

PRELIMINARY RESULTS OF DIFFERENT PISTACHIO CULTIVARS GROWN UNDER IRRIGATED CONDITIONS

B.E. Ak
Harran Univ., Faculty of Agriculture
Department of Horticulture, Sanliurfa
Turkey

N. Kaska
Sutcuimam Univ., Faculty of Agriculture
Department of Horticulture, Kahramanmaras
Turkey

I. Acar
Pistachio Research Institute
P.O. Box 32, 27001 Gaziantep
Turkey

A. İkinci
Harran Univ., Faculty of Agriculture
Department of Horticulture, Kahramanmaras
Turkey

Keywords: *Pistacia*, pistachio, adaptation, cultivar, type, irrigated conditions.

Abstract

In our country there are many pistachio cultivars and types. This project is a comparison of the bearing age, yield, and quality characteristics of our standard domestic cultivars and foreign cultivars under irrigated conditions at the Ceylanpinar State Farm. Budding success, rootstock development, scion and shoot growth, flowering period and fruiting were determined. Differences in the above parameters were noted among the cultivars.

1. Introduction

Turkey is one of the main pistachio producing countries in the world. Pistachio (*Pistacia vera* L.) is the only edible species out of 11 species in the genus *Pistacia*. Due to specific ecological demands, this species can grow in limited areas of the world. Pistachios have grown wild in Afghanistan, North India, Iran, Turkey, Syria, and other Near East and North Africa countries for centuries (Ak, 1992).

The major pistachio producing countries are Iran, the USA, in California's Central Valley, Turkey and Syria. Iran is the largest producer with 56% of the production in the world (Ak and Acar, 1998). The second largest producer is the USA, and Turkey is third.

Pistachios have been grown in Turkey for over one thousand years and it has one of the largest pistachio germplasm collections in the world. There are two different methods of orchard establishment in Turkey; the first is budding wild trees and the second is planting seedlings (Kaska, 1990).

The best pistachio production areas in Turkey have hot and dry weather during the summer and low annual precipitation, but there is no irrigation in pistachio orchards. For these reasons, seedling growth is very slow, and budding may be only done when pistachio trees are 8-10 years old. Pistachio trees can grow in stony, rocky, calcareous, poor arid soils. They can be adapted to soils where other trees cannot be grown (Kaska, 1990).

Pistachio production is primarily in the Sanliurfa, Gaziantep and Adiyaman provinces of Turkey. These provinces are located in the GAP (Southeastern Anatolia Project) region, producing 87.88 % of total Turkish production (Ak *et al.*, 1999). New and irrigated pistachio orchards in the GAP region will expand Turkey's pistachio production areas. When the project is completed, the arid soils of the region will be irrigated, thus making it possible to increase production (Kaska, 1995).

There are many pistachio cultivars and types in Turkey. In this study, the best cultivars or types will be determined with respect to yield and quality under irrigated conditions.

2. Materials and methods

This experiment was conducted at Ceylanpinar State Farm in Sanliurfa. There is a research centre called CEYTAM at the farm. The experimental orchard was established in 1992 with *P. vera* cv. 'Siirt' seedlings at a planting distance of 6 x 6 m. Budding started in 1995 by T budding.

In this study 25 domestic cultivars and types, and 11 foreign cultivars were budded. Domestic cultivars and types are 'Siirt', 'Kirmizi', 'Uzun', 'Halebi', 'Keten Gomlegi', 'Degirmi', 'Sultani', 'Beyazben', 'Cakmak', and 16 types were selected by the Pistachio Research Institute in Gaziantep in Turkey (Sel-1, Sel-2, Sel-3, Sel-4, Sel-5, Sel-6, Sel-7, Sel-8, Sel-9, Sel-10, Sel-11, Sel-12, Sel-13, Sel-14, Sel-15 and Sel-16). Foreign cultivars are 'Bilgen', 'Haci Reso', 'Ohadi', 'Sefidi', 'Mumtaz', 'Vahidi', 'Kallaghochi', 'Kerman', 'Tardivadis', 'Gialla' and M1 (male).

Pistachio trees were irrigated by sprinkler irrigation throughout 1992-1999, and they have been irrigated by drip irrigation since 1999. Tree growth, phenological stages, bearing age (juvenility) and pomological traits were determined in the experiment.

3. Results

3.1. Tree growth

Tree growth was measured at fall as rootstock diameter, stem diameter and shoot length in 1998, 1999 and 2000. The values for the year 2000 are discussed (Table 1). Rootstock diameter oscillated from 45.80 to 69.55 mm. The largest rootstock diameters, 69.55 and 69.38 mm, were obtained in 'Bilgen' and 'Ohadi' cultivars. The lowest values, 45.80 and 46.28 mm, were obtained in Sel-12 and 'Beyazben'.

Stem diameter varied from 36.19 to 65.38 mm. The largest stem diameters, 65.38 and 65.23 mm, were observed in 'Siirt' and 'Kallaghochi'. The lowest value, 36.19 mm, was obtained in 'Beyazben'.

Shoot length varied from 36.68 to 75.29 cm. The largest shoot length, 75.29 cm, was observed in 'Kallaghochi'. The lowest values, 36.68 and 36.83 cm, were obtained in Sel-3 and Sel-12.

3.2. Phenological observations

The phenological stages observed were bud swelling, bud bursting, first blooming, full blooming, end of blooming and blooming period (days) on trees that had been bearing since 1999 (Table 2, 3 and 4). As seen in the Tables, blooming can vary from year to year depending on the weather conditions.

3.3. Bearing age (juvenility)

Cultivars and types budded in 1995, started to bear as follows: 'Siirt', Sel-1 and Sel-4 in 1997; 'Haci Reso', 'Sefidi', Sel-2, Sel-5 and 'Kallaghochi' in 1998; 'Ohadi' in 1999; 'Mumtaz', 'Vahidi' and 'Bilgen' in 2000 and 'Kerman' in 2001.

3.4. Pomological traits

Weight and dimension of dehulled fruit and kernel were measured. (Table 5). Dehulled fruit: Fruit weight varied from 0.953 ('Mumtaz') to 2.650 g ('Vahidi'). Fruit length varied from 17.23 ('Mumtaz') to 21.00 mm (Sel-1). Fruit width varied from 11.76 ('Sefidi') to 14.07 mm ('Vahidi'). Fruit thickness varied from 10.98 ('Mumtaz') to 13.59 mm ('Vahidi').

Kernel weight varied from 0.381 ('Mumtaz') to 0.732 g ('Vahidi'). Kernel length varied from 12.80 ('Mumtaz') to 16.62 mm ('Siirt'). Kernel width varied from 7.70

('Mumtaz) to 9.77 mm ('Vahidi'). Kernel thickness varied from 7.00 ('Mumtaz') to 9.32 mm ('Vahidi').

4. Discussion

Pistachio trees have long been grown under unirrigated conditions in Turkey. Performance of domestic and foreign cultivars and types have been determined under irrigated conditions with this project. Of particular importance is the fact that the juvenile period of some pistachio cultivars may be shortened with irrigation.

'Siirt' and 'Ohadi' cultivars started bearing 6 years after budding and 'Uzun' started bearing 9 years after budding under unirrigated conditions in Turkey (Arpaci *et al.*, 1997). In this study, 'Siirt' cultivar, and Sel-1 and Sel-4 types started bearing 2 years after budding under irrigated conditions.

Other domestic cultivars have not started bearing since 1995. Under both irrigated and unirrigated conditions the juvenile period of domestic cultivars is generally long.

Acknowledgements

This project was supported by TUBITAK (The Scientific and Technical Research Council of Turkey). Project Number is TARP 1894.

References

- Ak B.E., 1992. Degisik *Pistacia* Türlerine Ait Cicek Tozlarının Antepfistiklerinde Meyve Tutumu ve Meyvelerin Kaliteleri Uzerine Etkileri. C.U. Fen Bilimleri Enstitüsü Müdürlüğü, Bahçe Bitkileri Anabilim Dalı Doktora Tezi. C.U. Fen Bilimleri Enstitüsü Yayın Kod No: 188. Adana. 210 s.
- Ak B.E. and. Acar I., 1998. Pistachio production and cultivated varieties grown in Turkey. IPGRI-JUST International Workshop on Pistachio, 14-17 December, 1998, Jordan (in press).
- Ak B.E., Kaska N. and Acar I., 1999. Dünyada ve GAP Bolgesi'nde Antepfistigi (*Pistacia vera* L.) Üretimi, Yetistirme ve Isleme Yontemlerinin Karsilastirilmesi. GAP 1. Tarım Kongresi, 26-28 Mayıs 1999, Sanliurfa, 19-28.
- Arpaci S., Atli H.S., Tekin H. and Uygur N., 1997. Kuru kosullarda antepfistiklerinde degisik sira üzeri mesafeli dikimlerde gelisme, verim ve bazi kalite ozelliklerinin incelenmesi. Sonuc Raporu. Antepfistigi Arastirma Enstitüsü Yay. No: 8, Gaziantep.
- Kaska N., 1990. Pistachio research and development in the Near East, North Africa and Southern Europe. Nut Production Industry in Europe, Near East and North Africa. Reur Technical Series 13, 133-160.
- Kaska N., 1995. Pistachio nut growing in Turkey. Acta Hort. 419: 161-164.

Table 1. Tree growth of rootstocks and scions

Cultivars	1998			1999			2000		
	Rootstock diameter mm	Stem diameter mm	Shoot length cm	Rootstock diameter mm	Stem diameter mm	Shoot length cm	Rootstock diameter mm	Stem diameter mm	Shoot length cm
Siirt	42.81	45.00	46.45	50.87	50.92	31.84	60.83	65.38	46.18
Kirmizi	45.88	33.16	49.70	48.49	42.32	34.79	61.41	50.66	51.14
Bilgen	49.56	42.26	56.03	56.66	52.19	39.12	69.55	61.57	56.69
Haci Reso	48.24	44.98	44.26	53.83	53.92	40.87	66.20	65.42	56.10
Ohadi	49.27	41.67	63.34	56.04	49.21	44.03	69.38	61.00	72.25
Kerman	36.37	30.13	44.83	42.22	37.10	24.71	50.85	43.16	51.56
Sefidi	42.49	40.66	55.33	50.07	48.50	31.83	62.94	58.22	68.33
Mumtaz	42.19	35.89	56.40	50.99	46.01	30.28	65.26	59.47	51.85
Vahidi	41.53	31.17	54.34	52.50	44.69	36.34	66.82	56.55	56.53
Sel-1	46.48	46.31	48.56	57.74	58.49	39.25	59.85	62.33	55.56
Sel-2	40.39	36.71	51.28	49.12	45.73	32.53	55.83	52.93	53.18
Sel-3	39.33	27.08	39.54	43.29	33.92	24.25	51.34	42.57	36.68
Sel-4	44.74	40.57	62.51	50.58	46.41	40.71	59.64	56.57	55.05
Sel-5	48.56	45.94	57.57	55.59	54.90	40.04	65.54	60.89	50.61
Sel-6	41.11	36.87	42.53	47.83	44.05	35.84	54.05	41.23	40.23
Sel-7	37.00	29.23	32.38	39.93	34.44	40.42	59.90	59.25	45.13
Sel-8	34.19	23.96	45.33	40.51	30.86	22.83	61.41	53.01	38.67
Sel-9	43.71	32.10	53.93	48.92	37.84	31.39	59.04	45.66	43.14
Sel-10	41.62	31.62	44.32	47.06	38.49	34.53	56.02	48.43	46.56
Sel-11	42.21	36.28	49.03	50.04	43.51	35.25	57.74	52.21	47.95
Sel-12	38.99	31.22	42.46	40.74	39.17	34.17	45.80	40.72	36.83
Sel-13	35.44	29.26	42.55	44.99	34.06	30.15	52.58	46.73	49.80
Sel-14	40.66	28.29	43.46	43.81	33.43	34.14	55.45	44.45	52.90
Sel-15	36.45	23.35	43.82	40.83	31.55	33.45	47.01	38.31	45.58
Sel-16	42.37	34.65	52.45	46.18	39.70	36.61	56.05	47.86	49.60
Cakmak	45.23	33.66	46.48	50.75	40.62	30.18	59.00	49.76	49.98
Kallaghochi	47.53	41.89	64.11	55.74	52.03	44.43	66.00	65.23	75.29
Halebi	42.85	37.08	52.08	48.49	43.35	35.90	54.69	50.23	53.93
K. Gomlegi	36.84	25.95	41.60	43.90	35.38	41.96	48.90	38.68	51.20
Degirmi	36.07	28.72	38.52	42.10	38.94	32.50	47.06	41.95	52.38
Beyazben	34.95	22.84	41.24	38.01	29.83	29.90	46.28	36.19	46.00
Sultani	43.28	28.45	44.54	46.00	34.56	36.73	57.57	48.43	62.38
Uzun	41.55	31.49	45.58	45.65	37.35	33.90	51.39	41.15	53.88
M-1	37.87	22.84	43.13	39.35	31.09	39.75	49.69	45.14	48.88
Tardivadis	37.25	38.62	59.25	39.25	41.00	32.25	49.23	50.60	52.5
Gialla	48.74	28.04	69.00	49.55	51.96	46.13	63.12	43.29	48.62

Table 2. Phenological observations on different pistachio cultivars in 1999

Cultivar	Bud swelling	Bud bursting	First blooming	Full blooming	End of blooming	Blooming period (days)
Siirt	25.03	01.04	09.04	16.04	22.04	14
Haci Reso	01.04	08.04	10.04	19.04	24.04	15
Sefidi	31.03	07.04	12.04	18.04	23.04	12
Sel-1	29.03	05.04	11.04	15.04	19.04	9
Sel-2	01.04	07.04	12.04	18.04	22.04	11
Sel-4	01.04	08.04	16.04	20.04	22.04	7
Sel-5	01.04	08.04	16.04	19.04	22.04	7
Ohadi	31.03	05.04	19.04	22.04	25.04	7
Kallaghochi	03.04	09.04	17.04	22.04.1999	25.04	9

Table 3. Phenological observations on different pistachio cultivars in 2000

Cultivar	Bud swelling	Bud bursting	First blooming	Full blooming	End of Blooming	Blooming period (days)
Siirt	25.03	01.04	09.04	12.04	18.04	10
Bilgen	01.04	09.04	14.04	19.04	23.04	10
Haci Reso	30.03	05.04	09.04	12.04	19.04	11
Sefidi	25.03	01.04	08.04	12.04	19.04	12
Sel-1	26.03	01.04	09.04	12.04	17.04	9
Mumtaz	01.04	07.04	12.04	19.04	24.04	13
Vahidi	01.04	09.04	14.04	20.04	25.04	12
Sel-2	28.03	02.04	09.04	12.04	18.04	10
Sel-4	27.03	01.04	06.04	12.04	19.04	14
Sel-5	27.03	02.04	07.04	12.04	17.04	11
Ohadi	01.04	09.04	12.04	16.04	21.04	10
Kallaghochi	01.04	09.04	11.04	14.04	21.04	11

Table 4. Phenological observations on different pistachio cultivars in 2001

Cultivar	Bud swelling	Bud bursting	First blooming	Full blooming	End of blooming	Blooming period (days)
Siirt	21.03	24.03	28.03	31.03	08.04	12
Bilgen	29.03	03.04	07.04	11.04	15.04	9
Haci Reso	21.03	26.03	31.03	04.04	10.04	11
Sefidi	20.03	25.03	29.03	05.04	08.04	11
Sel-1	21.03	25.03	31.03	04.04	09.04	10
Mümtaz	29.03	01.04	06.04	09.04	13.04	8
Vahidi	29.03	04.04	09.04	12.04	15.04	7
Sel-2	22.03	25.03	28.03	31.03	08.04	12
Sel-4	22.03	26.03	29.03	01.04	09.04	12
Sel-5	23.03	26.03	28.03	01.04	09.04	13
Ohadi	21.03	28.03	01.04	06.04	11.04	12
Kallaghochi	24.03	29.03	04.04	06.04	12.04	9
Kerman	24.03	29.03	09.04	12.04	14.04	6

Table 5. Some pomological traits of pistachio cultivars in 2000

Cultivar	Dehulled fruit				Kernel			
	Weight g	Length mm	Width mm	Thickness mm	Weight g	Length Mm	Width mm	Thickness mm
Siirt	1.440	20.40	12.23	11.98	0.607	16.62	8.86	8.93
Sel-1	1.588	21.00	13.22	11.93	0.624	16.33	8.20	8.30
Sel-2	1.331	19.90	12.16	11.72	0.565	15.67	8.01	7.82
Sel-5	1.424	19.47	12.13	12.10	0.508	15.81	7.76	7.50
Haci Reso	1.400	20.14	12.05	11.90	0.560	16.14	8.65	8.35
Sefidi	1.360	19.47	11.76	11.69	0.560	15.80	8.22	7.34
Sel-4	1.404	20.39	12.44	11.87	0.504	16.26	8.15	7.82
Kallaghochi	1.411	20.02	13.96	12.32	0.505	15.01	8.81	7.20
Bilgen	1.383	19.66	13.35	12.38	0.680	16.33	9.04	8.83
Vahidi	2.650	19.88	14.07	13.59	0.732	16.22	9.77	9.32
Mumtaz	0.953	17.23	12.04	10.98	0.381	12.80	7.70	7.00