

**Fruit set and some fruit traits of Pistachio cultivars grown under rainfed conditions at Ceylanpinar State Farm**

Ak B.E.

X GREMPA Seminar

Zaragoza : CIHEAM  
Cahiers Options Méditerranéennes; n. 33

1998  
pages 217-223

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

<http://om.ciheam.org/article.php?IDPDF=98606190>

To cite this article / Pour citer cet article

Ak B.E. Fruit set and some fruit traits of Pistachio cultivars grown under rainfed conditions at Ceylanpinar State Farm. X GREMPA Seminar . Zaragoza : CIHEAM, 1998. p. 217-223 (Cahiers Options Méditerranéennes; n. 33)



<http://www.ciheam.org/>  
<http://om.ciheam.org/>

## Fruit set and some fruit traits of Pistachio cultivars grown under rainfed conditions at Ceylanpınar State Farm

B.E. Ak

University of Harran, Faculty of Agriculture, Department of Horticulture,  
63200 Şanlıurfa, Turkey

---

**SUMMARY** - This research was conducted at Ceylanpınar State Farm. In this farm there are different Pistachio cultivars such as Kırmızı, Siirt, Ohadi, Mümtaz, Vahidi, etc. Five trees of each cultivar were selected during "on" years. Four fruiting branches were selected at different sides of the tree. In these branches, the first two clusters were harvested totalling eight clusters per tree. Fruit number, fruit weight, fruit number per cluster, and percentage of dehiscence, blank and filled nuts were determined.

**Key words:** Pistachio, fruit traits, dehiscence, blank, cluster, variety.

**RESUME** - "Mise à fruit ainsi que quelques caractéristiques du fruit pour les cultivars de pistachier cultivés sans irrigation à la Ferme d'Etat de Ceylanpınar". Cette étude a été menée à la Ferme d'Etat de Ceylanpınar. Dans cette ferme, il y a différents cultivars de pistachier tels que Kırmızı, Siirt, Ohadi, Mümtaz, Vahidi, etc. Cinq arbres de chaque cultivar ont été sélectionnés pendant les années productives du cycle alternant. Quatre branches avec fruits ont été choisies sur quatre côtés différents. Dans ces branches, on a pris les deux premières grappes, soit au total huit grappes, par arbre récolté. On a déterminé le nombre de fruits, le poids des fruits, nombre de fruits par grappe, ainsi que les pourcentages de déhiscence, de noix vides et pleines.

**Mots-clés :** Pistache, caractéristiques du fruit, déhiscence, vide, grappe, variété.

---

### Introduction

In Turkey and some other Near East countries the pistachio nut tree is called "tree of gold" or "green gold" because of the high profits it yields. But the most important value of the tree comes from its ability to grow in poor soils and dry climate conditions without irrigation (Ayfer, 1964).

In some desert and transitional areas pistachio trees are irrigated. California, Iran and Israel are examples of such areas. During the next five years new and irrigated pistachio orchards in the South East Anatolia Project region (GAP) will expand Turkey's pistachio nut areas. When the project is completed the arid soils of the region will be irrigated thus making it possible to increase the volume of output. It is only due to this project that the annual production of 100,000 tons of pistachio nut is expected (Kaşka, 1990).

There are some effective factors to get high yield. These are pollination and fecundation (Ak, 1992; Kuru, 1995), variety (Karaca and Nizamoğlu, 1995; Tekin and Akkök, 1995), rootstock (Ulusaraç and Karaca, 1995), irrigation (Monastra *et al.*, 1995), fertilization (Tekin *et al.*, 1995), pest and disease management (Michailides *et al.*, 1995), etc.

The aim of this experiment was to make comparison between pistachio varieties which are grown under rainfed conditions at Ceylanpınar State Farm. The Comparison was made on some traits such as, fruit set (eight clusters) at per tree, fruit set per cluster, fresh fruit weight, fruit dehiscence, filled nuts and blank nuts.

### Materials and methods

*The place:* This experiment was conducted at Ceylanpınar State Farm's Pistachio Orchards during 1992-94 years.

Growing under unirrigated conditions. Elevation is 397 m from sea level. Some climatic features were given Table 1.

*Varieties:* Kırmızı, Siirt, Ohadi, Bilgen, Vahidi and Mümtaz.

*Plantation:* The varieties 25 years old and planted 10 m x 10 m.

*Rootstock:* *Pistacia vera* seedlings.

*Experimental design:* 5 tree selected "on" year each variety 4 branches tagged per tree 2 clusters near to tip of shoots were chosen.

*The observations:* (i) fruit set (8 clusters) at per tree; (ii) fruit set per cluster; (iii) fruit weight (g); (iv) whole cluster weight (g); (v) fruit dehiscence (%); (vi) filled nuts (%) and (vii) blank nut (%).

Table 1. Monthly averages of some important climatic factors of the Ceylanpınar State Farm (1992-1994)

Months	Min. temp. (°C)	Max. temp. (°C)	Mean temp. (°C)	Relative hum. (%)	Precipitation (mm)
January	-0.0	10.7	4.7	70.4	54.2
February	0.2	10.7	4.8	68.8	62.0
March	2.5	17.2	9.4	61.6	20.3
April	8.0	24.2	16.1	60.2	28.9
May	12.2	28.7	21.1	56.5	54.1
June	16.2	37.5	27.9	38.6	0.9
July	19.2	41.1	31.4	37.6	0.0
August	19.4	42.1	31.1	36.8	0.1
September	14.4	37.5	26.1	35.8	2.0
October	9.7	32.7	20.1	45.6	19.5
November	2.7	20.3	10.3	72.0	54.7
December	-1.3	12.6	5.6	76.5	32.2

## Result and discussion

### Fruit set

Main pistachio varieties are Kırmızı and Siirt in Turkey. Kırmızı have been used as variety many years ago. Nowadays Siirt variety have been become common variety. Some of the Iranian varieties such as Ohadi, Vahidi and Mümtaz had been budded at the years of 1975-77.

The number of fruits per cluster was given Table 2. According to this table, average number of fruits among varieties was found statistically different from each other. The best fruit set was obtained Kırmızı variety. The lowest (8.52) fruit set per cluster obtained in Vahidi variety. Beside of these, fruit number per cluster among the certain years was obtained different each other.

Total fruit number at eight clusters was changed between 68.13-205.80 (Table 3).

There are differences among the years as statistically. The number of fruits in all the varieties but Kırmızı were found low in 1993. As a result number of fruits at eight clusters were better in Kırmızı, Ohadi and Siirt variety respectively.

Table 2. The number of fruit per cluster<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	24.53	25.90	26.75	25.73 <sup>a</sup>
Siirt	19.88	16.63	15.75	17.42 <sup>b</sup>
Ohadi	18.78	17.45	22.23	19.48 <sup>b</sup>
Bilgen	15.63	14.00	13.23	14.29 <sup>c</sup>
Vahidi	9.15	5.38	11.03	8.52 <sup>d</sup>
Mümtaz	10.25	9.83	13.38	11.15 <sup>d</sup>
Average	16.37 <sup>ab</sup>	14.87 <sup>b</sup>	17.06 <sup>a</sup>	15.36

<sup>†</sup>LSD<sub>5%</sub> (variety): 2.63; LSD<sub>5%</sub> (year): 1.86; LSD<sub>5%</sub> (variety x year): non significant  
a,b,c,d: Values marked with different letters are significantly different

Table 3. Total fruit number at eight cluster<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	196.20	207.20	214.00	205.80 <sup>a</sup>
Siirt	159.00	133.00	126.00	139.33 <sup>b</sup>
Ohadi	150.20	139.60	177.80	155.87 <sup>b</sup>
Bilgen	125.00	112.00	105.80	114.27 <sup>c</sup>
Vahidi	73.20	43.00	88.20	68.13 <sup>e</sup>
Mümtaz	82.00	78.60	107.00	89.20 <sup>d</sup>
Average	130.93 <sup>ab</sup>	118.90 <sup>b</sup>	136.47 <sup>a</sup>	121.82

<sup>†</sup>LSD<sub>5%</sub> (variety): 21.00; LSD<sub>5%</sub> (year): 14.85; LSD<sub>5%</sub> (variety x year): non significant  
a,b,c,d: Values marked with different letters are significantly different

## Weight

Total weight (fruits and pieces of clusters) were recorded when the clusters taken from trees (Table 4). According to Table 4 average total weight were changed between 209.10-430.62 g. Kırmızı was the best with 430.62 g.

Table 4. Total weight (fruit + pieces of clusters)<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	430.38	381.04	480.44	430.62 <sup>a</sup>
Siirt	443.71	346.30	328.82	372.94 <sup>b</sup>
Ohadi	371.16	246.63	354.82	324.20 <sup>b</sup>
Bilgen	463.37	320.19	326.98	370.18 <sup>b</sup>
Vahidi	256.75	116.73	253.83	209.10 <sup>c</sup>
Mümtaz	260.68	191.25	336.36	262.76 <sup>c</sup>
Average	371.01 <sup>a</sup>	267.02 <sup>b</sup>	346.88 <sup>a</sup>	328.30

<sup>†</sup>LSD<sub>5%</sub> (variety): 56.93; LSD<sub>5%</sub> (year): 40.26; LSD<sub>5%</sub> (variety x year): non significant  
a,b,c: Values marked with different letters are significantly different

Total fruit weight at eight clusters were given Table 5. According to average of three years' result, Kırmızı variety was better than others. Total fruit weight was changed between 390.02-185.71 g. The years was different from each other statistically, because of number of fruit at eight clusters.

Table 5. Total fruit weight at eight cluster<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	380.00	347.07	442.43	390.02 <sup>a</sup>
Siirt	405.46	305.81	301.69	337.65 <sup>ab</sup>
Ohadi	345.93	224.11	334.89	301.64 <sup>b</sup>
Bilgen	437.01	292.76	310.33	346.70 <sup>ab</sup>
Vahidi	229.05	96.03	232.04	185.71 <sup>d</sup>
Mümtaz	235.74	166.85	316.51	239.70 <sup>c</sup>
Average	338.96 <sup>a</sup>	238.77 <sup>b</sup>	322.65 <sup>a</sup>	300.10

<sup>†</sup>LSD<sub>5%</sub> (variety): 53.63; LSD<sub>5%</sub> (year): 37.93; LSD<sub>5%</sub> (variety x year): 93.00  
a,b,c,d: Values marked with different letters are significantly different

The single fruit weight was changed between 1.89-3.02 g averagely (Table 6). The lowest value was obtained Kırmızı variety. That means the fruit dimension of Kırmızı is very small. However the largest fruits have determined Bilgen variety.

Table 6. The single fruit weight<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	1.91	1.69	2.06	1.89 <sup>d</sup>
Siirt	2.52	2.30	2.43	2.42 <sup>c</sup>
Ohadi	2.32	1.61	1.89	1.94 <sup>d</sup>
Bilgen	3.48	2.63	2.94	3.02 <sup>a</sup>
Vahidi	3.13	2.21	2.68	2.67 <sup>b</sup>
Mümtaz	2.89	2.13	2.97	2.66 <sup>b</sup>
Average	2.71 <sup>a</sup>	2.10 <sup>c</sup>	2.49 <sup>b</sup>	2.44

<sup>†</sup>LSD<sub>5%</sub> (variety): 0.17; LSD<sub>5%</sub> (year): 0.12; LSD<sub>5%</sub> (variety x year): 0.29  
a,b,c,d: Values marked with different letters are significantly different

Cluster weight was determined after separating the fruits (Table 7). The obtained average results either varieties or years were calculated different from each other statistically. The weight of clusters in Kırmızı variety was higher than the others. Kırmızı was 40.60 g, Siirt was 37.90 g, the other varieties were about 22-23 g.

## Rates of split nuts

Percentage of split nuts were determined (Table 8). Splitting rates were changed among the years and the varieties. According to results, the best (66.49%) splitting rate was obtained from Siirt variety. Among the varieties the lowest rate (32.40%) was obtained Vahidi. Generally Iranian varieties known high percentage of splitting (Karaca and Nizamoğlu, 1995). But under this conditions it grows unirrigated area. Splitting rate will be high when the varieties grown under irrigated conditions.

Table 7. Eight cluster's weight (g)<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	49.82	33.97	38.01	40.60 <sup>a</sup>
Siirt	44.25	40.50	27.13	37.90 <sup>a</sup>
Ohadi	25.23	22.52	19.93	22.56 <sup>b</sup>
Bilgen	26.36	27.43	16.65	23.48 <sup>b</sup>
Vahidi	27.20	20.69	21.80	23.40 <sup>b</sup>
Mümtaz	24.94	24.40	19.85	23.06 <sup>b</sup>
Average	33.05 <sup>a</sup>	28.25 <sup>b</sup>	23.90 <sup>c</sup>	28.37

<sup>†</sup>LSD<sub>5%</sub> (variety): 3.83; LSD<sub>5%</sub> (year): 2.70; LSD<sub>5%</sub> (variety x year): 6.65

a,b,c: Values marked with different letters are significantly different

Table 8. Rates of split nuts (%)<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	57.98	31.37	42.10	43.82 <sup>b</sup>
Siirt	79.49	64.69	55.29	66.49 <sup>a</sup>
Ohadi	76.56	41.96	22.52	47.01 <sup>b</sup>
Bilgen	75.01	36.93	13.72	41.89 <sup>b</sup>
Vahidi	38.46	55.53	3.22	32.40 <sup>c</sup>
Mümtaz	82.79	57.95	32.22	57.65 <sup>a</sup>
Average	68.38 <sup>a</sup>	48.07 <sup>b</sup>	28.18 <sup>c</sup>	48.21

<sup>†</sup>LSD<sub>5%</sub> (variety): 9.30; LSD<sub>5%</sub> (year): 6.57; LSD<sub>5%</sub> (variety x year): 16.15

a,b,c: Values marked with different letters are significantly different

### Rates of blank nuts

Blank nut is undesirable for pistachio. It is not important economically. That means empty fruit. It is depend on pollination. Percentage of blank nuts were given Table 9.

Table 9. Rates of blank nuts (%)<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	9.12	12.28	14.28	11.89 <sup>ab</sup>
Siirt	9.04	14.97	10.24	11.42 <sup>ab</sup>
Ohadi	7.00	10.93	19.15	12.36 <sup>ab</sup>
Bilgen	3.54	9.00	7.37	6.64 <sup>b</sup>
Vahidi	5.10	8.25	38.46	17.27 <sup>a</sup>
Mümtaz	8.63	12.17	28.27	16.36 <sup>a</sup>
Average	7.07 <sup>b</sup>	11.27 <sup>b</sup>	19.63 <sup>a</sup>	12.66

<sup>†</sup>LSD<sub>5%</sub> (variety): 6.31; LSD<sub>5%</sub> (year): 4.46; LSD<sub>5%</sub> (variety x year): 10.97

a,b: Values marked with different letters are significantly different

As it is seen in this table, blank nut rates was changed among the years and the varieties. The best result that means the lowest blank (6.64%) nut rate was obtained Bilgen variety. Vahidi has very high empty fruits. In fact the obtained average blank nut rates are low when compared Kerman variety which is grown California (Crane and Iwakiri, 1981). However, Crane and Iwakiri (1981), determined that blank nut rate can be change from year to year.

### Rates of filled nuts

In pistachios seeded fruits have economic importance. Because of this reason, filled nuts are important. Rates of filled nuts were given Table 10. Percentage of filled nuts have been changed among the years. The best average results was obtained in 1992. However, filled nuts rates were changed among the varieties. The best result (93.36%) was obtained Bilgen.

Table 10. Rates of filled nuts (%)<sup>†</sup>

Varieties	Years			Average
	1992	1993	1994	
Kırmızı	90.88	87.72	85.72	88.11 <sup>abc</sup>
Siirt	90.96	85.03	89.76	88.58 <sup>ab</sup>
Ohadi	93.00	89.07	80.85	87.64 <sup>abc</sup>
Bilgen	96.46	91.00	92.63	93.36 <sup>a</sup>
Vahidi	94.90	91.75	61.54	82.73 <sup>c</sup>
Mümtaz	91.37	87.83	71.73	83.64 <sup>bc</sup>
Average	92.93 <sup>a</sup>	88.73 <sup>b</sup>	80.37 <sup>c</sup>	87.34

<sup>†</sup>LSD<sub>5%</sub> (variety): 6.37; LSD<sub>5%</sub> (year): 4.50; LSD<sub>5%</sub> (variety x year): 11.06  
a,b,c: Values marked with different letters are significantly different

Result of this research some of the varieties are very suitable to produce good yield in this conditions. As it is known adaptability experiments should be done before recommend to extension (Spiegel-Roy *et al.*, 1972). Of course these features may be change when the conditions were changed. Under irrigated conditions these values will be changed (Spiegel-Roy *et al.*, 1977). Because of this reason this experiment should be run under irrigated conditions as well. Some researchers mentioned that split rate may affected by rootstocks (Crane, 1975; Crane and Iwakiri, 1986), and may be change from year to year (Crane and Iwakiri, 1981). Similar things are valid for blank fruits as well (Crane, 1975).

### References

- Ak, B.E. (1992). *Effects of pollens of different Pistacia species on the nut set and quality of pistachio nuts*. PhD Thesis, University of Çukurova, Faculty of Agriculture, Adana Turkey, p.211, (in Turkish).
- Ayfer, M. (1964). *Pistachio nut culture and its problems with special reference to Turkey*. Univ. Ankara, Faculty of Agriculture, Yearbook, pp. 189-217.
- Crane, J.C. (1975). The role of seed abortion and parthenocarpy in the production of blank pistachio nuts as affected by rootstock. *J. Amer. Soc. Hort. Sci.*, 100(3): 267-270.
- Crane, J.C. and Iwakiri, B.T. (1981). Morphology and reproduction of pistachio. *Hort. Rew.*, 3: 376-393.
- Crane, J.C. and Iwakiri, B.T. (1986). Pistachio yield and quality as affected by rootstock. *HortScience*, 21(5): 1139-1140.

- Karaca, R. and Nizamoglu, A. (1995). Quality characteristics of Turkish and Iranian pistachio cultivars grown in Gaziantep. First International Symposium on Pistachio Nut, Adana, Turkey, September, 20-24, 1994, *Acta Horticulture*, 419: 307-312.
- Kaşka, N. (1990). *Pistachio research and development in the Near East, North Africa and Southern Europe*. Nut Production and Industry in Europe, Near East and North Africa. REUR Technical Series, 13: 133-160.
- Kuru, C. (1995). Artificial pollination of pistachio trees under insufficient pollination conditions. First International Symposium on Pistachio Nut, Adana, Turkey, September, 20-24, 1994, *Acta Horticulture*, 419: 121-123.
- Michailides, T.J., Morgan, D.P. and Doster, M.A. (1995). Diseases of pistachio in California and their significance. First International Symposium on Pistachio Nut, Adana, Turkey, September, 20-24, 1994, *Acta Horticulture*, 419: 337-343.
- Monastra, F., Avanzato, D., Martelli, S. and Dascanio, R. (1995). Pistachio trial under different volumes of irrigation in Italy. First International Symposium on Pistachio Nut, Adana, Turkey, September, 20-24, 1994, *Acta Horticulture*, 419: 249-252.
- Spiegel-Roy, P., Assaf, R. and Garmi, I. (1972). Essais d'acclimattion et de culture du pistachier (*Pistacia vera*) en Israel. *Fruits*, 27(9): 619-625.
- Spiegel-Roy, P., Mazigh, D. and Evenari, M. (1977). Response of Pistachio to low soil moisture conditions. *J. Amer. Soc. Hort. Sci.*, 102(4): 470-473.
- Tekin, H. and Akkök, F. (1995). Selection of pistachio nut and their comparison to Turkish standard varieties. First International Symposium on Pistachio Nut, Adana, Turkey, September, 20-24, 1994, *Acta Horticulture*, 419: 287-292.
- Tekin, H., Güzel, N. and Ibrikli, H. (1995). Influence of manure and inorganic fertilizers on growth, yield and quality of pistachios in Southeastern Turkey. First International Symposium on Pistachio Nut, Adana, Turkey, September, 20-24, 1994, *Acta Horticulture*, 419: 129-134.
- Ulusaraç, A. and Karaca, R. (1995). Rootstock selection for pistachio nut (*Pistacia vera* L.) varieties. First International Symposium on Pistachio Nut, Adana, Turkey, September, 20-24, 1994, *Acta Horticulture*, 419: 293-298.