ISOFAR International Society of Organic Agriculture Research

***PROCEEDINGS** of the*
***Third Scientific Conference of* ISOFAR**

ORGANIC IS LIFE - KNOWLEDGE FOR TOMORROW

28 September - 01 October 2011 in Namyangju / Republic of Korea

Vol.1: Organic Crop Production

Organic is Life

17th IFOAM OWC2011

Edited by Daniel Neuhoff, Niels Halberg, Ilse A. Rasmussen, John Hermansen, Charles Ssekyewa and Sang Mok Sohn

and external longitudinal length were higher than 80%, with a variation index higher than one. Thus, application of simple breeding methods, such as mass selection, show a real improvement.

The experience of participatory improving brings a rich knowledge for both involved - researcher and farmer

References

Bezerra Neto F; Leal N; Costa F; Gonçalves G; Amaral Júnior A; Vasconcellos H; Miguel Mello M. 2006. Análise biométrica de linhagens de abóbora. Horticultura Brasileira. 24: 378-380.

Boef W.S. et al (2007):Biodiversidade e agricultores:fortalecendo o manejo comunitário. Porto Alegre:LPM.

FAOSTAT (2009) . http://faostat.fao.org/site/567/default.aspx#ancor. Food and Agriculture Organization of the United Nations, Rome.

IBGE (2006). Censo Agropecuário 2006, Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro, p.1-777, 2006

Paternian E. (1978): Melhoramento e produção de milho no Brasil. Piracicaba, ESALQ, Marprint.

Robinson R.W & Decker-Walters D.S. (2004) **Cucurbits.** Crop production science in horticulture n°6. CABI Publishing, USA.

Setzer J. (1946): Contribuição para o estudo do clima no Estado de São Paulo. São Paulo: Escolas Profissionais Salecianas, 48p.

The effects of organic and biological fertilizers on yield and essential oil of *basil (Ocimum basilicum* L.) under an organic production system

Tahami, M.K[1]., Jahan, M[2] & Rezvani moghaddm, P[3].

Key words: Cow manure, azotobacter, vermicompost, ecological input

Abstract

To evaluate the effects of organic and biological fertilizers on yield and essential oil of basil (Ocimum basilicum L.) an experiment was conducted at Research Farm of Ferdowsi University of Mashhad, Iran, in year 2009. A split plot arrangement based on Complete Randomized Block Design with three replications was used.Ten different fertilizer (1-cow manure, 2-sheep manure 3-chicken manure, 4-compost, 5-vermicompost, 6-nitroxin (trade mark) as a biological fertilizer containing of Azotobacter sp. *and Azospirillum* sp., *7-Phosphate Solubilizing Bacteria (PSB) containing of Pseudomonas* sp. *and Bacillus* sp., *8-mixture nitroxin and PSB, 9-Chemical NPK and 10-control) were assigned to the main plots and three cut of basil considered as the subplots. The highest above-ground biomass and leaf yield resulted in vermicompost, cow and chicken manure, respectively. The highest yield of essential oil, were obtained from plants treated with cow and sheep manure, vermicompost and chemical fertilizer, respectively. The highest above-ground biomass, leaf yield and essential oil yield, obtained in third cut but essential oil percentage in the first cut was more than other cuts.*

Introduction

The use of the various ecologically inputs can substantially impact on yield and quality of products (Kapkiai *et al.* 1999). In many agricultural systems, especially in sustainable agriculture, bio-organic fertilizers would be used to improve some soil characteristics such as fertility, increase soil organic matter, plant growth, and soil properties (Azeez *et al.* 2010). Many of bacterial species which called plant growth promoting rhizobacteria affect on crop yield through the biological fixation of nitrogen, increasing availability of mineral elements such as phosphorus and potassium, inhibition of soil borned pathogens and produce plant growth hormones (Sifola & Barbieri 2006).

Among the species of the ocimum genus, *Ocimum basilicum* L. (basil) have more economic importance and can be used both fresh and dried as spice. Basil has been used traditionally as an important medicinal herb (Sifola & Barbieri 2006).

Due to emphasis of sustainable agriculture, especially on quality of the plants products and importance of medicinal plants, and also the lack of studies on the

[1] M.Sc. Student of Agroecology, Ferdowsi University of Mashhad, Iran, E-Mail s.m.k.tahami@gmail.com

[2] Assistant Professor of Faculty of Agriculture, Ferdowsi University of Mashhad, Iran, E-Mail jahan@ ferdowsi.um.ac.ir

[3] Professor, Faculty of Agriculture, Ferdowsi University of Mashhad, Iran, E-Mail rezvani@ferdowsi.um.ac.ir

fertilizer needs of basil, this study aimed to assess the effects of the various organic and biological fertilizers on some qualitative and quantitative characteristics of basil was conducted.

Materials and methods

The experiment was conducted at the Research Farm of Ferdowsi University of Mashhad, Iran, in year 2009. The treatments were arranged as split plots over time based on Complete Randomized Block Design with three replications. Ten different fertilizers were assigned to the main plots and three cut of basil considered as the subplots. Fertilizers were 1- cow manure (30 ton.ha-1), 2- sheep manure (20 t.ha-1), 3- chicken manure (10 t.ha-1), 4- municipal waste compost (10 t.ha-1), 5- vermicompost (7 ton.ha-1), 6-nitroxin (trade mark) as a biological fertilizer (containing Azotobacter sp. and Azospirillum sp. bacteria), 7- phosphate solubilizing bacteria (PSB) (containing Pseudomonas sp. and Bacillus sp.), 8- Mixture of Nitroxin and PSB, 9- chemical NPK fertilizer (110,60.60 kg.ha-1) and 10- control (no fertilizer). Based on soil data required amounts of organic and NPK fertilizers were applied to the regarded plots. Basil seeds were sown every 6 cm on rows which apart 50 cm of each other, in May 2009. Irrigation was done immediately after planting and then once every seven days separately for each plot. During the growing season, at the same developmental stage (5-10% flowering), three cut was harvested. Plants in each plot were harvested and after drying, leaf and total above ground biomass were measured. Air dried leaves in the three time of harvesting (50 g) were subjected to hydro distillation for 3 h using a clevenger apparatus, and percentage and yield of essential oil were determined. Data were subjected to analysis of variance (ANOVA) using the SAS Ver.9. MS-Excel ver.14 and Slide-Write Ver.2 were used for drawing the figures. Means Comparisons were performed using Duncan's multiple range test at 5% level of probability.

Results

Total above ground biomass and leaf yield

Plants treated with vermicompost had the most above ground biomass and cow manure ranked second. The lowest above ground biomass was observed in control and NPK fertilizer, respectively. Dry leaf yield was highest on plots with vermicompost and had no significant difference with chicken and cow manure plots (fig.1.). Leaf yield and above ground biomass significantly increased from first to third cut, as each cut had significant difference with previous cut (Table 1), it could be related to slow and gradual release of elements from organic fertilizers.

Percentage and yield of essential oil

The chemical and controls treatments that have the lowest total above ground biomass and leaf yield produce the largest percentage of essential oil and have significant difference with other treatments, except chicken and cow manure. The lowest percentage of essential oil was observed in plants treated with nitroxin, PSB and mixture of nitroxin and PSB (Fig. 2 & 3). Amongst the cuts, the highest percentage of essential oil was obtained in the first cut as it has significant difference with other two cuts (Table 1). Since the yield of essential oil is resultant of leaf yield and percentage of essential oil, and both of them were high in cow manure treatment, it could be postulated this treatment had also the highest essential oil yield and chicken manure, vermicompost and NPK fertilizer, ranked after the cow manure,

regarding this trait. However, control treatment caused the highest percentage of essential oil, though it was not considerable because of low leaf yield in this treatment. (Fig. 2 & 3). Among the cuts, the third cut had maximum essential oil yield (Table 1).

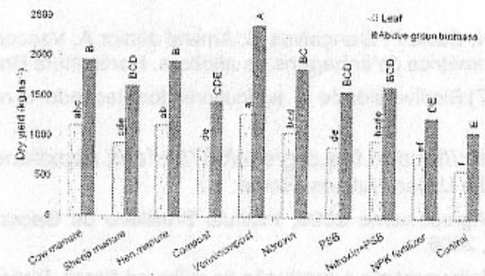

Fig. 1. Variation in leaf and above-grand biomass affected by different

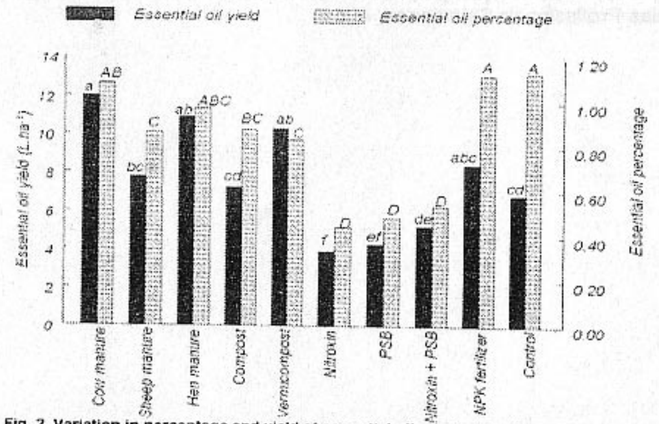

Fig. 2. Variation in percentage and yield of essential oil affected by different fertilizers.

Discussion

There are reports that proposed application of organic and biological fertilizers could be resulted in increasing in soil water holding capacity, strengthening the plant hormone-like activities and providing the required elements, increasing in nutrient availability and absorption by plants and at a glance may improve the chemical, physical and biological properties planting bed, finally it could be reflected in improved yield (Mahfouz & Sharaf-Eldin 2007, Khalid et al. 2006). Vermicompost is beneficial for crop yield because it improves the physical structure of the soil, enhance the biological properties of the soil (aggravate micro-organisms activities, secretion of growth hormones such as auxins and gibberellic acid, and exudation of enzymes, such as phosphatase, cellulase, etc.) (ValdezPerez et al. 2011). In another experiment, the combination of the organic fertilizers with inorganic nitrogen fertilizer, significantly enhanced growth characteristics of basil (Sifola & Barbieri 2006).

NPK fertilizer had no significant effect on plant performance, maybe this could be partially related to more susceptibility of chemical fertilizer to sublimation, leaching and denitrification processes and unlike organic fertilizers, chemical fertilizers does not any positive impact on soil bulk density (Kolata et al, 1992). Mahfouz and Sharaf-Eldin (2007) reported that application of different strains of biofertilizers amended with a half dose of N, P, and K increased fennel fruit yield compared to 50% and 100% NPK treatments.

Table 1- Means comparison of some measured characters in basil among different cuts.

	Dry leaf yield (kg.ha-1)	Above-ground biomass (kg.ha-1)	Essential oil (%)	Essential oil yield (L.ha-1)
First cut	706.8c	1168.8c	0.939a	6.52b
Second cut	906.5b	1497.3b	0.793b	7.18b
Third cut	1264.3a	2344.8a	0.771b	9.78a

* In each column, means followed by the same letter(s) are not significantly different at the 5% probability level.

The highest percentage of essential oil in the first cut and control treatment, which has had the lowest leaf yield, could be related to increased levels of the secondary metabolites which might have increased under stress conditions (such as low amounts of nutrient elements and water), because organic fertilizer increase soil water holding capacity, and increase plant nutrient elements availability, therefore help the plants to avoid from stresses.

Conclusions

The results showed that using of organic fertilizers has superiority compared to chemical fertilizers and this could be considerable for the sustainable production of medicinal plants. It seems that treatments of vermicompost and animal manure, particularly cow and chicken manure, were more effective due to increasing biomass and essential oil yield of basil compared with the standard treatments.

References

Azeez, J.O., Van Averbeke, W., Okorogbona, A.O.M. (2010): Differential responses in yield of pumpkin (*Cucurbita maxima* L.) and nightshade (*Solanum retroflexum* Dun.) to the application of three animal manures. Bioresource Technology. 101: 2499–2505.

Kapkiyai, J J , Karanja, N K , Qureshi, J N , Smithson, P C , Woomer, P L (1999): Soil organic matter and nutrient dynamics in a Kenyan nitisol under long-term fertilizer and organic input management. Soil Biol Biochem. 31:1773–1782

Kolata, E., Beresniiewicz, A., Krezel, J., Nowosielshi, L., Slow, O. (1992): Slow release fertlizers on organic carriers as the source of N for vegetable crops production in the open field. Acta-Horticulturae. 339: 241-249.

Mahfouz, S.A., Sharaf-Eldin. M.A. (2007): Effect of mineral vs. biofertilizer on growth, yield, and essential oil content of fennel (*Foeniculum vulgare* Mill.). Int. Agrophysics, 21: 361-366.

Sifola, M I , Barbieri G (2006): Growth, yield and essential oil content of three cultivars of basil grown under different levels of nitrogen in the field. Scientia Horticulturae. 108: 408–413.

Valdez-Perez, M.A., Fernandez-Luqueno, F., Franco-Hernandez, O. (2011): Cultivation of beans (Phaseolus vulgaris L.) in limed or unlimed wastewater sludge, vermicompost or inorganic amended soil, Scientia Horticulturae, 128: 380–387.

Dynamics of soil microbial community in organic, green and conventional vegetable production systems

Zhao, J.-J.[1], Li,J., Du X.-G.

Key words: Organic; Green; Conventional; Soil microorganisms; number

Abstract

This study is a long-term trial of greenhouse vegetables production under three different treatments: organic, green and conventional, began in March 2002 in Quzhou Experimental Station of China Agricultural University. Soils were sampled in 0-20cm and 20-40cm layer four times in January, April, July and October 2009. To reveal the number and dynamic changes of soil microorganisms under different managements, conventional plate culture and colony counting method were used to determine the number of soil microorganisms. The results showed that: (1) The systerm of organic management significantly increased the number of soil bacterium. The number of bacterium in the organic system was more than that in conventional systerm, and the number of bacterium reached a significant level in April and October in 0-20cm soil layer. The number of bacterium in the organic systerm was more than that in green systerm and conventional systerm, and the number of bacterium reached a significant level in April, July and October in 20-40cm soil layer. (2) The systerm of organic management significantly increased the number of soil actinomycetes. Among three systerms, the number of actinomycetes was the most in the organic systerm and the least in the conventional systerm in the 0-20cm and 20-40cm soil layer. In the 0-20cm soil layer, the number of actinomycetes reached a significant level between the organic systerm and conventionall systerm in April, July and October. In the 20-40cm soil layer, the number of actinomycetes reached a significant level between the organic systerm and conventional systerm in October. (3) Organic management significantly reduced the number of soil fungi. Among three systerms, the number of fungi was the least in the organic systerm and the most in the conventional systerm in the 0-20cm soil layer and the number of fungi reached a significant level between the organic systerm and conventional systerm in October. Compared with the 0-20cm, the trend was opposite in the 20-40cm soil layer.

Introduction

Vegetables are indispensable in our daily life. However, over-reliance on chemicals (i.e. synthetic fertilizers and pesticides) have brought negative impacts on the environment, food safety and human health (Ma W. Q., *et al.* 1999). Regarded as an environmentally friendly agriculture without inputs of chemical fertilizers, pesticides and growth regulators (Du X. G., *et al.* 2006), the total area of the world organic agriculture cultivation was 30.5 million hectares in 2007 (Kledal, *et al.* 2007). In *China, the certified organic food industry started in the 1990s,* and its rapid growth since then indicates the use of a huge amounts of organic fertilizers in organic agriculture. Soil

[1] Organic Agricultural Technology Research Center, China Agricultural University, P.R.China. E-mail duxge@cau.edu.cn.