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The Effects of Planting Methods and Head Pruning on Seed Yield and Yield Components of Medicinal Pumpkin (*Cucurbita pepo* subsp. *Pepo* convar. *Pepo* var. *styriaca*) at Low Temperature Areas

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Abstract: This experiment carried out to evaluate the effects of planting methods (seed sowing and transplanting) and head pruning (no pruning, pruning after 12th node and pruning after 16th node) on yield and yield components such as number of branches (sub-branches) per plant, fruits per plant, growth, fruit size, weight of fresh fruit, weight of seeds per fruit, number of seeds per fruit and seed yield of medicinal pumpkin. The experiment was carried out based of factorial experiment with Randomized Completely Blocks Design (RCBD) by three replications in Ardabil Agricultural and Natural Resources Researches Station at 2007. Seedlings were grown in heated greenhouse. When the climatic condition became suitable and seedlings were at the four leaves stage, both seeds and seedlings were planted at the same time in the farm. Maintenance operations were done during the growth season. Head pruning treatments were done the forecast time. The results showed that the planting methods had significant effect on the number of ripen fruits per plant, fruits diameter, weight of seeds per fruit, weight of 1000 seeds and seed yield and had no significant effect on the other traits. Also the results indicated that head pruning treatments had significant effects on the number of branches per plant, growth and seed yield and no significant on the other traits. In this experiment the most seed yield (997.8 kg ha⁻¹) obtained from transplanting method with head pruning after 12th node and the least seed yield obtained from control.

Key words: *Cucurbita pepo*, medicinal pumpkin, pruning, transplanting, seed

INTRODUCTION

Medicinal pumpkin (*Cucurbita pepo* subsp. *Pepo* convar. *Pepo* var. *styriaca*) is an important variety of *Cucurbita pepo* L. that has been existed by spontaneous mutation and now it is a valuable medicinal plant in pharmaceutical industries of developed countries (Aroiee *et al.*, 2004, 2003). It dose not grow naturally in Iran, but recently has planted and has been used as medicine in Iran. It has fibrous root systems (Gholipouri and Nazarnejad, 2007). The stems are long (300-500 cm). Leaves are large and green. Flowers are bright-yellow and fruits are green to orange in color. Seeds are dark green and coverless the seeds contain fatty acid oil 35-55% especially of the linoleic acid, β -sitrostrol and E-vitamin used to draw material for certain pharmaceutical products that are important to remedy of cancer (Murkovich, 1999).

The seeds of medicinal pumpkin are used to remedy Benign Prostatic Hyperplasia (BPH) and urinary tract

irritation (Mafakheri *et al.*, 2004). This species is native of American tropical and subtropical area. It produces seeds that contain higher percent of oil, oleic acid and sterol in the lower temperature areas but the seed yield decreases in these areas.

Lower temperature and nitrogen can delay flowering and ripening of fruits and this issue cause to produces high amount of unripe and green fruits at harvesting time (Kuhlmann *et al.*, 1999; Swaider *et al.*, 1994). Increases the growth period time for 3-4 weeks and fruits will have enough time to ripening.

Apical dominance cause to more vegetative growth and delay or inhibit to producing more fruits because pumpkin usually produces one fruit on main stem after 17 nodes (Wien *et al.*, 2004) which this fruit serves a strong sink for assimilate the materials and inhibits formation and producing next fruits on the further nodes (Rylski, 1974).

It seems that preventing to formation this fruit by head pruning, encourage plants to more fruits on lateral

branches and it seems that by transplanting method the fruits will have enough time to maturing and ripening. Present research has carried out to evaluate the effects of planting methods and head pruning on seed yield and yield components of medicinal pumpkin at low temperature area.

MATERIALS AND METHODS

The factorial experiment based on Randomized Complete Block Design with three replications was carried out in Ardabil Agricultural and Natural Resources Researches Station as a low temperature area that located at 38° 20' North latitude and 48° 20' East longitude at 2007. The soil was clay loam which characterized by low organic materials (0.25%). Mean of minimum temperature was 1.98°C, mean maximum temperature was 21.58°C and mean temperature was 15.18°C. The precipitation mean was 310 mm. The soil was clay loam. Seedlings was produced in pots (7 cm diameter and 10 cm depth) that were filled with 80% soil, 10% sand and 10% manure in the heated greenhouse (day temperature 24±2°C and night temperature 14±2°C). Watering was done every day with a fine meshed sprinkler. When the weather condition became suitable for planting at the outdoor, both the seed and seedlings were planted at same time on 20 May 2007 in the open field. Seedlings were hardened before transplanting them and transplanting was without any damage. Each plot had three rows with 2 m spacing between them and each row had 12 plants with 50 cm spacing between the plants in both planting methods (seed sowing and transplanting). The factors include planting methods (seed sowing and transplanting) and head pruning (no pruning, pruning after 12 nodes and pruning after 16 nodes) irrigation, fertilizing and breaking crust were done for all plots similarly. When more than 25% of fruits became yellowish orange in color, stem and leaves began to drying and the seeds became dark green and well rounded, manual harvesting was carried out. Ripen and unripe fruits were counted. Harvested ripen

fruits weighted and their diameters were measured at the farm and then the fruits transferred to laboratory. The seeds of each plant were manually extracted and dried at shadow and at room temperature. All dried seeds were counted, weighted and measured separately. Studied traits were number of sub branches and ripen fruits per plant, fruit diameter, weight of 1000 seeds and seed yield.

RESULTS AND DISCUSSION

The results indicated that the planting methods had significant effect on the number of ripen fruits, size of fruits, weight of seeds per fruit, weight of 1000 seeds and seed yield and no significant effect on the number of sub branches per plant. The results showed that head pruning had significant effect on the number of branches per plant, weight of 1000 seeds and seed yield and no significant effect on other traits. Interaction between planting methods and head pruning had significant effect on sub branches, ripen fruits per plant and seed yield and had no significant effect on the other traits (Table 1).

Planting methods: The results showed that the number of ripen fruits per plant was effected from planting method and the higher number (1.756 fruits/plant) obtained from transplanting method and the least number (1.211 fruits/plant) obtained from direct planting (seed sowing). Obtained the same results. The fruit diameter was bigger (192 mm) in transplanting method and it was smaller (177.44 mm) in direct planting and it is because of more time for absorption and accumulation the material in transplanting method by transplanted plants Bavec *et al.* (2002) reached to the same results.

Transplanting method produced 50.202 g seed per fruit while direct planting produced 37.247 g seeds per fruit. The weight of 1000 seeds in transplanting method was 201.733 g and it was 156.533 g in direct planting.

The seed yield in transplanting method (883.714 kg ha⁻¹) was significantly higher than direct planting (Table 2).

Table 1: Results of variance analysis of planting methods and pruning on studied trails

SOV	df	MS					
		Sub branches	Ripen fruits	Size of fruits	Weight of seeds per fruit	Weight of 1000 seeds	Seed yield
R	2	0.097 ^{ns}	0.020 ^{ns}	284.056 ^{ns}	4.603 ^{ns}	60.322 ^{ns}	8504.262 ^{ns}
P	1	0.681 ^{ns}	1.334 ^{**}	953.389 ^{**}	755.309 ^{**}	19193.680 ^{**}	936282.059 ^{**}
H	2	2.187 ^{**}	0.032 ^{ns}	29.556 ^{ns}	25.263 ^{ns}	9129.572 [*]	22968.124 [*]
P×H	2	0.121 ^{**}	0.084 [*]	44.222 ^{ns}	2.292 ^{ns}	41495.000 ^{ns}	31556.564 [*]
Error	10	0.0576 ^{ns}	0.020 ^{ns}	87.856 ^{ns}	13.467 ^{ns}	221.902 ^{ns}	5406.302 ^{ns}
CV%		8.140	9.350	5.070	8.390	8.320	11.210

R: Replication, P: Planting method, H: Head pruning, P×H: Interaction between P and H, CV: Coefficient varieties, ns: Not significant, **: Significant in 1% probability level, *: Significant in 5% probability level

Table 2: The effects of planting methods on the studied traits

Planting methods	Sub branches (No.)	Ripen fruits (No.)	Size of fruits (mm)	Weight of seeds per fruit (g)	Weight of 1000 seeds (g)	Seed yield (kg ha ⁻¹)
P ₀	2.744 ^a	1.211 ^b	177.4 ^b	37.427 ^b	156.533 ^b	427.576 ^b
P ₁	3.133 ^a	1.756 ^a	192.0 ^a	50.202 ^a	201.733 ^a	883.714 ^a

P₀: Seed sowing method, P₁: Transplanting method, Values in the same row with different letter(s) are significantly different

Table 3: The effects of head pruning on the studied traits

Head pruning	Sub branches (No.)	Ripen fruits (No.)	Size of fruits (mm)	Weight of seeds per fruit (g)	Weight of 1000 seeds (g)	Seed yield (kg ha ⁻¹)
H ₀	2.300 ^f	1.400 ^e	182 ^a	1492 ^a	165.4 ^b	587.85 ^b
H ₁	3.500 ^b	1.533 ^a	184 ^a	1961 ^a	182.2 ^a	709.15 ^a
H ₂	3.017 ^b	1.517 ^a	187 ^a	2056 ^a	182.2 ^b	669.89 ^a

H₀: No pruning, H₁: Pruning after 12 nodes, H₂: Pruning after 16 nodes, Values in the same row with different letter(s) are significantly different

Table 4: Effects of interaction between treatments on studied traits

Treatments	Sub branches (No.)	Ripen fruits (No.)	Size of fruits (mm)	Seeds weight per fruit (g)	Weight of 1000 seeds (g)	Seed yield (kg ha ⁻¹)
P ₀ H ₀	2.267 ^d	1.232 ^c	178.7 ^{bc}	35.70 ^b	143.0 ^d	410.8 ^c
P ₀ H ₁	3.200 ^b	1.133 ^c	175.0 ^c	37.28 ^b	164.5 ^c	420.5 ^c
P ₀ H ₂	2.767 ^c	1.267 ^c	178.7 ^{bc}	38.76 ^b	162.1 ^d	422.0 ^c
P ₁ H ₀	2.332 ^d	1.567 ^c	187.0 ^{abc}	47.11 ^a	187.9 ^b	735.6 ^b
P ₁ H ₁	3.800 ^a	1.933 ^a	193.3 ^{ab}	51.85 ^a	215.1 ^a	997.8 ^a
P ₁ H ₂	3.267 ^b	1.767 ^{ab}	195.7 ^a	51.65 ^a	202.1 ^{ab}	917.8 ^a

P₀H₀: Transplanting and no pruning (control), P₀H₁: Transplanting and pruning after 12 nodes, P₀H₂: Transplanting and pruning after 16 nodes, P₁H₀: Direct planting (seed sowing) and no pruning, P₁H₁: Direct planting and pruning after 12 nodes, P₁H₂: Direct planting and pruning after 16 nodes, Values in the same row with different letter(s) are significantly different

The sub branches were significantly influenced by head pruning and in no pruning, pruning after 12 nodes and pruning after 16 nodes they respectively were 2.3, 3.5 and 3.017 sub branches per plant. Mafakhrey *et al.* (2004) reached the same result in their study. The weight of 1000 seeds in the no pruning, pruning after 12 nodes and pruning after 16 nodes were 165.4, 182.2 and 182.2 g per 1000 seeds. Seed yield in no pruning, head pruning after 12 nodes and pruning after 16 nodes were 587.85, 709.15 and 669.89 kg ha⁻¹. The most amounts obtained from pruning after 12 nodes. Gholpouri and Nazarnejad (2007) and Mafakheri *et al.* (2004) reached to the same results (Table 3).

Interaction between treatments: The number of sub branches was influenced from interaction between treatments and the most number obtained from transplanting with pruning after 12 nodes (3.80 branches) and least number obtained from direct planting with no pruning (2.267 branches). Number of ripen fruits was effected by interaction between treatments and the highest number obtained from transplanting with pruning after 12 nodes and lowest number obtained from direct planting with pruning after 12 nodes.

The highest seed yield (997.8 kg ha⁻¹) obtained from transplanting with pruning after 12 nodes and the lowest obtained from direct planting with no pruning (410.8 kg ha⁻¹) (Table 4). It is because of enough time for growth and ripening most of the fruits in transplanting method and increasing the weight of 1000 seeds.

CONCLUSION

The results of present research indicated that transplanting method and head pruning caused to increasing the seed yield of medicinal pumpkin at low temperature areas because long period of growth in transplanting method (4 weeks) provides sufficient opportunity for material build and those save in seeds. It is because of preparing enough time to maturing and ripening the fruits by transplanting method and decreasing the effect of topical dominance and encourage the plants to producing more fruits by head pruning after 12 nodes. It sees that transplanting method and head pruning after 12 nodes are suitable for producing medicinal pumpkin at low temperature areas.

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