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in

Ak B.E. (ed.).
XI GREMPA Seminar on Pistachios and Almonds

Zaragoza : CIHEAM
Cahiers Options Méditerranéennes; n. 56

2001
pages 311-314

Article available on line / Article disponible en ligne à l'adresse :

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To cite this article / Pour citer cet article

Ak B.E. **Effects of different Pistacia species pollen on fruit dimension and weight in the Kirmizi variety.** In : Ak B.E. (ed.). *XI GREMPA Seminar on Pistachios and Almonds*. Zaragoza : CIHEAM, 2001. p. 311-314 (Cahiers Options Méditerranéennes; n. 56)



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Effects of different *Pistacia* species pollen on fruit dimension and weight in the Kırmızı variety

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SUMMARY – In this experiment, the effects of *P. vera*, *P. atlantica* and *P. terebinthus* pollen on fruit dimensions and weight were investigated. The results were changed according to pollen sources. The fruit which were pollinated with *P. vera* pollen was better than other *Pistacia* species' pollen. Generally fruit weight, width and thickness were affected but length was not. Shelling percentage was also changed.

Key words: Pollen, *Pistacia*, fruit dimension, Kırmızı.

RESUME – "Effets du pollen de différentes espèces de *Pistacia* sur la dimension et le poids des fruits chez la variété Kırmızı". Dans cette expérience, ont été étudiés les effets du pollen de *P. vera*, *P. atlantica* et *P. terebinthus* sur les dimensions et le poids des fruits. Les résultats ont changé selon les sources de pollen. Les fruits pollinisés par du pollen de *P. vera* étaient meilleurs par rapport au pollen d'autres espèces de *Pistacia*. En général le poids, la largeur et l'épaisseur des fruits étaient affectés, mais pas la longueur. Le pourcentage au passage subissait également des variations.

Mots-clés : Pollen, *Pistacia*, dimensions du fruit, Kırmızı.

Introduction

Pistachio (*Pistacia vera* L.) trees are dioecious. That means male and female flowers are borne on different trees. It belongs to the nut fruit group in which the seed of the pistachios is edible. In order to get filled nuts, pollination and fecundation are necessary. Pollination is very important to get an economically high yield (Woodroof, 1982).

Pistachio female flowers may set nuts after they are pollinated with pollen of other *Pistacia* species such as *P. terebinthus*, *P. khinjuk*, *P. atlantica*, etc., besides of *P. vera*. There are plenty of researches on the effect of pollen on the fruit quality such as splitting, filling nut, kernel and nut weight, etc.

Crane and Iwakiri (1980) reported that no differences in fruit size or time of maturity of Kerman pistachio following pollination with pollens from five different sources. They stated that the degree of shell dehiscence was related to kernel development rather than to the type of pollen.

Riazi and Rahemi (1995) worked on the effects of five different pollens on nut and seed characteristics of three pistachio cultivars. According to their obtained results, they confirmed previous studies in showing xenia and metaxenia effects. *P. vera* tended to retard nut development. Effects upon kernel weight and shell dehiscence were greatest when *Pistacia mutica* pollen was used, followed by *Pistacia atlantica* pollen. Larger kernel and higher shell splitting resulted from the use of *Pistacia vera* pollen.

Ka_ka and Ak (1996) reported that *Pistacia vera* pollen was found more effective to produce higher percentages of split nuts than the pollen of the *P. terebinthus* and *P. atlantica*.

In this work, the effect of artificially applied *Pistacia* spp. pollen on the weight and dimensions such as length, width and thickness of Siirt pistachio cultivar were investigated.

Material and methods

This work was carried out during 1989 and 1990 in the pistachio orchards of Ceylanpınar State

Farm (TIGEM) and in the laboratories of the Department of Horticulture, Faculty of Agriculture, University of Çukurova.

In the experiment, Siirt pistachio cultivar planted in 1971 with 10 x 10 m distances between and on the rows were used. The tree grows rainfed conditions.

Pollen sources: pollinations were performed with the pollen collected from the selected male trees *Pistacia vera* L. (63-PV-3), *Pistacia atlantica* Desf. (01-PA-4) and *Pistacia terebinthus* L. (01-PT-5).

Pollen collection: the branches carrying staminate clusters were collected from male *Pistacia* spp. trees mentioned above, just prior to pollen shedding time and pollens put into glass vials. They were kept in deep freezer (-18°C) until used.

Artificial application: in the selected female trees belong to Siirt cultivar 4 branches on each at the 4 directions and 3 female flower clusters on each branch were chosen and they were bagged with muslin bags (45 cm x 25 cm) on stage 1 of flower development (Ülkümen, 1945). In addition to bagged female flower clusters some clusters are marked and left on the tree for natural open pollination. The pollen were not mixed with any carrier and they were sprayed by means of a hand duster.

Harvesting: when the nuts of the adjacent trees in the same plot with the experimental trees were ready to harvest that is when their exocarps can be easily dehulled (Ayfer, 1964; Crane, 1978), nuts of the artificially pollinated clusters were harvested. The harvested fruits were sun dried and kept in the laboratory until they were subjected to physical analysis. Of course the nuts of different treatments were separately collected at harvest.

Fruit evaluation: after harvesting and sun dried nuts were kept in laboratory. They were kept in over at 35°C in case may take humidity before to start analysis. Fruits were weighted (g) and measured with hull, dehulled and kernel. The measurement of dimensions (mm) such as length, width and thickness were made with digital compass (Fig. 1).

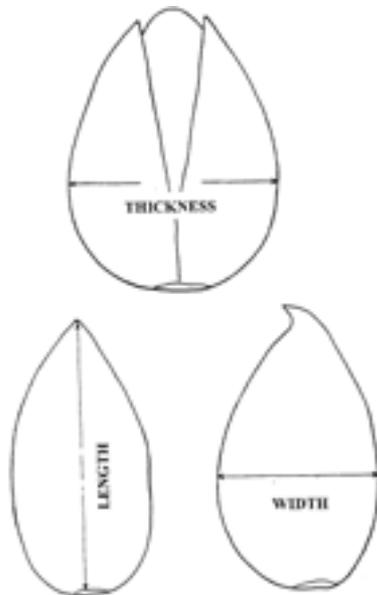


Fig. 1. Measurement of dimensions in fruit.

Shelling percentage (%): it is calculated as kernel/shell ratio.

Statistical design: the measurements of dimensions were done 5 replications, each replication contained 20 fruits. Statistical analysis of the values were done according to randomized plot design. The obtained average results compared with "Least Significant Difference (LSD)" 5% (Bek, 1983).

Results

As it is mentioned in the introduction pollen are effects of fruit and seeds. In this experiment, effect of *P. vera*, *P. atlantica* and *P. terebinthus* pollen on the fruit weight and dimensions were investigated (Table 1).

Table 1. Effects of different *Pistacia* spp. pollen on the weight and dimensions of Siirt pistachio cultivar in 1989

Features	Source of pollen					Mean	LSD (% 5)
	<i>Pistacia vera</i>	<i>Pistacia atlantica</i>	<i>Pistacia terebinthus</i>	Natural pollination			
Hulled nut							
100 nut weight	114.8 a	98.8 b	88.4 c	95.4 bc	99.35	8.37	
Length	23.61 a	22.12 b	20.37 c	21.71 b	21.95	0.90	
Width	11.89 a	11.77 a	11.28 b	11.82 a	11.69	0.41	
Thickness	10.47 a	10.00 b	9.57 c	10.21 ab	10.06	0.36	
Dehulled nut							
100 nut weight	91.6 a	78.6 b	69.6 c	75.0 bc	78.70	7.31	
Length	20.83 a	19.23 b	17.98 c	18.90 b	19.24	0.76	
Width	10.86 a	10.73 ab	10.43 b	10.60 ab	10.66	0.36	
Thickness	9.70 a	9.06 bc	8.74 c	9.17 b	9.17	0.32	
Kernel							
100 nut weight	48.4 a	42.0 b	36.2 c	39.6 bc	41.55	4.23	
Length	16.77 a	16.16 ab	15.12 c	15.90 b	15.99	0.71	
Width	8.46 a	8.70 a	8.28 b	8.49 ab	8.48	0.35	
Thickness	7.62 a	7.44 ab	7.07 b	7.31 ab	7.36	0.41	
Shelling (%)	42.14	42.53	41.09	41.62	41.85	NS	

Generally, *P. vera* pollen produced the heaviest fruits than other pollen sources. The average of the weight involving hulled nuts, dehulled and kernel, between pollen sources were found statistically significant.

The fruit weight were 114.8 g in hulled nuts, 91.6 g in dehulled nuts and 48.4 g in kernel with *P. vera* pollen. *P. atlantica* pollen effects was nearer to *P. vera*.

The averages of the length were found statistically significant. The best results were obtained from the pollen of *P. vera* and *P. atlantica*. The highest value were obtained from *P. vera*'s pollen.

The thickness were changed 9.57 mm-10.47 mm among the pollen sources in hulled nuts. The best value was obtained from the application of pollen of *P. vera* and natural pollinated fruits. In the dehulled nuts, the highest value (9.70 mm) was obtained from pollen of *P. vera*. In kernel, the highest value (7.62 mm) was obtained the fruits which were pollinated with *P. vera*'s pollen.

Shelling percentages were calculated as kernel weight/fruit weight. The averages were calculated statistically non-significant. The averages were changed between 41.09%-42.53% (Table 1). The best result (42.53%) was obtained from application of *P. atlantica* pollen.

Discussion

The pistachio, *Pistacia vera* L., can be fertilized with pollen from other species of the genus *Pistacia* (Whitehouse *et al.*, 1964) but fertilization with *P. vera* pollen is preferred because it induces larger kernels and increases shell splitting, both commercially desirable characters (Ka_ka and Ak, 1996). In this experiment the weight and sizes of the fruit and kernels are increased generally with *P. vera* pollen.

Pollen obtained from different sources, may not have the same effect on fruit set and the quality of the nuts (Peebles and Hope, 1936; Crane and Iwakiri, 1980; Pontikis, 1989). In this experiment, the results approved by these idea.

Pollen of *P. vera* is preferred because it increases shell splitting, weight, diameter, etc. Riazi and Rahemi (1995) reported that greater kernel weight of "Kalleh-ghuchi" higher shell splitting of "Momtaz" and increase blanks of "Owhadi" resulting from pollination with *P. vera*, suggested that female parent affected response. In this experiment, the values obtained the Siirt cultivar which grown unirrigated conditions. When this cultivar grown irrigated conditions, the fruits will be larger than these values.

The results indicated that use of pollen of *Pistacia* species other than *P. vera* is undesirable. In Turkey especially rocky and mountains area which are not suitable for other crops cultivations are covered wild *Pistacia* such as *P. terebinthus*, *P. khinjuk*, etc. In these areas top-working have been started and continues (Ka_ka and Bilgen, 1988). We have advised to remain the male trees without budding. Because pollination is very important problem in pistachio cultivated areas. However in the new pistachio plantations, we recommend to plant *P. vera* male trees. Because of the advantages which have been mentioned above.

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