

Effects of Supplementary Pollination on Qualitative and Quantitative Traits of Pistachio in Qazvin Region

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Abstract: In this study the artificial pollination of pistachio was investigated. Two types of pollen of local selective genotypes (Q1 and Q2) which were different pollinizers were used. The experiment had six treatments. Qazvini and Ohadi cultivars were pollinated with supplementary pollinations as treatment which was covered with cotton bag, natural pollination as a control which was not covered and two types of pollen of local selective genotypes (Q1 and Q2) which were prepared. Results showed that supplementary pollination had positive effects on fruit number per cluster and reduction of blank percentage. Supplementary pollination not only increased quantitative traits (Number of nut per cluster, Kernel dry weight and yield), but also it improved some qualitative traits such as unsplit nut percentage and reduced blank nut percentage in Qazvini and Ohadi cultivars.

Keywords: Supplementary Pollination; Fruit Set; *Pistachio vera*

INTRODUCTION

Pistachio is deciduous wooden tree from Anacardiaceous family which primarily is cultivated in European Mediterranean, Middle East and California [11]. Its origin is unclear but experts agree that its origin is in Central Asia [6]. Pistachio trees have two basic, Male and female flowers which are formed on distinct trees and so pollination is necessary for this position. Pistachio's flowers do not have petal and do not attract insects [4]. Therefore, pollination / pollen transfer from male to female tree, is took place with wind [4, 1, 7]. To ensure from adequate pollination and maximum production, having male trees is necessary. Male and female trees are cultivated in mixed manner and their ratio is 1 male tree to 8-11 female trees which depends on orchard [8, 4, 6]. Therefore, Pollination is one of the most important factors in pistachio cultivation that is

related to time differences between flowering of male and female trees. In addition, it might be unsatisfactory if the ratio of male and female trees and cultivation situation are inappropriate. This will reduce production and nut blank percentage increases in this case.

This study was conducted where the pistachio trees with male and female flowers were at different periods. Therefore, the goal of this study was artificial pollination in selected cultivars of pistachio with various treatments in Qazvin region.

MATERIALS AND METHODS

This experiment was carried out in a semi mechanization orchard with an area of 250 hectare, for Arezuye Bahar Company, in BuinZahra, Mohammad Abad, 30 km from Qazvin, in 2010-2011, for 15 year- old trees and two types of pistachio, Qazvini and Ohadi. To prevent from

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open pollination, female trees were isolated with paper bags before flowering [9].

This experiment had six treatments. Supplementary pollination which were covered with plastic bags was carried out according to the Acar [1] and Kuru's [8] method. It involved Qazvini and Ohadi overlapping pollinators (Q1 and Q2) and natural pollination as a control (without covering).

After visiting orchard and male tree flowering, branches which had more flowers were chosen for pollination and were labeled. To prevent unwanted pollination, female branches before flowering were covered by bags. Pollination was performed according to the Iisfendiyaroglugluglu [7] method. Pollen was put on the stigma with using a painting brush. Clusters which were treated by pollen were covered by paper bags until the end of pollination. On the other side, treated clusters were subjected to the wind without any covering.

The harvest of Qazvini cultivar fruit was begun 7 days before Ohadi's fruit in 20 August 2011, when green shell changed to red. Clusters were gathered and parameters which were important for pistachio pollination survey were as following:

Number of fruit in each cluster. The number of fruits was counted and then the average was calculated for each tree.

Total production in each cluster. Total fruits were weighted by digital balance and then the average was calculated for each cluster.

Pistachio dry weight. The weight of dry pistachio for ten nuts was weighted in each replication and then they were put in 60 °C for 48 hours.

Weight of fresh fruit. In each replication, ten nuts were weighed and the average was calculated for each nut.

Splitting percentage. After dehulling of ten fruits, Splitting nut were counted.

Blank percentage. In a sample with 50 members, the number of blank nuts was counted.

Data analysis

Split plots design on base of random complete blocks was used with six treatments in three replications. The difference between means of different treatments was compared with LSD and SAS software was used for this purpose. These differences were considered with 0.05 probabilities significantly.

RESULTS AND DISCUSSIONS

Results of studied traits have been presented as following (Table 1, 2, 3 and 4):

Table 1. Analysis variance of studied traits

SOV	Df	Number of set fruits	Fresh weight	Dry weight	Splitting percentage	Blank percentage	Yield
Replication	2	255.05	66.68	23.47	120.05	127.16	930708.26 ^f
Cultivar	1	138.88 ns	59.36 ns	.188 ns	1.389ns	227.55ns	797576.12 ns
Error	2	126.05	39.78	19.54	261.72	105.05	89610.21
Pollination	2	1734.05**	885.13**	303.79**	907.38**	340.66**	428880.11**
Reaction	2	422.72*	89.33 ns	32.38 ns	75.05 ns	54.22*	244390.91 ns
Error	8	105.722	59.935	17.892	41.972	15.278	482786.10
CV%		23.67	21.03	25.12	13.87	14.48	19.95

Table 2.comparison of mean of studied traits in Ohadi and Qazvin cultivar

Cultivar	Number of set fruits	Fresh weight	Dry weight	Splitting percentage	Blank percentage	Yield
Ohadi	40.66a	23.13a	14.63 a	46.44a	23.44a	1949.70a*
Qazvin	46.22a	26.76a	14.42a	47.00 a	30.55a	1528.70a

*Means with the same letter are not significantly different at p=0.05using Duncan's multiple range test.

Table 3.comparition of mean of studied traits in open and supplementary pollination

Type of pollination	Number of set fruits	Fresh weight	Dry weight	Splitting percentage	Blank percentage	Yield
Q1	55.50a	33.27a	19.36a	55.50a	22.00b	2186a*
Q2	50.83a	30.56a	17.87a	52.00a	23.33b	2267a
open	24.00b	11.01b	6.35b	32.67b	35.67a	764.10b

*Means with the same letter are not significantly different at p=0.05using Duncan's multiple range test.

Table 4.comparition of mean of cultivar and pollination reaction

Treatment	Number of set fruits	Fresh weight	Dry weight	Splitting percentage	Blank percentage	Yield
Ohadi × Q1	55.33ab	35.12a	21.95a	52.33a	18.67c	2619a*
Ohadi × Q2	38.67bc	24.72a	15.85a	50.67a	22.67bc	2429a
Ohadi × open pollination	28.00c	9.55a	6.09a	36.33b	29.00b	801.7a
Qazvin × Q1`	55.67ab	31.42a	16.77a	58.67a	25.33bc	1754a
Qazvin× Q2	63.00 a	36.40a	19.88a	53.33a	24.00bc	2106a
Qazvin × open pollination	20.00 c	12.46a	6.620a	29.00b	42.33a	726.50a

*Means with the same letter are not significantly different at p=0.05using Duncan's multiple range test.

Splitting percentage

From the results of Table 3, there is a meaningful difference between splitting percentage and pollination treatment, its highest value is for supplementary pollination with 55.50% value and its lowest value is for natural pollination with 32.67% value.

Crane [5] reported that there are more effects on weight and hull split prosperity if we use *P. mutica* instead of *P. atlantica*. Using *P.vera* results bigger and better fruit with more splitting percentage. *P. vera* is better type and it is more economical rather than other types.

Blank percentage

Results of Table 1 and 2 analysis show that there is a significant difference between Qazvin and Ohadi which highest value is for Qazvin type with 30.55% value and lowest value is for Ohady type with 23.44%.

As it can be seen from Table 3, there is a significant difference between blank percentage of Qazvin and Ohadi types and its highest value is for natural pollination with 35.67% value and lowest value is for supplementary pollination with 22.00% that agree with results acar [1] and Ak [2].

As it can be seen in Table 4, there is a significant difference between interaction of pollination

treatments and Qazvin and Ohadi pistachios, highest value of open pollination for Qazvin cultivars is 42.33% and lowest value of supplementary pollinizer Q1 for Ohadi cultivars is 18.67%.

Yield

Results of Table 1 and 2 shows that there is meaningful difference between Qazvin and Ohadi yield and its value is about 5%.

As we can see from comparing pollination treatment averages in Table 3, there is a meaningful difference between pollination treatment and yield, its highest value is for supplementary pollination with 2267 kg/ha and lowest value is for natural pollination with 764.10 kg/ha value.

Crane [5] revealed that supplementary pollination not only increases number of fruit in each cluster, but also it enhances seed size and dry weight of pistachio.

Number of fruits in each cluster

Results of Table 1 and 2 analysis show that there is a significant difference between Qazvin and Ohadi fruit set. The most number of fruit sets is for Qazvin cultivar and it is about 46.22 and lowest of that is for Ohadi cultivar and it is about 40.66.

There was no significant difference between pollinizers Q1 and Q2 on fruit set per cluster. Similar results of pollen effect on fruit set or fat and protein content of seed of pistachio were reported [10, 3].

Weight of fruit

As we concluded by comparing averages in Table 3, between Q1 and Q2 male pollens, there were not significant differences about dry weight and other traits, and their effects in this case were same. Although, there were significant differences between Q1 and Q2 and open pollination.

It was been reported that *p.vera* pollen for better production was more effective than *p.mutica* and *P.anlantic* pollens also *P. vera* pistachio can fertilized with other types of pistacia [1,3].

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