on shoot/root were significant ( $p < 0.01$ ). Mean comparisons showed that 1/2DKW medium is the best medium for plantlet length and root length. In the present study, we tried to optimize in vitro culture of Eremurus zygotic embryo in order to facilitate the biotechnological researches on this valuable plant in addition to its propagation.

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**THE EFFECT OF CITRIC ACID AND POTASSIUM NITRATE ON SEED GERMINATION OF EREMURUS PERSICUS (JAUB. AND SPACH) BOISS**

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Genetic diversity is the basis of plant breeding programs. Using seed as the most important propagation method is one of the main sources of genetic variation in plant species. Nevertheless, dormancy is an important barrier in plant breeding programs, especially wild medicinal plants. Therefore, this study was carried out to evaluate the effect of citric acid (CA) and Potassium Nitrate (PN) on seed germination of *Eremurus Persicus* (Jaub. and Spach) Boiss in 2015. The experiment was conducted in a completely randomized design (CRD) with 3 treatments (control, 35 mg/l of citric acid and 1% of potassium nitrate) and 3 replications. All seeds pre-treated with Captan fungicide, sodium hypochlorite and immersion in water (for 24 to 48 hours). Also, temperature and light intensity during the experiment were 22 to 24 °C and 5000 lux with the frequency of 16:8 hours, respectively. In this experiment, the studied traits were seed germination percentage and speed as well as seed vigor index. Based on the results, the highest level of seed germination percentage (66.66%) and speed (35.75) as well as seed vigor index (5.33) were observed in 35 mg/l of citric acid. Also, the germination percentage and speed and vigor index of seed in Potassium nitrate treatment were 60.86%, 10.26 and 9.73, respectively.

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**WHEAT GERM AGGLUTININ PURIFICATION BY A CHITOSAN-BASED  
AFFINITY CHROMATOGRAPHIC AND LC-MS**

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Lectins are proteins capable of binding reversibly to carbohydrates and agglutinating and/or precipitating polysaccharides and glycoproteins. Certain types of glycan structures are epitope markers for cancer progression, such as sialyl LewisX and sialyl LewisA (carbohydrate antigen 19-9, CA19-9). Lectins have long been used to characterize cell-surface glycans because of their substantial selectivity [2]. WGA has an affinity to N-acetyl-glucosamine and there are two specific binding sites per molecule, also, it has high affinity to di- and tri-saccharides  $\beta$ -1, 4. In addition, it has affinity to sialic acid residues [3]. Wheat germ agglutinin (WGA) is a non-toxic plant lectin that has the capacity to bind N-acetyl-D-glucosamine and sialic acid on intestinal enterocytes and microfold cells. It has a stable structure that is resistant to enzymatic degradation and pH variation, especially under acidic conditions [4]. The most purification strategies include an affinity chromatography step in columns containing polysaccharides to take advantage of the specificity of lectins for sugars and the ready availability of sugar-based gel matrix for chromatography, specially the glucose-based Sephadex<sup>TM</sup> (cross-linked dextran) and the galactose-based Sepharose<sup>TM</sup> [1]. In the present study, mini-spheres of chitosan cross-linked with epichlorhydrin for WGA affinity purification have generated. WGA has a high added value and a growing global market. Thus, the aim of this investigation is to develop an affinity matrix with high adsorption capacity and excellent mechanical resistance to purify WGA. We use SDS- PAGE and LC-MS/MS for identifying the purified protein.

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**NON-COVALENT INTERACTIONS STUDY BETWEEN CURCUMIN AND SNAKE  
VENOM USING MASS SPECTROMETRY**

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Plants synthesize an extensive array of secondary metabolites with different biological properties which are considered to be a rich source for drug discovery. The neutralization properties of some secondary metabolites against different snake venoms; as medically significant toxins with main role in the pathophysiology of human victims of envenoming (Mackessy, 2009), plays a key role in anti-venom drug discovery. Different active plant constituents that show promising activity against the effects of Cobra venom include  $\beta$ -sitosterol, stigmasterol, quercetin, aristolochic acid, and curcumin. The main objective of the present study is to investigate non-covalent interactions between curcumin molecule and venom components by use of Mass Spectrometry (MS) systems in order to characterize the structure of combined complexes. First of all, we tried to optimize the interaction conditions of treatment curcumin and proteins of venom. According to LC-ESI-MS and MALDI-TOF MS results, two non-covalent complexes have been prepared between the curcumin and venom components. This non-covalent complex has been studied at various MS conditions to find neutralize.

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**EFFECT OF KNO<sub>3</sub> ON SEED DORMANCY BREAKING OF TWO  
MEDICINAL PLANTS**

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*Satureja hortensis* L. as an aromatic plant which has many applications such as remedy for muscle aches, nausea and infectious disease and flavor of food materials. *Thymus daenensis* is endemic species of Iran that is used as an antispasmodic, antitussive, expectorant. The purpose of this study was to evaluate the effect of priming on germination of two medicinal species including esphahan ecotypes of *Satureja hortensis* L and *Thymus daenensis*. A factorial experiment on the base of completely randomized design was conducted with three replications. Factors are four concentration levels (0, 50, 100 and 200 ppm) of KNO<sub>3</sub> and three priming time levels (0, 24, 48 hours). The result of ANOVA showed that priming time is more effective than priming concentration in esphahan ecotype of *Satureja hortensis* L but seeds priming with 50 ppm KNO<sub>3</sub> for 24 and 48 hours for *Thymus daenensis* had the greatest effect on root & shoot dry weight and mean germination time respectively. In general, it can be concluded that determination of the optimal time and concentration of priming is an important factor for using the positive effect of seed priming.

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**EVALUATION OF THREE CULTIVARS OF (*CHRYSANTHEMUM MORIFOLIUM* RAMAT.) VOLATILE COMPOUNDS BY GC/MS IN LORESTAN PROVINCE**

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Chrysanthemum is one of the ornamental and medicinal plants of in the world. Regarding the importance this drug in the world of flowers, the volatile components of the plant has not been evaluated in Iran. This plant is due to numerous applications in the pharmaceutical and floricultural industries is considered to one of the most ornamental and medicinal plants [1]. In this study, three cultivars of Chrysanthemums ("Tehihoo", "Yasamin" and "Golgis") cultivated in beiranshahr region of Khorramabad city in a randomized complete block design with three replications. The essential oil of the flowers extracted by steam distillation by Clevenger apparatus. Analysis and identification of volatile compounds using was conducted GC/MS. In all three cultivars "Tehihoo", "Yasamin" and "Golgis" were detected " alpha- pinene (7.73) Chrysanthenone (7.32)", "trans-Chrysanthenyl acetate (4.17) "and "Myrcene (3.83) " account as the dominant compounds. In this study, the three cultivars examined were the difference between the compounds is largely dependent on plant cultivars. Also, as noted "Tehihoo" cultivar had a high levels of Eucarvone (10.81) , "Yasamin " had a high levels of Decane (11/77) and "Golgis" had a high levels of alpha-pinene (14.52) Alpha-pinene is the potential of this monoterpene in the treatment and prevention of infectious diseases has been proved so this valuable medicinal cultivarsfor use against infectious diseases is advisable after the completion of relevant studies [2].

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**IMPROVEMENT OF GERMINATION PROPERTIES OF CUMIN BY NITRIC  
OXIDE PRIMING UNDER SALINITY STRESS**

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Cumin is an important medicinal plant with a variety of potential advantages. Nitric Oxide is known as an important messenger in plant defence signaling and it is shown that it has a crucial role in plant physiological processes regulation, including germination, flowering, fruit ripening and organ senescence (Arasimowicz and Floryszak-Wieczorek, 2007; Neill et al., 2002). An experiment was carried out to assess the effects of seed priming with NO (0, 10, 15 and 20  $\mu$ M) on germination characteristics of Cumin (*Cuminum cyminum*) under salinity stress conditions using different concentrations of NaCl (0, 50, 100 and 200 mM). Germination characteristics, seed stamina index, relative water content and electrolyte leakage were measured after imposing salinity stress for 10 days. Salinity stress reduced germination and seedling growth, significantly. Seeds primed with various concentrations of NO induced salinity tolerance during germination. Electrolyte leakage was significantly declined due to the salinity stress, but it was improved in primed treatments. The improvement of germination properties was generally considerable and showed a possible potential for future works in this area.

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**SALICYLIC ACID IMPROVES GERMINATION CHARACTERISTICS OF  
FENUGREEK UNDER SALINITY STRESS**

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Salicylic acid (SA) plays a fundamental role in water stress tolerance and considerable interests have been focused on SA due to its ability to induce a protective impact on plants under water stress (Azoon and Youssef, 2010; Hayat et al., 2010). An experiment was carried out to assess the effects of seed priming with SA (0, 10, and 20  $\mu$ M) on germination properties of fenugreek drought stress conditions using different concentrations of NaCl (0, 100 and 200 mM). Germination percentage, seed stamina index, relative water content and electrolyte leakage were measured after imposing salinity stress for 9 days. Salinity stress reduced germination and seedling growth, significantly. SA induced salinity tolerance during germination and all evaluated characters were improved, significantly. Relative water content showed the highest response to the stress condition and the improvement and the improvements regards to the SA application was not substantial. In general, results implied the positive role of SA during salinity stress tolerance induction process.

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**CHEMICAL COMPOSITION AND ANTIMICROBIAL PROPERTIES OF THE ESSENTIAL OIL AND EXTRACT OF *TANACETUM WALTERI* FROM IRAN**

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*Tanacetum* L. belongs to the tribe of Anthemideae of the Asteraceae. The genus comprises about 35 species in Iran. *Tanacetum walteri* (C.Winkl.) Tzvelev is growing in northeast of Iran, North Khorasan Province. In this research, chemical composition and antimicrobial properties of the essential oil and hydroalcoholic extract of the species were studied. Aerial flowering parts of plant were collected from its natural habitat in North Khorasan Province and the essential oil was isolated by hydrodistillation. Essential oil compounds was analyzed and identified by GC-FID and GC-MS. Antimicrobial properties of the essential oil and extract was determined by disk diffusion and MIC and MBC determination on four microbial standard laboratory strains. In the essential oil of *T. Walteri* 35 compounds that includes 94.4% of the total oil was identified. Among the identified compounds, thymol (22.5 %) 1,8-cineole (8.2 %) umbellulone (6.9 %)  $\alpha$ -bisabolol (6.3 %) camphor (5.3 %) myrtenol (4.9%) and myrtenal (4.6%) were characterized as the principal constituents. The highest antimicrobial activity of the essential oil was observed against Gram-positive bacteria *Staphylococcus aureus* and *Enterococcus faecalis*, and Gram-negative bacterium *Klebsiella pneumoniae* with MIC value of 0.63 mg/ml. *Enterococcus faecalis* and *Klebsiella pneumoniae* were found as the sensitive bacteria to the extract of *T. walteri* with MIC value of 16.0 mg/ml. The inhibitory effect of the essential oil of *T. walteri* could be attributed mainly to the high levels of phenolic compounds in essential such as thymol.



## HYDROPHILIC INTERACTION LIQUID CHROMATOGRAPHY STATIONARY PHASES FOR ANALYSIS OF NATURAL OPIATES

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Opium poppy (*Papaver somniferum* L., Papaveraceae) is an annual plant, containing benzyloisoquinoline alkaloids (BIAs), a large and divergent group of plant secondary metabolite. The importance of this medicinal plant is derived from its five major alkaloids including; morphine, codeine, thebaine, noscapine and papaverine which are vastly produced and consumed by pharmaceutical industries. They have been used directly and indirectly (via semi-synthesis) as valuable drugs such as antitussive agents and to treat severe pain [1-3]. The separation of a mixture containing five major opium alkaloids, namely morphine, codeine, thebaine, noscapine and papaverine, was investigated in hydrophilic interaction liquid chromatography (HILIC) mode using five different stationary phases: bare silica, zwitterion, aminopropyl, diol and cynopropyl. In order to propose the appropriate column for separation and purification, their retention behaviors of five natural opioids were studied on mentioned HILIC stationary phases. The mechanism of separation in diverse HILIC media based on the formation of water-rich layer on surface of the HILIC stationary phases and the physicochemical properties of opium alkaloids, such as  $pK_a$  (acidic  $pK$ ) and the octanol-water distribution coefficient ( $\log D_{oct/wat}$ ), are discussed. Chromatographic responses including modified limit of detection  $LOD_m$ , signal to noise ratio  $(S/N)_m$  and defined modified  $R_{Sm}$ , were considered for suggestion of the suitable column for quantitative/qualitative and preparative purposes. According to the obtained results, diol stationary phase was best suited for analytical chromatography, whereas bare silica and zwitterionic stationary phases were appropriate for preparative applications.

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## HPLC QUANTIFICATION OF SILYMARIN IN *SILYBUM MARIANUM* HERBAL DISTILLATE

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*Silybum marianum* (L.) Gaertn., with common name of Milk Thistle, is one of the important medicinal plants of Asteraceae family and its seed extract contains large numbers of chemical constituents including several flavonolignans collectively known as silymarin [1]. *S. marianum* is mainly used for curing liver diseases due to the presence of active silymarin compounds [2]. The main objective of this study was to address whether silymarin is present or not in herbal distillate of *S. marianum* which is sold to a great extent in herbal shopping (Attari) of Iran. Accordingly, HPLC quantification of silymarin in different brands of this herbal distillate was performed. Optimum separation of the compounds was achieved by reverse-phase high-performance liquid chromatography (HPLC) on a C18 column with 50:0.05:49.5 (v/v/v, isocratically) methanol-phosphoric acid-water as mobile phase (British pharmacopoeia). Peaks were monitored at 288 nm. Injection volume was 20  $\mu$ L and the temperature was maintained at 25°C. All injections were repeated three times ( $n=3$ ). Calibration graphs were plotted subsequently for linear regression analysis of the peak area with concentration 1, 10, 25, 50, 80, 120, 150 and 200 mg L<sup>-1</sup>. The results revealed that no traces of silymarin (including silibin A and silibin B) were detected in all three of herbal distillates tested. So, the medicinal value of Milk Thistle (Khar-e Maryam) distillate remains unclear and controversial, because of the absence of silymarin as active ingredient. The poor water solubility of silymarin could be responsible for this deficiency. Further phytochemical investigation for finding possible compounds in this product is recommended.

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**STUDY OF MORPHOLOGICAL AND BIOCHEMICAL CHARACTERISTIC OF  
*SALVIA VERTICILLATA* FROM MAKO**

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*Salvia* is the largest genus in the family Lamiaceae. *Salvia verticillata* (whorled clary) is one of the important medicinal plants species. Plants from this genus are renowned for their biological activities such as antibacterial, antioxidant, antitumor, antidiabetic and antimicrobial activities. In this study, the morphological characteristics (stem length, length of flowering stem, sub stems length, number of sub stems length and flower color and etc), phytochemical composition (total phenol content, total flavonoid, chlorophyll a and b and total carotenoid) and antioxidant activity of *Salvia verticillata* grown in regions of Mako (West Azerbaijan) was investigated. The evaluation of phytochemical compounds showed that total phenolic and flavonoid compound contents were 39.18 mg GAE/g DW and 0.98 mg QUE/g DW respectively. Chlorophyll a and b and total carotenoid contents in acetonic extract of *Salvia verticillata* were 0.26, 0.28 and 8.09 mg/g DW respectively. In addition antioxidant activity in DPPH assay were found 72.55%. According to recorded data for morphological traits was plant height (30 cm), flower color (white), stem color (green), length of flowering stem (15cm), leaf height (8 cm), stem diameter (2 cm), number of node (7) and number of flower (25). These results showed that biochemical characteristics of *S. verticillata* are promising sources of bioactive compounds beneficial to be used in the pharmaceutical industries.

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**THE EFFECT OF MYCORRHIZA FUNGI ON GROWTH AND PHYTOCHEMICAL CHARACTERISTICS OF MARIGOLD UNDER SALT STRESS**

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One of the objectives of agricultural researchers, is achieve to the sustainable agriculture along with increasing the yield of crops and the providing health community. In recent decades, the use of chemical inputs in agricultural land has caused numerous environmental problems such as water pollution, soil fertility decline and the loss of balance of chemicals material in the soil. the use of biological and chemical soil amendments is Including the new ways to prevent these problems. On this basis, an experiment was conducted to evaluate the effect of mycorrhizal fungi on marigold under salinity stress in shahrood. The samples were cultivated in sandy loam soils that was done the monitorin of the soil test. This experiment was conducted in a completely randomized design with 4 replications. Treatments were consisted of the four levels of salinity (1.5, 3.5, 5.5 and 7.5 dS /m) and two levels of mycorrhiza and without mycorrhiza. Simultaneously with planting of Marigold, F1 seeds were impregnated with mycorrhizal fungi. Salinity treatments were applied at 4-leaf stage. Characteristics of this study were root and shoot dry weight, leaf width, number of flowering shoots, chlorophyll a and chlorophyll b, glucose, proline, percent colonization, and leaf phosphorus. The results showed that different treatments of *mycorrhiza* and salinity stress had a significant effect on the measured characteristics. So That application of mycorrhiza had significant effect at 5% on shoot dry weight, proline content, leaf width and was significant at 1%of the value of P, the number of flowering shoots, chlorophyll a, b and colonization was significant at 1%. The use of salt treatment on blood glucose levels is significant at the 5% level ( $p \leq 0.05$ ), but were significant at 1% ( $p \leq 0.01$ ), in the amount of phosphorus, chlorophyll a, b and proline.

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**EFFECT OF SUPERABSORBENT AND HUMIC ACID WITH  
DIFFERENT IRRIGATION REGIMES ON QUANTITATIVE AND QUALITATIVE  
TRAITS OF *CALENDULA OFFICINALIS* L.**

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To study the effect of superabsorbent and humic acid with different irrigation regimes on quantitative and qualitative traits of *Calendula Officinalis* L. the experiment was conducted using a split-plot layout in a randomised complete block design with three replications. The levels of irrigation (every 2th day, 3th day and 4th day) were compared in main plots and treatments control (without treatment), humic acid 500 ppm, superabsorbent (7.5g/m<sup>2</sup> and 15g/m<sup>2</sup>), humic acid 500 ppm + 7.5g/m<sup>2</sup> superabsorbent and humic acid 500 ppm + 15g/m<sup>2</sup> superabsorbent were assigned in sub-plots. Evaluated traits were including plant height, number of branches per plant, dry and fresh foliage weight, dry and fresh root weight, number of flowers per plant, flower diameter, flower longevity and flowering time. Results showed that with increasing of irrigation interval flowering time was increased while the other traits were decreased. Application of humic acid significantly increased the rate of fresh root weight, dry foliage weight, number of flowers per plant, flower diameter as well as decreased flowering time. superabsorbent at concentration of 7.5g/m<sup>2</sup> dramatically improved number of branches per plant, dry foliage weight, number of flowers per plant, flower diameter while decreased the flowering time. 15g/m<sup>2</sup> superabsorbent considerably increased plant height, number of branches per plant, dry foliage weight, fresh root weight, number of flowers per plant, flower diameter and flower longevity. Application of 7.5g/m<sup>2</sup> superabsorbent + humic acid reduced the flowering time, as well as other traits except plant height and root dry weight to be significantly improved compared to control. Treatment 15g/m<sup>2</sup> superabsorbent + humic acid had no significant effect on flowering time, while significantly increased other traits. The highest and lowest rate of flowering time respectively was obtained by control and 7.5g/m<sup>2</sup> superabsorbent + humic acid. 15g/m<sup>2</sup> superabsorbent + humic acid lead to the highest content in morphological and growth parameters as well as quantity and quality of flower and the lowest of them obtained by control.

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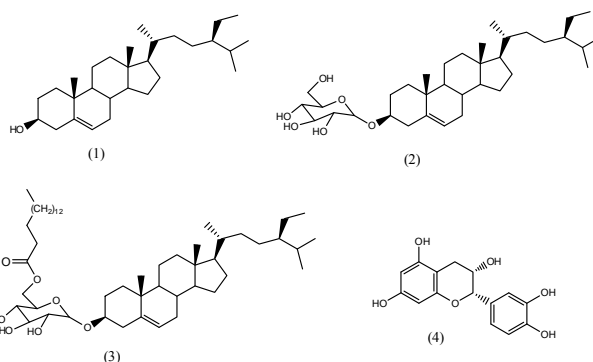
## PHYTOCHEMICAL STUDY OF *PROSOPIS FARCTA*

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The *Fabaceae*, *Leguminosae* or *Papilionaceae*, commonly known as a legume, pea, or bean family, is a large and economically important family of flowering plants. This family is widely distributed, and is the third-largest land plant family in terms of number of species, behind only the *Orchidaceae* and *Asteraceae*, with about 751 genera and 19,000 known species. *Prosopis* is a genus of flowering plants in the pea family, *Fabaceae*. It contains around 45 species of spiny trees and shrubs found in subtropical and tropical regions of the Americas, Africa, Western Asia, and South Asia. *Prosopis farcta* is a species of the genus *Prosopis*, growing in and around the Middle East. In folk medicine, *Prosopis farcta* is used as a diuretic, and against constipation, hemorrhoids, tooth pain, diabetes, kidney stones, skin and conditions. We have undertaken a phytochemical investigation on aerial parts of *P. farcta* to discover novel and potentially bioactive secondary metabolites. Fractionation of the ethyl acetate extract using repeated column chromatography led to the isolation of three steroidal compounds  $\beta$ -sitosterol (1), daucosterol (2) and daucosterol fatty ester (3), and one flavonoid epicatechin (4). Their structures were established on the basis of extensive spectroscopic data, including <sup>1</sup>H NMR, <sup>1</sup>H-<sup>1</sup>H COSY, HSQC-DEPT and HMBC, and by comparison with the reported data in the literature.



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952



**EVALUATION PHYTOCHEMICAL PROPERTIES SPATHE OF *PHOENIX DACTYLIFERA* L. (TAROONEH) PLANT INDIGENOUS OF KHUZESTAN**

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*Phoenix Dactylifera* a collection of flowers in each inflorescence branches grown on a diet of dates in the series are drawn oval wooden sheath [1]. Spathe of date palm and its aroma water is widely used in Persian traditional medicine but according to the best of our knowledge lack is done on its chemical composition or standardization of the herb for its quality control in herbal market [2]. For this purpose, Tarooneh was collected from Khuzestan in the spring (2015-2016). To investigate the total phenolic compounds, flavonoids and flavonols, the plant extracts were done in the solvents including EtOH, MeOH, acetone, water, chloroform, *n*-butanol and ethyl acetate. Anthocyanins, carbohydrates and antioxidant activity of plant extracts were determined by UV-Vis spectrophotometer [3]. The oil content of tarooneh Khuzestan was (3.83 %) and the ratio of unsaturated fatty acids (72.1%) is higher than saturated fatty acids (27.3 %). Palmitic (21.2%) and oleic acids (40.6%) are major saturated and unsaturated fatty acids in the oil, respectively. The highest amounts of total phenolic compounds were observed in ethanolic extract (60%) (36.56 mg GA/g). The ethanolic extract (50%) is enrich of flavonoid compounds (2.50 mg RE /g), and the ethanolic extract (70%) of plant is enrich of flavonols (7.06 mg RE/g).

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**OPTIMIZATION OF PARAMETERS FOR BIOSYNTHESIS OF SILVER NANOPARTICLES USING SPATHE OF *PHOENIX DACTYLIFERA* L. EXTRACT**

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In this research, biosynthesis of silver nanoparticles using the extract spathe of *Phoenix dactylifera* L. (Tarooneh) from *Arecaceae* family were investigated. The AgNPs were characterized by UV-Vis Spectrophotometer, fourier-transform infrared (FTIR) spectrophotometry, and high resolution transmission electron microscopy (HRTEM). TEM micrographs showed spherical particles with an average size of 8 nm. The XRD pattern showed the characteristic Bragg peaks of (111), (200) and (220) facets of the face center cubic (fcc) silver nanoparticles and confirmed that these nanoparticles are crystalline in nature [1]. The optimum conditions for the synthesis of silver nanoparticles are, 30 min, 40°C, pH equal 9, concentration of extract 1 g /10 ml and the concentration of silver nitrate 0.035 molar.

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**EFFECTS OF GROWING MEDIA ON SEED GERMINATION AND SEEDLING GROWTH OF SOUR ORANGE (*CITRUS AURANTIUM*)**

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Sour orange (*Citrus aurantium*, L.) is a minor species of Citrus with multiple uses. The peel, flower, leaf, fruit, and fruit juice of sour orange used to preparation of medicine or fragrance products. FDA argue that the synephrine in sour orange is pharmacologically close enough to ephedrine. Therefore, sour orange is frequently used in “ephedra-free” products since the FDA banned ephedra in 2004 for serious side effects on the heart. Information is needed on superior genotypes of sour orange and propagation of genotypes that contain high levels of constituents. Sour orange propagated from seeds that directly planted in nursery, but similar to other citrus species, seed germination of sour orange is slow and acceleration of seed germination and seedling growth of this plant is important. The aim of present experiment was to improve seed germination and seedling growth of sour orange by using soil-less growing media substitution indeed of soil. Fruits of bitter orange harvested from mature and healthy trees grown in Ramin Agriculture and Natural Resources University of Khuzistan (35 Km from Ahvaz, in Southwestern of Iran) in November. Seeds of sour orange extracted from mature fruits and were washed in tap water for 48 hrs. Before sowing, seeds were surface sterilized with sodium hypochloride (5%) for 5 min. Uniform seeds were sown in commercial growing media: Soil (as Control), vermiculite, perlite, coco peat+ vermiculite (1:1 w/w), coco peat+ perlite (1:1 w/w), coco peat+ sand (1:1 w/w). Seedlings were irrigated with full strength of Epstein nutrient solution. After 3 months, plants were harvested, were separated into roots and leaves and shoots, and vegetative growth of sour orange seedlings were determined. Results indicated that mean of seed germination of sour orange ranged from 11.7% in soil to 52% in vermiculite. The leaf growth based on leaf number per plant, dry weight and leaf area were higher in coco peat+ vermiculite than soil or other soilless growing media. Also, the highest content of chlorophyll *a* and *b* and total chlorophyll was measured in leaves of plants that grown in coco peat + vermiculite. There were significantly differences in length of seedlings and the highest root and shoot length were in coco peat +vermiculite or coco peat+ perlite. Also, the highest dry weight of root or shoot were measured in vermiculite, coco peat+ vermiculite or coco peat+ perlite. Based on this experiment, bitter orange responded positively to soilless growing media with a higher early seedling growth indices. Better seed germination, leaf growth and seedling dry weight of bitter orange occurred in vermiculite or coco peat+ vermiculite.



PHYTOCHEMICAL INVESTIGATION OF *COLCHICUM SPECIOSUM* STEVEN

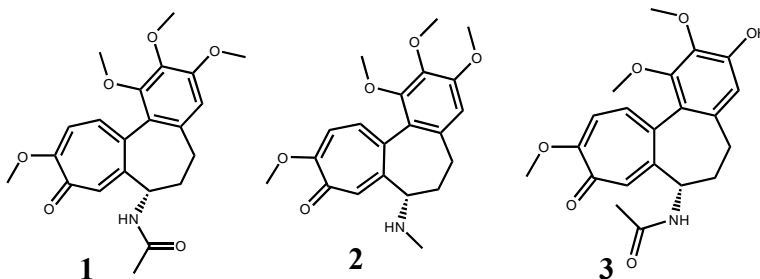
Saheb Tayyeb,<sup>1,\*</sup> Samad Nejad Ebrahimi<sup>1</sup>, Mohamad Hossein Mirjalili<sup>1</sup>, Marzieh Tabefam<sup>1</sup>  
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The genus *Colchicum* belongs to Liliaceae 100 species worldwide have been recognized for more than 2000 years for their noticeable biological properties [1]. *Colchicum speciosum* Steven is an indigenous perennial herbaceous plant widely distributed to northern, central and western regions of Iran. The *Colchicum* species are well known for presence of tropolonic alkaloids, mainly colchicine. Colchicine is a medication mostly applied for treating of gout, Familial Mediterranean Fever (FMF) and Behçet's syndrome [2]. In the present study the phytochemical composition of MeOH extract from bulbs of *C. speciosum* investigated by combination of HPLC-PDA-MS spectrometry Furthermore the MeOH extract suspended on water and partitioned on CH<sub>2</sub>Cl<sub>2</sub>, EtOAc and water. The isolation and purification of CH<sub>2</sub>Cl<sub>2</sub> portion by combination revers and normal phase chromatography resulted on identification of several alkaloids in multi milligram amount such as colchicine (**1**), colcemid (**2**), 3-demethylcolchicine (**3**). Their structures were established by extensive spectroscopic methods, including 1D (<sup>1</sup>H NMR) and 2D-NMR (COSY, HSQC and HMBC).



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## AUTHENTICATION AND DETECTION OF ADULTERATION IN COMMERCIAL PEPPERMINT AND LAVENDER OILS

Worldwide consumption of essential oils and high demanding for these natural compounds leads to manifestation of diverse types of adulterations in essential oils industry. Peppermint and lavender essential oils are two remarkable and widely used natural oils. In this investigation, seven commercially used peppermint oils as well as nine lavender oils were assessed for their authenticity and possible adulterations. Also, five natural peppermint oils and six natural lavender oils have been utilized as controls. All the samples were subjected to different analytical techniques including GC-FID, GC-MS, eGC-FID, NMR and IR for evaluating their constituents. Results have displayed that (-)-menthol (36-52%) in peppermint and (-)-R-Linalool (30-50%) along with (-)-R Linalyl acetate (18-34%) in lavender are their main constituent. Tween, non-volatile oils and solvents such as propylene glycol are prevalent types of adulterations which were detected in commercial peppermint oils. Moreover, occurrence of insecticides was also observed in these samples. Subsequently, implementation of *Mentha arvensis* oil instead of peppermint oil, as well as addition of low-cost spearmint oil were identified in commercial samples. Characterization of camphor in commercial lavender oil proved the usage of lavandin species instead of lavender. By application of chiral column and comparison with standards, (-)-R-Linalool and (-)-R Linalyl acetate were quantified in natural and commercial lavender oils in which lead to identification of synthetic linalool and linalyl acetate in one of samples. This method could be applied for authentication two cultured species of lavender, *L. angustifolia* and *L. latifolia*, in Iran.



**SYNTHESIS AND ANTIMICROBIAL ACTIVITIES OF AMINO NITRILE DERIVATIVES OF SUBSTITUTED MENTHYL TRIAZOLES**

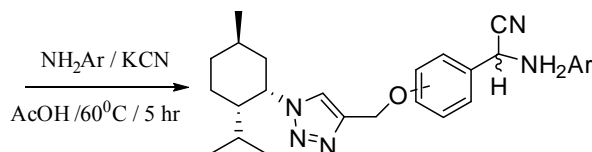
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Eighteen novel derivatives of menthyl tethered triazoles of *ortho*, *meta*, and *para*-hydroxybenzaldehyde were synthesized by the reaction of menthyl azide with the corresponding propargylated hydroxy benzaldehydes [1]. Then by using three-component Strecker synthesis [2], all of the aldehydes were reacted with aniline derivatives in the presence of KCN. The antimicrobial activity of the products were investigated against *staphylococcus aureus*. Promising results observed for some of the synthesized compounds.



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## SYNTHESIS OF NEW DERIVATIVES OF CURCUMIN AND INVESTIGATION OF THEIR ANTIMICROBIAL AND ANTIFUNGAL PROPERTIES

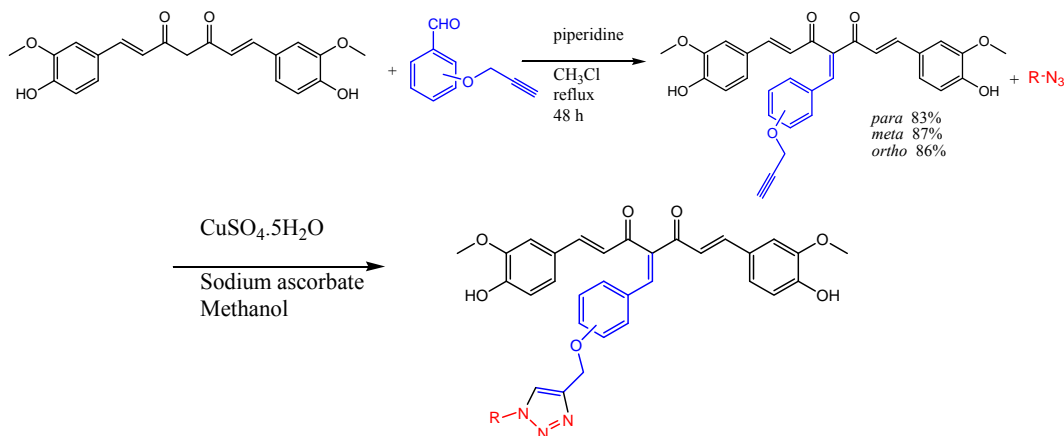
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New derivatives of curcumin connected to 1,2,3-triazole ring were synthesized by Knoevenagel reaction [1] of the middle carbon with aromatic aldehydes, followed by alkyne-azide 1,3-dipolar cycloaddition [2]. These new compounds were evaluated for their antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli*, *Bacillus cereus* and *Pseudomonas aeruginosa*. Among these derivatives, three compounds showed better MICs than curcumin against *Staphylococcus aureus* in the range of 11-23  $\mu\text{M}$ . In the case of *Escherichia coli* all of the synthesized compounds showed better MIC values than curcumin. Six compounds showed better MICs than curcumin against *Pseudomonas aeruginosa*. Triazole ring improved the antifungal activity of 9 derivatives against *Candida albicans* fungi in the range of 88-101  $\mu\text{M}$  compared to curcumin.



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**MORPHOLOGICAL ANALYSIS OF COMPLEX SPECIES  
*TANACETUM PINNATUM* BOISS.**

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Star flower Family (Asteraceae) including common morphological and biological characteristics of complex plant that is very difficult genus and species separated from each other. The genus *Tanacetum* L. to Anthemidinae subtribe and Anthemideae tribe belongs. This genus of 160 species of *Artemisia* L. and *Anthemis* L. descent third great genus is mainly within the Mediterranean region, South-West, Central and East Asia and parts of North America and parts of Africa. In this genus, there are several such complexes due to the change taxonomic history, the wide variation in morphology and its wide distribution, morphology and molecular have need to check. In the present study were collected and studied different populations of the species *T. pinnatum* Boiss., morphological data were analyzed. Data analyzes by UPGMA cluster analysis and the distance coefficient Gower, with cophenetic index ( $r = 0.96$ ) and principal component analysis (PCA) cluster analysis is confirmed. According to the results of the study populations can be divided into two distinct groups. First group have population of Tehran, Zanjan, Iran, Azerbaijan, Kashan and second group have populations of Hamedan, Isfahan, Qazvin, Markazi and sample types of Kohgiluyeh and Boyer Ahmad. Five axis obtained by principal component analysis in this case is the axis 1 with about 84.19% of the variation, traits such as plant height, number of capituls, basal petiole length and axis 2 with about 11.08% of variability, traits such as the length of involucre, length of marginal flower is to show that highest correlation.

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