

Effect of Different Environments on Fruit Characteristics of Table Fig (*Ficus carica* L.) Cultivars

A. A. Polat, and O. Caliskan

Department of Horticulture, Faculty of Agriculture, Mustafa Kemal University, Turkey

Abstract: We conducted a study to determine the effect of different environment on fruit characteristics of table fig cultivars. Six fig cultivars were studied: Bursa Siyahı, Yediveren, Göklop, Sarı Zeybek, Morgüz and Yeşilgüz planted in two fields in East Mediterranean, Turkey. Two trials were established; one trial at Kirikhan Fruit Experimental Station, 103 m.a.s.l., and one trial Dörtöyl Fruit Experimental Station, 198 m.a.s.l. Five replications of each cultivar of 6 year old plants were evaluated for pomological characteristics. Almost all the parameters evaluated exhibited significant differences between the Kirikhan and Dörtöyl counties. The highest fruit weight was found in Dörtöyl conditions. TSS, pH, acidity and TSS/acidity were higher in Kirikhan. Bursa Siyahı, Yediveren and Göklop cultivars had higher fruit weight (41.64 g, 40.07 g and 39.24 g, respectively). Bursa Siyahı, Yediveren and Göklop cultivars were found to promising for table fig cultivation in Dörtöyl and Kirikhan ecological conditions.

Key words: Table fig, fruit quality, environment conditions, productivity

1. Introduction

The fig tree is widely spread in Turkey-the Black Sea, Marmara, the Aegean and Mediterranean coast, Southern Anatolia, and the interior valleys of central Anatolia. Since table figs are not as demanding as dried figs in terms of climatic and soils, they can also be economically grown in other regions of Turkey [1]. The shores of Mediterranean and South-East Anatolia have especially suitable conditions for fresh fig production [2]. Figs are adaptable to various climatic conditions, but prefer total yearly rainfall of 500-550 mm, especially 40-45% humidity for the drying period between July and September, average temperatures of 18-20°C and 20°C yearly between May and October [3]. Hatay is one of important provinces in terms of table fig production in Turkey. The aim of study was to determine the effect of different environments

conditions on table fig fruit characteristics of some fig cultivars.

2. Materials and Methods

The study was conducted on the Mustafa Kemal University, Agriculture Faculty, Dörtöyl Fruit Experimental and Kirikhan Fruit Experimental Station in Hatay, Turkey. Six fig cultivars were studied: Bursa Siyahı, Yediveren, Göklop, Sarı Zeybek, Morgüz and Yeşilgüz planted in two fields in East Mediterranean, Turkey. Two trials were established; one trial at Kirikhan Fruit Experimental Station in, 103 m.a.s.l. (36°28'N, 36°19'E), and one trial Dörtöyl Fruit Experimental Station, 198 m.a.s.l. (36°54'N, 36°13'E). Five replications of each cultivar of 6 year old plants were evaluated for pomological characteristics. Fruit weight (g), fruit size (length and width, mm), neck length (mm), ostiole width (mm), total soluble solids (TSS, %), pH, Acidity (%), TSS/acidity ratio, trunk diameter (mm), shoot length (cm), yield (kg/tree) and *yield per trunk cross section area (g/cm²)* were

Corresponding author: A. A. Polat, Ph.D., research areas: fruit breeding, cultivar adaptation, propagation techniques, E-mail: aapolat@mku.edu.tr.

determined. Data obtained were statistically evaluated using SAS [4].

3. Results and Discussion

Dörtyol and Kirikhan has a typical Mediterranean climate. According to the climatic parameters for each locality are showed important differences (Table 1).

The yearly average temperature is 19.1°C, with 1061 mm precipitation which during all months (primarily falls during winter and spring), and average yearly 54.5% humidity in Dörtyol near the Mediterranean sea (distance about 3 km). The yearly average temperatures are 19.3°C with 578 mm precipitation which primarily falls during winter and spring, and average yearly 46.5%

humidity in Kirikhan near the Amik plain. The mean temperatures and maximum temperatures between April and September in Kirikhan were higher than Dörtyol. At the same time, monthly rainfall was lowest during harvesting period (especially, July and August months) in Kirikhan. Despite the fact that the distance between Dörtyol and Kirikhan is 70 km, these differences can occur due to between them of the Amanos mountains which has 2.240 m altitude.

Almost all the parameters evaluated showed significant differences between the Kirikhan and Dörtyol counties (except fruit width, fruit length and neck length) (Table 2).

Table 1 Means of temperature and humidity in the Kirikhan and Dörtyol counties, Turkey.

Characteristics	Counties	Months											
		Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
	Kirikhan	67.15	65.20	57.85	58.50	41.90	38.85	38.55	40.15	51.25	54.60	53.95	64.06
Humidity (%)	Dörtyol	54.10	50.75	51.55	61.55	50.10	57.35	60.00	57.85	56.30	52.95	47.50	55.15
Mean Temp. (°C)	Kirikhan	7.75	9.10	16.95	16.10	23.15	27.85	30.50	30.10	25.60	21.35	14.50	8.47
	Dörtyol	10.40	11.15	13.35	16.80	22.30	25.40	28.20	28.45	25.25	21.75	16.20	10.30
Min. Temp. (°C)	Kirikhan	-1.00	-0.50	1.35	6.30	10.15	13.60	18.20	18.95	13.60	5.20	3.95	-1.60
	Dörtyol	1.25	1.65	4.10	8.70	12.35	15.35	21.30	20.90	16.10	8.10	6.05	-0.75
Max. Temp. (°C)	Kirikhan	20.10	18.50	24.50	27.60	35.60	39.70	41.80	41.20	38.40	34.70	26.80	17.60
	Dörtyol	20.40	21.65	24.80	28.05	36.40	38.00	37.00	35.60	36.05	33.00	28.95	22.35
Rainfull (mm)	Kirikhan	90.95	128.25	131.00	56.95	2.75	6.30	0.00	0.00	10.60	17.80	59.85	74.42
	Dörtyol	124.60	116.00	113.40	133.75	79.35	39.80	45.90	26.30	99.20	94.00	91.60	97.35

Table 2 Characteristics of pomological of some fig cultivars harvested at different environment conditions.

Variables	Fruit weight (g)	Fruit width (mm)	Fruit length (mm)	Neck length (mm)	Ostiol width (mm)	TSS (%)	pH	Acidity (%)	TSS /Acidity
Counties									
Kirikhan	33.89 b ⁽¹⁾	41.51	38.83	3.53	1.22 b	25.29 a	5.05 a	0.29 a	111.94 a
Dörtyol	37.08 a	40.53	39.03	3.15	1.99 a	22.99 b	4.78 b	0.23 b	94.50 b
LSD _{0.05}	1.54	NS ⁽²⁾	NS	NS	0.13	0.83	0.08	0.02	6.74
Cultivars									
Bursa Siyahi	41.64 a	41.37 bc	45.60 a	5.16 a	1.23 c	22.30 b	4.75 c	0.27 b	91.01 b
Yediveren	40.07 a	43.76 ab	39.82 b	3.37 b	1.98 b	23.49 b	4.84 c	0.24 bc	102.91 b
Göklop	39.24 a	46.51 a	39.22 b	3.73 b	2.49 a	23.48 b	4.82 c	0.28 ab	87.33 b
Sarı Zeybek	32.75 b	39.63 bcd	37.27 bc	2.69 bc	1.20 c	22.28 b	5.06 b	0.23 bc	101.54 b
Morgüz	30.51 bc	38.50 cd	35.94 c	1.81 c	1.43 c	27.22 a	5.30 a	0.19 c	143.40 a
Yeşilgüz	28.72 c	36.33 d	35.73 c	3.28 b	1.29 c	26.07 a	4.73 c	0.34 a	93.15 b
LSD _{0.05}	4.00	4.75	2.61	1.05	0.34	2.16	0.20	0.06	17.49

¹: The means presented with different letters in each column are significantly different at 5%. ²: NS; Not significant

Fruit weight and ostiole width showed significant higher values for fig harvested in Dörtüol (respectively, 37.08 g and 1.99 mm), whereas TSS, pH, acidity and TSS/Acidity were found higher in Kirikhan (respectively, 25.29%, 5.05, 0.29% and 111.94). This can be explained to be a result of the climatic conditions which is lower humidity, high temperature and without raining during harvesting period (July and August months) in Kirikhan. Concerning fruit width, fruit length and fruit neck length no significant differences were found both Dörtüol and Kirikhan. All pomological characteristics of fig cultivars were significant at the 5% level. In this study, averaged over 2 years, fruit weight values ranged from 28.72 (Yeşilgüz) to 41.64 (Bursa Siyahı). In similar studies, fruit weights ranged from 9 to 38 g [5], 30 to 90 g [1], 29.6 to 40.0 g [6]. According to the fruit dimension Goklop, Yediveren and Bursa Siyahı were classified as medium. Neck length was longest on Bursa Siyahı (5.16 mm). In other studies, the longest neck was 14.5 mm [7] and 8.70 mm [1] and 7.20 mm [6]. A large ostiole on the fig is an undesirable characteristic as

pests and pathogens enter the fruit. In our results, ostiole width was found between 1.23 and 2.49 mm. Ostiole width was reported as 1.5-4.0 mm [8] and 1.5-3.5 mm [9]. In this study, TSS, pH and acidity were 22.30-27.22%, 4.73-5.30 and 0.19-0.34%, respectively, which were in agreement with other reports [5, 7, 10]. The sugar/acidity ratio is one of the most important factors in fruit taste [11]. In this study, the highest sugar/acid ratio was observed on the cultivars of Morgüz (143.40) (Table 2).

The mean trunk diameter and shoot length were higher in Kirikhan (respectively, 73.65 mm and 38.56 cm) than Dörtüol, whereas yield per tree and yield per trunk cross section area (g/cm^2) were higher in Dörtüol (respectively, 1.78 kg/tree and $64.61 \text{ g}/\text{cm}^2$) (Table 3). Averaged over the two years, Yeşilgüz had the higher values in terms of trunk diameter (77.70 mm) and shoot length (36.87 cm). Bursa Siyahı had the highest yield (2.30 kg/tree), followed by Yediveren (1.77 kg/tree). The lowest yield value was observed for Sari Zeybek (0.94 kg/tree) (Table 3).

Table 3 Characteristics of vegetative growth, yield and harvesting times of some fig cultivars at different environment conditions.

Variables	Trunk Diameter (mm)	Shoot Length (cm)	Yield (kg/tree)	Yield per trunk cross section area (g/cm^2)	Harvesting Times
Counties					
Kirikhan	73.65 a ⁽¹⁾	38.56 a	1.21 b	31.08 b	6 August
Dörtüol	61.30 b	23.07 b	1.78 a	64.61 a	11 August
LSD _{0.05}	4.04	2.70	0.18	6.42	
Cultivars					
Bursa Siyahı	63.56 b	32.02 b	2.30 a	78.41 a	6 August
Yediveren	65.67 b	25.87 c	1.77 b	59.56 b	9 August
Göklop	68.17 b	28.85 bc	1.32 c	39.14 c	9 August
Sarı Zeybek	48.89 c	29.88 bc	0.94 d	47.53 c	6 August
Morgüz	80.85 a	31.40 b	1.42 c	37.44 c	12 August
Yeşilgüz	77.70 a	36.87 a	1.23 cd	24.99 d	12 August
LSD _{0.05}	6.99	4.69	0.32	11.13	

¹: The means presented with different letters in each column are significantly different at 5%.

The cultivars were earlier harvested in Kirikhan (before 5 day) than Dörtüol (Table 3). This can be explained to be a result of the foehn wind blowing from

Amanos Mountain to Amik plain during harvesting period (July and August months) in Kirikhan. We know that foehn winds can raise temperatures as much

as 10°C in just a matter of hours. While Bursa Siyahı and Sarı Zeybek cultivars were the earliest harvested (6 August), Morgüz and Yeşilgüz were latest harvested (12 August). Since table figs are not as demanding as dried figs in terms of climatic and soils, they can also be economically grown in different environment conditions [1]. The results of this study demonstrate the effect of the environment on table fig quality. These results are in agreement with findings of Botti et al. (12). Therefore, we have to make the adaptation studies before new planting made. As a result, we can say the shores and valleys of East Mediterranean have especially suitable conditions for table fig production. In this region, Bursa Siyahı, Yediveren and Göklop cultivars were found very promising for table fig cultivation.

References

- [1] E. Ozeker and M. Isfendiyaroglu, Evaluation of table fig cultivars in Çeşme Peninsula, *Acta Horticulturae* 480 (1998) 55-60.
- [2] N. Kaşka, A. B. Küden, A. Küden and S. Çetiner, The investigation of adaptation of Aegean figs and figs selected from Çukurova region, *Journal of the Faculty of Agriculture, Çukurova University* 5 (1990) 77-86.
- [3] A. Kabasakal, *Fig Growing*, TAV Press, 1990, p. 96, Yalova, Turkey. (in Turkish)
- [4] SAS Institute, SAS Online Doc. Version 8. SAS Inst., Cary, N.C., 2005.
- [5] M. A. Koyuncu, A study on some fruit characteristics in local fig cultivars growth in Hilvan, Urfa, Southern Turkey, *Acta Horticulturae* 480 (1998) 83-85.
- [6] A. A. Polat and O. Caliskan, Fruit characteristics of table fig (*Ficus carica*) cultivars in subtropical climate conditions of the Mediterranean region, *New Zealand J. Crop and Horticulture Science* 36 (2008) 107-115.
- [7] M. Ilgin, The investigation of fertilization biology of some fig genotypes selected from Kahramanmaraş region, Ph.D. thesis, Cukurova University, Adana, Turkey, 1995. (in Turkish)
- [8] M. A. Koyuncu, S. Z. Bostan, A. Islam and F. Koyuncu, Investigation on physical and chemical characteristics in fig cultivars grown in Ordu, *Acta Horticulturae* 480 (1998) 87-89.
- [9] S. Z. Bostan, A. Islam and A. Aygun, A study on pomological characteristics of local fig cultivars in Northern Turkey, *Acta Horticulturae* 480 (1998) 71-73.
- [10] A. B. Kuden, S. Bayazit and S. Comlekcioglu, Morphological and pomological characteristics of fig genotypes selected from Mediterranean and South East Anatolia regions, *Acta Horticulturae* 798 (2005) 95-102.
- [11] İ. Karacalı. Storage and Marketing of Horticultural Products, Ege Uni., Agric. Fac., Publication no: 494, 2002. (in Turkish).
- [12] C. Botti, N. Franck, L. Prat and D. Ioannidis, The effect of climatic conditions on fresh fig fruit yield, quality and type of crop, *Acta Horticulturae* 605 (2003) 37-42.