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Influence of Plant Growth Regulators (PGRs) and Planting Method on Growth and Yield in Oil Pumpkin (*Cucurbita pepo* var. *styriaca*)

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Abstract

The effect of plant growth regulators IBA (indole butyric acid), GA_3 (gibberellin) and ethylene (as ethephon) in two methods of planting was investigated (each method was considered as a separate experiment) on morphological characters and yield of medicinal pumpkin. The experiments were carried out in a factorial trial based on completely randomized block design, with four replicates. The treatments were combined with priming and spraying with the above PGRs. The first seed priming with control (water), IBA 100 ppm, GA_3 25 ppm and ethephon 200 ppm, and when seedling developed to 4 leaf stage sprayed there with control (water), IBA 100 ppm, GA_3 25 ppm and ethephon 200 ppm for three times. In both planting methods, there were all of these treatments. The result showed that PGRs and planting method had significant effects on vegetative, flowering and yield characteristics including: leaf area %DM plant, number of male and female flowers per plant, number of fruit/plant, fruits fresh weight, seeds length and width, number of seed per fruit, seed yield, % seeds oil and oil yield. Hence spraying with GA_3 25 ppm in four leaf stage at trellis method could be a suitable treatment for enhancing growth and yield of medicinal pumpkin.

Keywords: medicinal pumpkin, oil yield, plant growth regulator, planting method

Introduction

Research on crop seeds in the entire world indicated that seeds contain a high percentage of protein and especially oil that showed a suitable nutritional value of these crops. One of the valuable plants in the pharmaceutical industry in most developed countries is oil pumpkin (*Cucurbita pepo* var. *styriaca*) that belongs to *Cucurbitaceae* family. In recent years the use of oils crops, especially vegetables oil have been focused on (Bombardelli and Morazzoni, 1997). PGRs (GA_3 and IBA and ethephon) play an important role in morphology and physiology of the plants. PGRs influence the plant growth and morphogenesis. They should be applied in optimal concentrations, stage of application, species specificity, seasons, etc. accurately. (Birader and Navalagatti, 2008). PGRs such as auxin and gibberellin include many aspects of plant growth and development. Also, they have important roles in many processes such as germination, seedling growth, product performance and yield and ripening (Al-Khassawneh *et al*., 2006). Seed priming with PGRs caused an increase in seed germination and seedling vigor (Chauhan *et al*., 2010; Jamil and Rha, 2007). In recent years, plant growth, flowering and yield have been manipulated with the help of growth regulating substances. Some PGRs have important effect on sex expression in various cucurbitaceous crops. Also, by decreasing or increasing the male or female flowers, it causes change in yield (Hilli *et al.,* 2005). PGRs are chemical materials that are used in low concentration change the growth of plant usually by stimulating part of the natural growth regulatory system. Ethrel at 400 ppm in four to six leaf stage significantly increased the number of female flowers per plant (35.23%) and reduced the sex ratio (3.69) compared to control (19.8 and 224.5, respectively) in cucumber (Vadigeri *et al.,* 2001). Ethephon at 100 ppm enhanced the total yield of cucumber (Thappa *et al*., 2011) Trailing method plays very important role in growth and quality of *Cucurbitaceae* family crops. Sedghi *et al*. (2010) reported NAA increased the number of seed per fruit doubled and enhanced the seed yield significantly with compared to the control. Part *et al*. (2008) reported GA_3 increased the growth characteristic and total flowering in jujube. Asrey *et al*. (2001) studied the effect of seed priming with GA_3 on growth and fruiting in musk melon and reported that GA_3 at 400 ppm enhanced the yield significantly with compared to control. Ntui *et al*. (2007) showed that application of NAA at 100 ppm increased the seed yield in pumpkin). Ethrel at 400 ppm in four to six leaf stage significantly increased the number of female flowers per plant (35.23%) and reduced the sex ratio (3.69) compared to control (19.8 and 224.5 respectively) in cucumber (Vadigeri *et al.,* 2001). Ethrel at 300 and 500 ppm had little effect on 1000-seed weight and Seed germination was not influenced by ethrel in *Cucurbita maxima* (Korzeniewska and Niemirowiez, 1993). Gad *et al*. (1993) studied showed Ethrel at 225 or 300 ppm were very effective on summer squash sex expression and enhanced number of fruit per plant and total yields. Ethephon at 100 ppm enhanced the total yield of cucumber (Thappa *et al*., 2011) Trailing method play very important role in

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growth and quality of *Cucurbitaceae* family crops. Since, when fruits are in contact with the ground, it is likely to decay and reduce the quality, under irrigation condition and during rainy season, the crop should be staked or trailed so that fruits will be prevented from direct contact with the soil. Higher productivity in trailing is due to increase in the photosynthesis sunlight by maximum number of leaves and higher number of side branches resulting in enhanced assimilation of carbohydrates caused to increase in yield. Singh *et al.* (1982) studied the trellis method on muskmelon and reduction in plant to plant spacing to 30 cm resulted in further increase in the fruit yield than the plants spreading on the ground. Hilli *et al*. (2009) studied the effect of trellis on yield of ridge gourd and reported that fruit yield and %DM significantly increased compared to farming method (without staking). Due to the importance of this product and inadequate data on the effect of PGRs on growth and yield in medicinal pumpkin, the present investigation was aimed to find out suitable growth regulators for increasing the yield potential and also quality in medicinal pumpkin.

Materials and methods

To study the effect of PGRs on growth and yield on medicinal pumpkin *(Cucurbita pepo* var. *styriaca,* cv. 'Kaki') two experiments were conducted at Agricultural Research Station in Ferdowsi University of Mashhad, Mashhad Iran, during spring and summer 2011. The cultivar employed in this experiment was Kakai.

Experiment 1

This experiment was conducted in farming method (without staking) in four blocks (each block 88 m^2) and there were sixteen plots in each block (each plots 5.5 m^2) and in each plot there were 10 plants. Distance on the stack was 200 cm and spacing on the row was 40 cm.

Experiment 2

This experiment was conducted to trellis method in four blocks (each block 35.2 m^2) and there were sixteen plots in each block (each plots 2.2 m^2) and in each plot, there were 10 plants. Distance on the stack was 50 centimeters and spacing on the row was 40 centimeters.

In both experiments, treatments were seed priming with PGRs [control (water), IBA (100 ppm), GA_3 (25 ppm) and ethephon (200 ppm)] 20 h, and then seeds sowed. After seedling developing on true four-leaf stage, seedlings were sprayed with PGRs [control (water), IBA (100 ppm), GA_3 (25 ppm) and ethephon (200 ppm)] for three times.

Each experiment had 16 treatments (in fact all treatments were combinations of priming and spray) witch are presented in Tab. 1.

In both experiments, after the soil analysis, fields were ploughed twice, first with disc plough in autumn and the second was manually done in spring. Farm manure at 30 t/ha were applied in each plot separately at the time of final land preparation and N fertilizer (75 kg/ha) was applied to road method in three stages (planting time, four-leaf stage and during flowering). Seed sowed in 10 May 2011 at 40 cm plant-to-plant distance. Surface irrigation was practiced at 4-7 days interval in summer when necessary and weeding was handy. Number of male and female flower, number of node to first male and female flower, fresh and dry weight of leaf, stem and root were measured thrice at flowering stage. Average numbers of fruits per plant, number of seed in fruit, mean of fruit weight, seed oil percentage were counted.

Statistical analysis

The experiment was carried out in a factorial trial based on completely randomized design, with three replicates. ANOVA was run for the variables by SAS 9.2 software and the least Significant Difference (LSD) test was used to separate the means at $p<0.05$ and the charts were drowned in Excel 2010.

Results and discussion

Experiment 1 (farming method)

The result indicated that there were significant effects between all treatments on the growth and yield characteristics (Tab. 1).

Morphological traits

GA_3 and IBA have significant effect on growth characteristics compared to control and ethephon. The highest leaf area (418.57 cm^2) was recorded at P_2S_3 (combined effect of priming with IBA and spraying with GA_3) treatment. The highest DM% of plant (14.31%) was measured in P_1S_3 (combined effect of priming with control and spraying with GA_3). These results are in agreement with several investigators (Akter *et al*., 2007; Asrey *et al*., 2001, Emongor, 2007). This had proved that GA_3 influences a range of developmental processing in stem elongation, germination, flowering, sex expression, enzyme induction

Tab. 1. Number of treatments applied on growth and yield on medicinal pumpkin (*Cucurbita pepo* var. *styriaca,* cv. 'Kaki')

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P	Con	Con	Con	Con	IBA	IBA	IBA	IBA	GA_3	GA_3	GA_3	GA_3	Eth	Eth	Eth	Eth
S	Con	IBA	GA_3	Eth	Con	IBA	GA	Eth	Con	IBA	GA_3	Eth	Con	IBA	GA_3	Eth
	P_1S_1	P_1S_2	P_1S_3	P_1S_4	P_2S_1	P_2S_2	P_2S_3	P_2S_4	P_3S_1	P_3S_2	P_3S_3	P_3S_4	P_4S_1	P_4S_1	P_4S_3	P_4S_4

P=priming, S=spray, Con=control, Eth=ethephon

and can improve the seedling vigor. Applications of PGRs such as GA_3 have prompted the metabolic activities in plants due to enhancing vegetative growth. Plants which were treated with GA_3 have a higher leaf area, and vegetative growth and can enhance the photosynthesis, and can be very effective on final yield.

Floral traits

The application of ethephon decreased the sex ratio (male/female). These results indicated that ethephon was more effective in female flower apparition. Spray ethephon enhanced the number of female flower and reduced male flower significantly, even in some vine no mail flower was observed. The number of male flowers was maximized in GA_3 treatment (combined effect of priming with GA_3 and spraying with GA_3) this result was confirmed by Yamasaki *et al*. (2003) on cucumber, Brantley and Warren (1960) on muskmelon. The sex expression of medicinal pumpkin is determined by genetics as well as environment. The application of ethephon can have effects on sex ratio and increase the ultimate fruit yield/plant by increasing the number of pistillate flowers and fruit set percentage.

Yield components

Number of fruit/plant was affected by ethepon treatment (Tab. 2). Considering that normally medicinal pumpkin given one fruit/plant, ethephon with enhancing female flower increased the number of fruit/plant, and highest number of fruit (1.25) was obtained at P_2S_4 (combined effect of priming with IBA and spraying with ethephon) this result was consistent with Vadigar *et al*. (2001) and Desai *et al*. (1994). The application of IBA and GA_3 were more effective on fresh weight of fruit. Fresh weight of fruit was maximized by P_2S_1 (combined effect of priming with IBA and spraying with control) (Gedam *et al*., 1998; Sidhu *et al*., 1981). Maximum of seed/fruits (325.43) was observed in P_4S_2 (combined effect of priming with IBA and spraying with control). This result is consistent with Marbhal *et al*. (2005) and Dostogir *et al*. (2006). Thousand seed weight was affected by GA_3 and IBA treatment and had significant effect compared to the control. GA_3 and IBA were more effective in seeds specifications; both seed length and width were maximized by IBA (combined effect of priming with control and spraying with IBA) to (19.26 mm) (9.71 mm), respectively.

Total seed yield (kg/ha), seed oil percent and total seed oil kg/ha

The result indicated that the application of PGRs enhanced seed yield significantly compared to control (Fig. 1). The maximum total seed yield (946.73 kg/ha) was found in P_2S_4 (combined effect of priming with IBA and spraying with ethephon). Despite enough space to growth on the farming method, the P_2S_4 treatment by maximizing the fruit number per plant increased yield kg/ha. This result is consistent with the results of (Birader and Navalagatti, 2008; Sedghi *et al*., 2010; Thappa *et al*., 2011; Vwioko and Ukpo Longe, 2009) in their study. The seed oil % was directly affected by PGRs application, specially GA_3. Both methods of the application of GA_3 (priming and spray) have significant effect on oil% compared to the other treatment. Result indicated that foliar application of P_2S_3 (combined effect of priming with IBA and spraying with GA_3) treatment enhanced seed oils % (38.08%) significantly compared to the other treatment (Fig. 2), and oil yield to (346.51) maximized by P_2S_4 (combined

Tab. 2. Effect of PGRs on growth and yield characteristics on (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in farming method

Treatment	Leaf area cm^2	Sex ratio male/female	DM of vine %	Number of fruit per plant	Fresh weight of fruit (kg)	Number of seed per fruit	1000 Seed weight (g)	Length of seed (mm)	Width of seed (mm)
P_1S_1	346.65 g	11 b	13.05 j	0.6 i	1.65 g	275.11 d	130.57 gh	17.15 jk	8.34 fg
P_1S_2	402.68 b	10.8 b	14.08 b	0.9 de	1.7 g	228.07 g	141.75 de	18.57 c	8.79 ed
P_1S_3	378.35 e	13 a	14.31 a	0.83 fg	2.05 cd	263.95 e	150.25 b	18.41 cd	8.87 cde
P_1S_4	343.15 g	0.35 c	13.30 h	1.18 b	J 1.26 k	210.64 h	118.25 i	17.32 ij	8.53 efg
P_2S_1	388.86 cd	12.75 a	13.29 h	0.86 efg	2.78 a	288.88 c	142.75 cde	19.26 a	9.71 a
P_2S_2	391.67 c	11.75 ab	13.64 e	0.87 def	1.40 i	234.86 g	148.62 bc	17.94 fg	9.44 ab
P_2S_3	418.57 a	15.5 a	13.72 d	1.04 c	2.03 d	320.90 b	140.57 ef	17.73 gh	9.41 ab
P_2S_4	378.44 de	0.18 c	13.55 ef	1.25 a	1.3 j	315.91 b	134.76 fg	18.49 cd	9.21 bc
P_3S_1	375.28 e	11 b	13.85 c	0.82 fg	2.24 b	277.42 d	130.48 gh	18.32 de	8.55 efg
P_3S_2	384.16 cde	15.75 a	14.03 b	0.69 h	1.97 e	259.67 e	157.6 a	17.51 hi	8.55 efg
P_3S_3	389.5 c	17 a	13.95 bc	0.81 g	1.47 h	249.46 f	141.39 ed	18.95 b	9.45 ab
P_3S_4	364.26 f	10.75 b	13.50 f	1.14 b	1.12 l	216.67 h	126.45 h	16.99 k	8.90 cde
P_4S_1	364.14 f	0.25 c	13.22 hi	1.05 c	1.77 F	290.49 c	118.72 i	18.16 ef	8.21 gh
P_4S_2	381.84 cde	7.25 b	13.98 bc	0.92 d	2.1 c	275.22 d	147.58 bcd	19.02 b	9.12 bcd
P_4S_3	360.5 f	12.91 a	13.59 e	0.92 d	2.2 b	325.43 a	132.99 gh	17.41 i	7.85 h
P_4S_4	348.17 g	0.24 c	13.40 g	1.07 c	1.22	276.39 d	118.26 i	17.74 gh	8.69 ef

Mean with same letters in each column has no significant difference in ($p \leq 0.05$); P_1=priming with water (control), P_2=priming with IBA at 100 ppm, P_3=priming with GA_3 at 25 ppm, P_4=priming with ethephon at 200 ppm, S_1=spray with water (control), S_2=spray with IBA at 100 ppm, S_3=spray with GA_3 at 25 ppm, S_4=spray with ethephon at 200 ppm

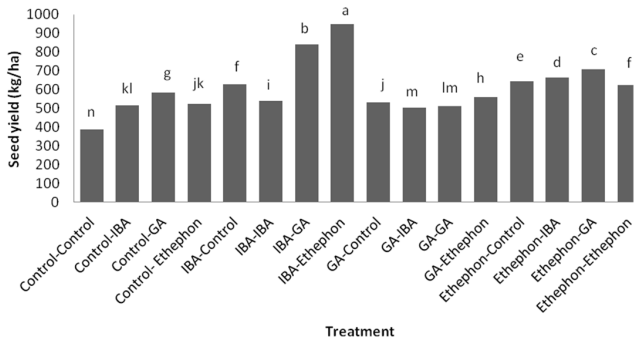

Fig. 1. Effect of PGRs on seed yield kg/ha in medicinal pumpkin (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in farming method

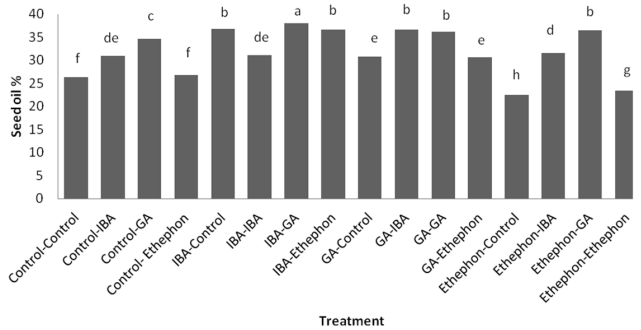

Fig. 2. Effect of PGRs on seed kg/ha of oil% of medicinal pumpkin (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in farming method

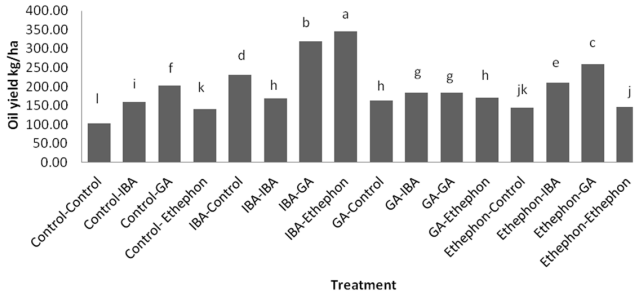

Fig. 3. Effect of PGRs on oil yield kg/ha in medicinal pumpkin (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in farming method

effect of priming with IBA and spraying with ethephon), (Fig. 3). The result was consistent with (Jaleel *et al*., 2007; Pouraghdam *et al*., 2011; Sedghi *et al.,* 2010). PGRs application to overcome the growth limiting factors to access the yield and maximum benefit of seed production, and proved exogenous foliar application of growth regulators stimulate flowering, pollination, fertilization and seed setting to get maximum seed yield.

Experiment 2 (trellis method)

The result in Tab. 3 indicated the effect of PGRs on growth and yield characteristic in medicinal pumpkin.

Morphological traits

GA_3 had more effective influence on growth characteristics compared to the other treatment. The highest Leaf area (391.18) cm^2 was recorded at P_1S_3 (combined effect of priming with control and spraying with GA_3) treatment. The highest DM% of plant (14.66%) was measured in P_1S_3 (combined effect of priming with control and spraying with GA_3). Gehan *et al*. (2001) reported GA_3 and IAA increased plant height and %DM in *balanites aegyptiaca*. Yaxley *et al*. (2001) reported that seed priming by GA_3 increased stem elongation, leaf expansion, and root growth on pea. In trellis method, considering the limit in space, plants which had rapid growth in primary stage can affect other plant by shading. GA_3 at an early stage increased the plant growth and then plant which treated by GA_3 had a great leaf area and level of light absorption that caused increasing in yield and DM%.

Floral traits

The data showed that ethephon was more effective sex expression on cucurbita plants. Spray ethephon significantly reduced the sex ratio and GA_3 treatment (combined effect of priming with GA_3 and spraying with GA_3) significantly enhanced sex ratio this result confirmed by (Yongan *et al*. (2002) on summer squash, Thappa *et al*. (2011) on cucumber.

Yield components

Data in Tab. 3 showed the yield Components. One of the main problems in *Cucurbita pepo* is low fruit set. It seems that Ethephon enhanced fruit set by increasing female flower. The number of fruit/plant enhanced by Ethephon treatment and maximized by P_1S_4 (combined effect of priming with control and spraying with Ethephon) to 1.29. The application of GA_3 was more effective on fresh weight of fruit. Fresh weight of fruit was maximized by P_3S_1 (combined effect of priming with GA_3 and spraying with control). Maximum seed/fruits (262.6) was observed in P_1S_3 (combined effect of priming with control and spraying with GA_3). One hundred seed weight was affected by GA_3 treatment P_1S_3 (combined effect of priming with control and spraying with GA_3) and had significant effect with the other treatment. Seed length was maximized by P_3S_2 (combined effect of priming with GA_3 and spraying with IBA) to (20.01 mm) and seed width was maximized by P_3S_3 (combined effect of priming with GA_3 and spraying with GA_3) to (10.04 mm).

Total seed yield (kg/ha), seed oil percent and total seed oil kg/ha

The maximum total seed yield (1686.21 kg/ha) was found in P_1S_3 (combined effect of priming with control and spraying with GA_3) Vegetative growth in trellis method was limited by low space availability. GA_3 treated increased primary growth and plant. In competition with the other, it could enhance seed yield by increasing photosynthesis. It seems that P_3S_3 (combined effect of priming and spray with GA_3) which decreases female flower and number of fruit/pant too could not enhance seed yield as P_1S_3. This result is consistent with the results of Musabber *et al*. (2010), Asrey *et al*. (2001) in their study. The seed oil

Tab. 3. Effect of PGRs on growth and yield characteristics of (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in trellis method

Treatment	Leaf area cm^2	Sex ratio male/female	DM of vine %	Number of fruit per plant	Fresh weight of fruit (kg)	Number of seed per fruit	1000 Seed weight (g)	Length of seed (mm)	Width of seed (mm)
P_1S_1	348.50 ef	10.50 b	13.07 i	0.70 e	1.71 e	115.3 4 i	114.96 ced	16.18 n	7.98 h
P_1S_2	364 d	8.92 b	14.38 b	0.64 f	1.69 e	227.8 cd	114.7 cde	16.40 m	8.68 g
P_1S_3	391.18 a	13.75 ab	14.66 a	1.05 b	2.07 b	262.6 a	132.21 a	17.93 f	9.09 cd
P_1S_4	351.20 ef	0.35 c	13.43 h	1.29 a	1.78 d	134.8 h	111.79 defg	17.84 g	8.64 g
P_2S_1	345.36 f	13 ab	13.56 g	0.80 d	1.52 f	218.1 d	119.79 bc	19.04 b	9.47 bc
P_2S_2	362.13 d	9.88 b	13.69 ef	0.63 f	1.45 gh	210.2 4 df	117.12 bcd	17.25 k	9.32 bcd
P_2S_3	376.88 c	16.50 a	13.76 e	0.58 g	1.48 g	206.5 f	112.77 def	17.54 i	8.99 ef
P_2S_4	355.4 e	0.19 c	13.65 f	0.61 fg	0.98 k	226.5 cd	107.77 fgh	18.31 c	10.04 a
P_3S_1	370.64 cd	13.25 ab	13.94 d	0.64 f	2.18 a	212.0 df	107 ghi	17.49 j	9.50 bc
P_3S_2	364.21 d	16.25 a	14.18 c	0.51 h	1.83 c	226.1 cd	121.75 b	20.01 a	9.58 b
P_3S_3	380.23 b	19 a	14.06 d	0.72 e	1.82 c	241.3 4 b	121.3 b	18.15 e	9.29 cd
P_3S_4	360.15 de	0.24 c	13.67 ef	0.64 f	1.13 j	197.97 g	107.3 fghi	16.51 l	8.60 g
P_4S_1	345.80 f	10 b	13.44 h	0.73 e	1.43 h	200.4 g	120.75 b	15.75 p	7.92 h
P_4S2	355.18 e	4.79 c	13.94 d	0.96 c	1.85 c	232.1 4 c	120.75 b	17.56 h	8.82 fg
P_4S_3	360.63 de	11.88 b	13.67 ef	0.62 fg	1.33 i	215.8 d	110.3 efgh	15.87 o	8.12 h
P_4S_4	345.36 f	0.16 c	13.42 h	0.96 d	1.34 i	200.5 g	105.42 hi	18.21 d	9.16 de

Mean with same letters in each column has no significant difference in ($p \leq 0.05$); P_1= priming with water (control), P_2= priming with IBA at 100 ppm, P_3= priming with GA_3 at 25 ppm, P_4= priming with ethephon at 200 ppm. S_1= spray with water (control), S_2= spray with IBA at 100 ppm, S_3= spray with GA_3 at 25 ppm, S_4= spray with ethephon at 200 ppm.

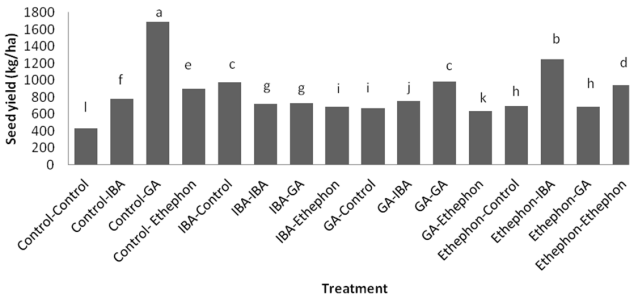

Fig. 4. Effect of PGRs on seed yield kg/ha in medicinal pumpkin (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in trellis method

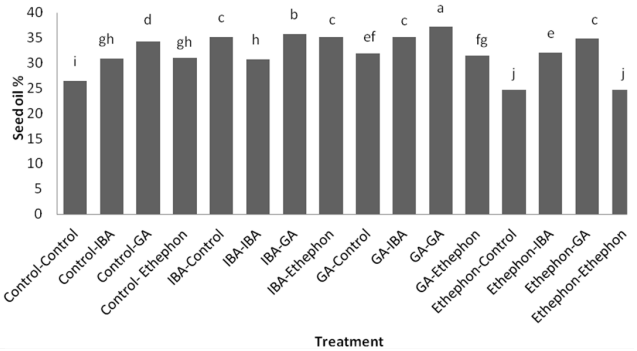

Fig. 5. Effect of PGRs on oil % of medicinal pumpkin (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in trellis method

% was directly affected by PGRs application. The result indicated that foliar application of P_2S_3 (combined effect of priming with GA_3 and spraying with GA_3) treatment enhanced seed oils% (37.175%) significantly compared to the other treatment (Fig. 5), and oil yield to (577.46) was maximized by P_1S_3 (combined effect of priming with GA_3 and spraying with GA_3), (Fig. 6). Many researchers have

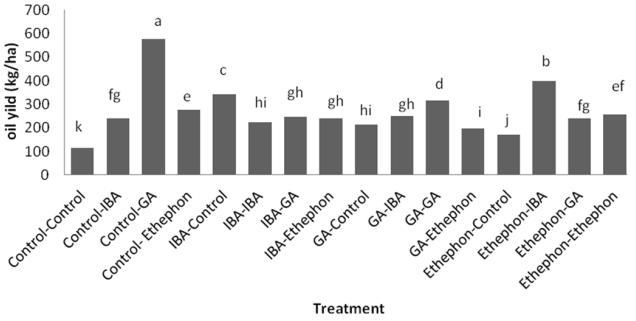

Fig. 6. Effect of PGRs on oil yield kg/ha of medicinal pumpkin (*Cucurbita pepo* var. *styriaca* cv. 'Kaki') in trellis method

proven that gibberellin is associated in increasing the protein and vitamin and oil of grain (Akter *et al*., 2007; Manjit Singh *et al*., 2011; Sedghi *et al*., 2010). GA_3 effectively increased yield and oil in *Ocimum basilicum* (Shukla and Farooqi, 1990).

Comparison of two experiments

The result indicated that trellis method was an effective method of planting in medicinal pumpkin culture compared to farming method. Present data showed the maximum yield in trellis method obtained in P_1S_3 (1686.21 kg/ha) that was significantly higher than maximum yield in farming method at P_2S_4 (946.73 kg/ha) treatment. Seed yield kg/ha was duplicated in trellis method by optimum use of available space. Minimum yield in both planting methods was observed in control treatment but in control treatment in trellis method seed yield kg/ha increased by 17% compared to the farming method control treatment. Ridge gourd (*Luffa acutangula* Roxb.) and sponge gourd (*Luffa cylindrica* Roem.) are in trellis method which get

higher yield. (Saimbhi, 1993). Fruit yield of muskmelon enhanced significantly in trellis method, and this method reduced plant to plant spacing to 30 cm (Singh *et al*., 1982). Hilli *et al*. (2009) reported that trellis method enhanced yield in ridge gourd (*Luffa acutangula* L. Roxb) by 30-35% compared to farming method.

Conclusions

Due to the limit of farm land to achieve maximum yield, an appropriate culture system and optimum use of area under planting is necessary to get higher performance with the optimum use of available space. The effect of PGRs in various Vegetative and Generative processes in plants is well known. Growth regulators affect seed germination, vegetative growth, flower induction, fruit set, seed development, fruit ripening and yield. PGRs may increase root activity and plasticity of cell wall to provide greater absorption of water and nutrients and cause enhancement in growth and yield. In generally growth regulators have different effects on seed yield and oil% in medicinal pumpkin. As regards the main gold of medicinal pumpkin planting is Access to height amount of oil GA_3 can improve the seed yield and oil% effectively. Thus, given the obtained data, the use of GA_3 is recommended and trellis method could lead these crops manufacturers to access more yield.

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