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## Effects of pollens of different *Pistacia* spp. on the protein and oil content in pistachio nut

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**SUMMARY** - In this experiment, the effects of *P. vera*, *P. atlantica* and *P. terebinthus* pollens on Kırmızı, Siirt, Ohadi, Bilgen and Vahidi pistachio varieties which were grown at Ceylanpınar State Farm were investigated. In these investigations, orchard experiments were done in 1989 and in 1990 growing seasons, the fruit analyses were completed in 1991 at the University of Çukurova, Faculty of Agriculture, Department of Horticulture's laboratories. The obtained results, effects of various pollen on the oil and protein contents of the nuts did not seem stable. However, Kırmızı, Bilgen and Vahidi cultivars have higher oil and protein contents.

**Key words:** Pistachio, pollen, oil, protein.

**RESUME** - "Effets du pollen de différentes *Pistacia* spp. sur la teneur en protéine et en huile chez différentes noix de pistache". Dans cette expérience, on a étudié les effets du pollen de *P. vera*, *P. atlantica* et *P. terebinthus* sur les variétés de pistachiers Kırmızı, Siirt, Ohadi, Bilgen et Vahidi plantées à la Ferme d'Etat de Ceylanpınar. Dans ces recherches, les expériences en verger ont été réalisées pendant les saisons de plantation de 1989 et 1990, l'analyse des fruits ayant été achevée en 1991 à l'Université de Çukurova, Faculté d'Agriculture, laboratoires du Département d'Horticulture. Les résultats obtenus, concernant les effets de plusieurs pollens sur la teneur en protéine et en huile des noix, n'ont pas semblé stables. Cependant, les cultivars Kırmızı, Bilgen et Vahidi se sont montrés plus riches pour la teneur en huile et en protéine.

**Mots-clés :** Pistache, pollen, huile, protéine.

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### Introduction

Pistachio (*Pistacia vera* L.) is one of the most important tree nuts of Turkey. Pistachio nut tree called "tree of gold" or "green gold" and pistachio nut is known "King of Fruits, fruits of King".

Pistachio nut is quite important fruit in terms of nutrient values. It has high calorie because of oil, protein and carbohydrate contents. In addition to this, it is rich unsaturated oil acids which are called oleik and linoleik for human nutritious (Agar *et al.*, 1995b). It contains high level A and B1 (Thiamin) vitamins. It contains mineral matters high level such as calcium, iron, phosphorous and potassium (Sokraii, 1977).

According to Ak and Ünsal (1993), pistachio nut has 20-23.5% protein, 53.8-56.4% oil, 15.5-19% carbohydrate and 5.3% RH and it has 594-637 calorie in 100 g of average.

The main objective of this investigation was to find out effects of pollen which was got from *P. vera*, *P. atlantica* and *P. terebinthus* male trees, on Kırmızı, Siirt, Ohadi, Bilgen, Vahidi pistachio varieties.

### Material and method

This work is carried out in Ceylanpınar State Farm during 1989 and 1990. In the experiments Kırmızı, Siirt, Bilgen, Ohadi and Vahidi cv. budded on *P. vera* seedlings planted with 10 m x 10 m

distances between and on the rows in 1971 were used. In the pollination works pollen of selected males of *P. vera* L. (63-PV-3), *P. atlantica* Desf. (01-PA-4) and *P. terebinthus* L. (01-PT-5) were used.

In order to obtain nuts which are pollinated from different pollen sources, 3 tree from each cultivar were selected for each treatment and out of these 3, each tree was taken as a repetition. From the 4 directions of each tree one branch and 3 female flower clusters were bagged at stage 1 as it was suggested by Ülkümen (1945). When the majority of the female flowers were receptive they were pollinated by a hand duster. In the course of pollination the flowers on the non-receptive stage or the ones on the tip of the clusters were eliminated. Besides the pollinated branches some extra branches, were chosen and left open for natural pollination. The bags were kept on the trees until the stigmas of the flowers are completely dried. At harvest the nuts of different treatments were separately collected, dried and kept until chemical analyses were done.

Oil and protein contents were (percent as dry matter) analysed. Oil proportion (%) g/100 g using Soxhlet method (Anonymous, 1970), protein proportion (%) g/100 g were done by Kheltec method (Less, 1971).

## Results

### Protein contents

The protein contents of different pistachio varieties which are pollinated different pollen of *Pistacia* species, result of in 1989 were given Table 1. As it is seen in this Table the highest value (25.50%) was obtained from Kırmızı variety which is pollinated with *P. terebinthus* L. pollen.

Table 1. The protein content (%) of Kırmızı, Siirt and Ohadi Pistachio varieties pollinated with different *Pistacia* species in 1989

Source of pollen	Varieties			Average
	Kırmızı	Siirt	Ohadi	
<i>Pistacia vera</i>	25.13	23.13	22.50	23.59
<i>Pistacia atlantica</i>	21.00	21.50	20.63	21.04
<i>Pistacia terebinthus</i>	25.50	22.75	24.25	24.17
Natural pollination	24.25	20.75	20.88	21.96
Average	23.97	22.03	22.07	22.69

In 1990, the best result was obtained from Vahidi variety which is pollinated with *P. atlantica* (Table 2).

Table 2. The protein content (%) of Siirt, Ohadi, Bilgen and Vahidi pistachio varieties pollinated with different *Pistacia* species in 1990

Source of pollen	Varieties				Average
	Siirt	Ohadi	Bilgen	Vahidi	
<i>Pistacia vera</i>	21.88	23.75	27.50	25.63	24.69
<i>Pistacia atlantica</i>	22.88	14.50	19.38	27.75	21.13
<i>Pistacia terebinthus</i>	20.50	22.50	27.00	25.38	23.85
Natural pollination	21.38	19.00	24.63	20.37	21.35
Average	21.66	19.94	24.63	24.78	22.76

According to two years' results the values are not stable. General average was found 22.76% in 1990 and 22.69% in 1989.

## Oil contents

The oil contents of different pistachio varieties which are pollinated different pollen of *Pistacia* species, result of in 1989 were given Table 3. As it is seen in this Table the highest value (58.84%) was obtained from Kırmızı variety which is pollinated with *P. atlantica* Desf. pollen.

Table 3. The oil content (%) of Kırmızı, Siirt and Ohadi pistachio varieties pollinated with different *Pistacia* species in 1989

Source of pollen	Varieties			Average
	Kırmızı	Siirt	Ohadi	
<i>Pistacia vera</i>	56.07	51.70	51.75	53.17
<i>Pistacia atlantica</i>	58.84	50.96	48.35	52.72
<i>Pistacia terebinthus</i>	51.72	49.42	45.13	48.76
Natural pollination	50.25	50.17	48.12	49.51
Average	54.22	50.56	48.34	51.04

In 1990, The best result (53.66%) was obtained from Vahidi variety which is pollinated with *P. vera* (Table 4). It has been found that according to two years results oil content was 51% generally.

Table 4. The oil content (%) of Siirt, Ohadi, Bilgen and Vahidi pistachio varieties pollinated with different *Pistacia* species in 1990

Source of pollen	Varieties				Average
	Siirt	Ohadi	Bilgen	Vahidi	
<i>Pistacia vera</i>	52.07	51.07	50.36	53.66	51.79
<i>Pistacia atlantica</i>	49.02	52.89	53.12	51.64	51.67
<i>Pistacia terebinthus</i>	44.14	52.18	48.78	45.15	47.56
Natural pollination	50.74	55.05	54.72	52.56	53.27
Average	48.99	52.79	51.75	50.75	51.07

## Discussion

The effects of various pollen on the oil and protein contents of the nuts did not seem stable. Average oil and protein percentages of the varieties are shown in Table 5.

As it is seen Kırmızı, Bilgen and Vahidi are richer in oil and protein contents.

Table 5. Average oil and protein percentages of the varieties

Variety	Oil content (%)	Protein content (%)
Kırmızı	54.22	23.97
Siirt	49.78	21.85
Ohadi	50.57	21.01
Bilgen	51.75	24.63
Vahidi	50.75	24.78

Average oil and protein percentages of the pollen sources are shown in Table 6.

Table 6. Average oil and protein percentages of the pollen sources

Pollen source	Oil content (%)	Protein content (%)
<i>P. vera</i>	52.48	24.14
<i>P. atlantica</i>	52.20	21.09
<i>P. terebinthus</i>	48.16	24.01
Natural pollination	51.39	21.66

In this experiment pollen source was effected protein and oil content. According to results protein and oil content was somewhat higher with *P. vera* pollen.

Karaca and Nizamoğlu (1995) found that proportion of oil and protein was following as Kırmızı has 58.89% - 24.77% Siirt: 56.70% - 20.88, Ohadi: 58.97 - 23.22%, Vahidi: 55.67% - 21.77% respectively. When it is compared the result protein content of varieties were found lower except Siirt and Vahidi. Oil content of the varieties were lower when compared this results. According to Kamangar and Farsam (1977), Iranian Ohadi variety has 58.4% oil and 17.8% protein. But in this experiment Ohadi has 50.57% oil and 21.00% protein content of average.

As it is seen there are some differences between the varieties. This differences may be ecological conditions. Although Agar *et al.* (1995a) claimed that there is no any correlation between fat content and ecological conditions. Because, according to Schweizer *et al.* (1988) The fat content in plants are genetically controlled. But It can be changed when the ecology is different. Especially can be affected by temperatures (Fernández-Martínez *et al.*, 1986).

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