African Journal of Biotechnology Vol. 9(46), pp. 7857-7862, 15 November, 2010
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB10.1382

Full Length Research Paper

Selection studies on fig (*Ficus carica* L.) in Antalya Province of Turkey

S. Gozlekci

Department of Horticulture, Faculty of Agriculture, Akdeniz University, Antalya, Turkey.

Accepted 15 October, 2010

Turkey is one of the gene centers of fig in the world and there are great variations and distributions in wild fig forms as well as fig cultivars. The primary objective of this study is to select valuable fig genetic resources in Ibradi and Kumluca (Antalya) province and to conserve the promising figs genetic resources. Populations consisting of native fig genotypes were selected and chracterized in terms of pomological and morphological traits. The data revealed that some of the fruit and leaf characteristics of the investigated fig types were significantly different in terms of location and fig types. Consequently, it is suggested that these promising fig genetic resources could be used for further breeding programs and therefore they need to be preserved.

Key words: *Ficus carica* L., genetic resources, fruit characteristics, leaf characteristics.

INTRODUCTION

Fig (*Ficus carica* L.) is among the oldest fruits and is known to man from ancient times (Aksoy, 1998). Today, the fig is an important fruit crop in many parts of the world. Figs are cultivated around the world in subtropical and tropical regions and to some extent in moderate climatic regions of the temperate zones (Storey, 1975).

Fig is considered as one of the oldest fruit trees in the Mediterranean region. Its wild genetic resource (relatives) still exists in many countries. Turkey is also considered as an important gene center of figs and some temperate fruit species in the world. It is known that Anatolia is the native land of fig and wild figs spread from here to the Mediterranean, Syria, Iran, Iraq, Saudi Arabia, South Caucasia and Crimera (Condit, 1947; Kuden and Tanriver, 1998).

Turkey is one of the main fig producing countries of the world and is considered the first in the trade of fresh or dried figs worldwide (Aksoy et al., 2003). The fig production in Turkey is about one fourth of the world production (1 108 398 Mt) (FAO, 2008). In the world market, there is an increasing demand for fresh figs, therefore production with standard varieties accompanied by advanced handling, attractive packaging and transportation facilities will enable the establishment of a strong and lasting chain between the producer and the consumer. Because of increasing demand for fresh consumption cultivars, any attempt to increase fig production is of value (Aksoy et al., 1992).

Fig is commonly consumed as fresh and dried fruits. Westwood (1978) reported that calories, carbohydrate and protein content of figs are high. Fig contains 1.3 to 3.6% protein, 9.5 to 52.9% total sugar, 45 to 300 kcal energy, 5.2 to 28.6% glucose, and 4.1 to 22.7% fructose per 100 g of fresh and dried fruits, respectively (Aksoy et al., 2001). Mature and young fig fruit extracts are used for medicinal purposes. Its high fibre content helps in the digestive system (Wang et al., 2003). Fig fruits are also of importance in the food industry since they are transformed into several processing products such as preserved fruits, canned foods, jam, juice, wine, powder, tea, paste confection, covered with chocolate and baked in pastries.

The fig genetic resources comprise great numbers of cultivars in various Mediterranean countries. Figs are an important traditional crop in Turkey, due to the wide adaptability to the soil and climatic conditions, many different local cultivars are grown in different regions. Worldwide, the best quality of dried figs is produced in the Aydin and Izmir provinces of the Aegean region in Turkey (Aksoy et al., 2001). In Turkey, table fig trees are

*Corresponding author. E-mail: sgozlekci@gmail.com.

common in all of the coastal areas. The Mediterranean and the South East Anatolian regions are the most important gene centers of table fig cultivars (Kuden and Tanriver, 1998). Figs are native trees of Anatolia and originated from Caucasian and the Mediterranean regions, including Turkey (Condit, 1947; Aksoy, 1995; Aksoy, 1996). East Mediterranean and Southeast Anatolia (Kuden and Tanriver, 1998) regions are known for the genetic resources of figs, especially for fresh fig cultivars (Ozbek, 1978). Although there are some selection studies conducted in different ecological regions on fig in Turkey (Cetiner, 1981; Eroglu, 1982; Aksoy et al., 1992; Sen et al., 1993; Kuden et al., 1995; Ilgin and Kuden, 1996; Ozkaya, 1997; Koyuncu, 2004), there are none in the Mediterranean region. In the coastal regions of Turkey, the fig orchards or plantations are been abandoned due to high income from tourism. Therefore, fig trees grown in all of the coastal regions are under high risk because they are continually subjected to genetic erosion. Due to these reasons and continuous genetic erosion, it is necessary to collect, describe and also maintain them *in situ* and *ex situ*.

The objectives of this study are to: 1) Determine fig ecotypes of good quality for fresh consumption in Ibradi and Kumluca, in Antalya province of Turkey and the surrounding area of west Mediterranean region and 2) study their pomological and morphological characteristics. In order to preserve their genetic diversity, cuttings from 24 selected fig ecotypes were used.

MATERIALS AND METHODS

Experimental materials

The experimental materials of the present study were fruits of 8 and 16 native landraces of fig (*F. carica* L.) collected in Ibradi and Kumluca (Antalya provinces) located in the west Mediterranean region of Turkey.

Fruit and leaf characteristics

Twenty fruits for each fig landrace were randomly sampled for measurements and analyses. The characteristics were fruit weight (g), fruit length (mm), fruit diameter (mm), neck length (mm), ostiol width (mm), fruit shape index, fruit skin (external) and flesh color, leaf width (mm), leaf length (mm), petiole length (mm), the number of the fruits and leaves per shoot, number of leaf lobes, total soluble solid content (%) and titratable acidity (%). The results were comparatively investigated in Ibradi and Kumluca (Antalya province).

Fruit width and fruit length were measured by using a digital caliper with a sensitivity of 0.01 mm. Fruit weight was measured using a digital balance with a sensitivity of 0.001 g. Fruit shape index was explained as the ratio of fruit width to fruit length. Fruits samples were homogenized and filtered, then the total soluble solid content (TSS) was measured using an ATAGO (ATC-I, Japan) handheld refractometer. Titratable acidity was measured by titration method and was calculated as percent citric acid (AOAC, 1995). Fruit and leaf characteristics of the samples were determined according to Fig Descriptors (IPGRI and CHIEAM, 2003).

Statistical analyses

Analysis of variance and descriptive statistics were separately performed for Ibradi and Kumluca samples using the PC-SAS software package (SAS-Institute, 1987).

RESULTS AND DISCUSSION

Fruit and leaf characteristics in Ibradi and Kumluca

Analyses of variance showed that there were statistically significant differences among samples for all traits ($P < 0.05$) (Table 1). As seen in Table 1, mean values of parameters showed large differences in both fig types collected in Ibradi and Kumluca. Ibradi is located in the high plateau of Antalya, while Kumluca is in the coast. Therefore, these provinces had altitude differences of about 900 m. The results of this study clearly demonstrate the strong effect of the climate on fig production and fruit quality.

The fruit weight of Ibradi types ranged from 13.40 to 51.94 g, while the fruit weight of Kumluca types ranged from 19.98 to 62.55 g (Tables 1 and 2). Although results obtained on fruit weight in the present study are in agreement with some previous studies (Chessa and Nieddu, 1990; Aksoy et al., 1992; Kuden et al., 1995; Ilgin, 1995; Koyuncu, 1998; Koyuncu et al., 1998; Bostan et al., 1998; Aksoy et al., 2003; Koyuncu 2004), there are some other studies that are not in agreement (Yang et al., 1994; Karadeniz, 2003; Ferrara and Papa, 2003). These differences could be attributed to genotypes variations and environmental conditions.

The fruit width was between 30.58 and 47.54 mm in Ibradi, while it was between 32.63 and 50.21 mm in Kumluca. Fruit shortest length was recorded at 31.71 and 35.84 mm and the tallest at 43.79 and 56.65 mm in Ibradi and Kumluca, respectively. Results obtained on fruit length and fruit width are in agreement with previously published data (Aksoy et al., 1992; Kuden et al., 1995; Ilgin and Küden, 1996; Bostan et al., 1998; Koyuncu, 1998; Koyuncu et al., 1998; Ozkaya, 1997; Kuden and Tanriver, 1998; Ferrara and Papa, 2003; Koyuncu, 2004). In terms of fruit size obtained in this study, results demonstrated mostly a medium size.

Aksoy et al. (1992) reported that the fruit size (width and length) and fruit weight were considered as an important trait in the fresh consumption group. Usually, small fruits are used for making jam, whereas big ones are consumed as fresh fruit in Antalya region. The fruit shape index of Ibradi genotypes was 0.92 to 1.10 mm. The fruit shape was oblate, spherical and oblong. In Kumluca, the fruit shape index was 0.67 to 1.08 mm (Table 1) and varied from oblate to oblong. Ferrara and Papa (2003) reported that the fruit shape ranged from turbinate to spherical in all the cultivars. Condit (1941) indicated that the fruit shape index is of great importance in packaging and transportation. According to fruit shape,

Table 1. Descriptive statistics (means and standard errors) in fig types collected from Ibradi, Antalya.

Type No	Fruit weight (g)	Fruit width (mm)	Fruit length (mm)	Fruit shape index	Neck length (mm)	Ostiol width (mm)	Leaf Length (mm)	Leaf Width (mm)	Petiole Length (mm)	Number of Leaf Per Shoot	Number of Fruit Per Shoot	Titratable acidity (%)	Total Soluble Solid (%)
I10	30.24±1.88	39.69±1.04	40,10±1.52	0.99±0.06	9.64±1.38	3.43±0.48	29.58±0.29	18.62±0.40	6.59±0.22	8.73±0.25	4.17±0.17	1.03±0.01	17.67±0.18
I11	39.72±1.03	43.94±0.58	43.79±1.39	1.01±0.04	8.47±1.20	3.51±0.29	29.06±0.53	20.84±0.31	5.69±0.16	6.77±0.21	3.88±0.12	0.36±0.02	19.68±0.12
I12	51.94±6.11	47.54±1.71	43.45±2.39	1.10±0.03	7.53±0.97	5.35±0.85	26.23±0.56	17.25±0.43	5.58±0.30	7.10±0.08	3.83±0.30	0.25±0.01	17.40±0.23
I15	27.41±1.20	36.84±0.74	38.56±0.55	0.96±0.03	2.20±1.08	2.80±0.15	31.50±2.02	16.13±1.11	9.37±1.49	8.43±0.27	3.81±0.24	0.23±0.03	28.00±0.12
I16	24.10±1.43	36.62±0.78	40.15±0.87	0.92±0.04	3.84±0.83	4.53±0.74	20.58±0.23	10.86±0.34	5.78±0.17	7.83±0.16	3.88±0.22	0.27±0.01	16.06±0.11
I17	13.40±0.61	30.58±0.54	31.71±0.40	0.97±0.02	1.46±0.58	2.61±0.15	16.89±0.83	12.59±0.22	3.61±0.27	7.85±0.09	3.94±0.23	0.44±0.01	25.03±0.15
I24	32.86±1.91	40.24±0.43	40.42±2.44	1.01±0.08	9.93±2.29	2.20±0.07	24.74±0.15	11.71±0.69	5.85±0.23	8.26±0.14	3.93±0.16	0.33±0.02	30.10±0.17
I27	22.71±0.83	35.94±0.31	34.65±0.52	1.04±0.01	5.94±0.42	2.81±0.12	32.87±1.14	22.36±0.63	8.10±0.49	7.29±0.18	3.63±0.36	0.61±0.02	22.06±0.14
F values	16.65**	25.89**	6.30**	1.28	5.00**	2.97*	35.60**	53.79**	8.81**	13.64**	0.42	2479.67**	688.88**

all fig types can be suitable for commercial production. In Ibradi and Kumluca, the fruit neck length was between 1.46 and 9.93 mm and 6.02 and 13.74 mm, respectively. Short neck length is not a desirable characteristic in terms of harvest, because damages may occur due to difficulties in harvest (Ozeker and Isfendiyaroglu, 1997). With respect to neck length, K13 type (13.74 mm) and K46 type (12.90 mm) had the highest values. Also, it was found that the neck length was changed between 0.7 and 21.2 mm which are in accordance with the results of Aksoy et al. (2003). The ostiolum width of the fruits in Ibradi was 2.20 to 5.35 mm, while in Kumluca, the ostiolum width of the fruits varied from 1.73 to 5.48 mm (Table 1). The results obtained are in accordance with the previous studies (Chessa and Nieddu, 1990; Aksoy et al., 1992; Ilgin, 1995; Ozkaya, 1997 and Bostan et al., 1998). On the other hand, findings in the study are not in agreement with Ozeker and Isfendiyaroglu (1998), perhaps due to genotypic and environmental differences.

Both in Ibradi and Kumluca figs, leaf dimensions showed large variability. The leaf length was between 16.89 and 32.87 mm in Ibradi, while it was between 19.57 and 31.16 mm in Kumluca. The lowest values recorded for leaf width, were 10.86 and 10.80 mm and the highest ones were 22.36 and 23.56 mm in Ibradi and Kumluca, respectively. In Ibradi and Kumluca figs, the petiole lengths were between 3.61 and 9.37 mm and 5.60 and 10.71 mm, respectively (Tables 1 and 2). In similar studies, leaf length, leaf width and petiole length were reported to be between 22.7 and 28.9 mm, 20.7 and 25.6 mm, 8.0 and 14.3 mm (Bostan et al., 1998), 20.2 and 25.7 mm, 18.5 and 25.5 mm, 7.2 and 17.1mm (Koyuncu et al., 1998), 20.37 and 23.19 mm, 19.45 and 22.28 mm and 7.35 and 10.38 mm (Sanchnez et al., 2003), respectively.

In Ibradi fig types, the mean number of the leaves and fruits per shoot ranged between 6.77 and 8.73 and 3.63 and 4.17, respectively (Table 1). The mean number of the leaves and fruits per shoot of the Kumluca province types varied between 5.18 and 11.18 mm and 2.81 and 8.65 mm, respectively. Typically, the lobe of the leaves of the selected types ranged between 3 and 5(Data not shown). These results are in agreement with previous reports (Ilgin, 1995; Ozkaya, 1997; Koyuncu et al., 1998; Koyuncu, 2004). In Ibradi and Kumluca province fig types, the fruit skin (external) color ranged from green-yellow to dark blue. In Kumluca, the most frequent color of the skin was dark blue for 12 cultivars; and the remaining were light green. The fruit flesh color changed between amber, pink and red to dark red (data not shown). Aksoy et al., (1992) reported that there were great variabilities for skin color in fig types and cultivars. Likewise, great variations for skin color were observed in this study.

Titratable acidity of Ibradi and Kumluca fig types were between 0.23 and 1.03% and 0.11 and 1.04%, respectively. The lowest and the highest total soluble solid content ratios in Ibradi fig types were 16.06 and 30.10%, respectively; while they were found to be between 16.17 and 30.02% in Kumluca fig types (Table 1). Concerning soluble solids and titratable acidity, no significant differences were found between Ibradi and Kemer provinces. Total soluble solid contents obtained in this study were higher than those obtained by Wills et al. (1987) and Sugiyma et al. (1989). However, the results on titratable acidity and total soluble solid content were similar to other reports (Chessa and Nieddu, 1990; Flores, 1990; Kabasakal, 1990; Aksoy et al., 1992; Pilando and Woolstad, 1992; Yang et al., 1994; Ilgin, 1995;

Table 2. Descriptive statistics (means and standard errors) in fig types collected from Kumluca, Antalya.

Type No	Fruit weight (g)	Fruit width (mm)	Fruit length (mm)	Fruit shape index	Neck length (mm)	Ostiol width (mm)	Leaf Length (mm)	Leaf Width (mm)	Petiol Length (mm)	Number of Leaf Per Shoot	Number of Fruit Per Shoot	Titratable acidity (%)	Total Soluble Solid (%)
K13	23.74±2.13	34.34±1.43	45.98±1.23	0.75±0.01	13.74±0.31	2.53±0.36	19.62±0.52	18.81±0.34	8.91±0.26	7.07±0.10	3.77±0.21	0.39±0.02	20.03±0.12
K14	62.55±0.43	50.21±0.59	46.70±0.19	1.08±0.01	8.50±0.50	5.48±0.39	29.24±0.51	17.22±0.49	7.28±0.42	7.62±0.27	3.85±0.25	0.18±0.01	17.03±0.09
K18	44.17±2.34	44.15±1.21	43.39±1.41	1.02±0.02	6.30±0.47	3.15±0.17	28.77±0.76	16.37±0.49	9.22±1.08	7.17±0.11	4.69±0.30	1.04±0.01	19.33±0.13
K22	20.18±0.87	33.14±0.32	40.32±1.28	0.83±0.03	11.63±1.19	2.95±0.18	24.77±0.34	16.27±0.56	5.60±0.32	8.64±0.34	7.44±0.26	0.67±0.01	18.13±0.18
K28	30.71±2.03	39.57±0.95	38.93±1.04	1.02±0.01	7.35±0.83	3.70±0.37	26.57±0.46	16.85±0.22	7.03±0.27	5.18±0.11	3.94±0.13	0.21±0,01	23.00±0.12
K29	29.15±0.85	34.47±1.35	35.84±0.98	0.96±0.02	7.67±0.19	2.80±0.48	25.25±0.60	11.31±0.65	8.64±0.35	9.90±0.08	5.94±0.12	0.27±0.02	26.07±0.15
K30	37.78±1.30	40.62±0.64	39.70±0.59	1.03±0.01	6.61±0.08	2.02±0.12	21.69±1.05	23.56±1.03	10.71±0.25	8.97±0.14	4.38±0.21	0.32±0.01	22.80±0.23
K36	35.73±0.73	40.01±0.43	47.27±1.04	0.85±0.02	9.94±0.68	4.41±0.14	29.52±0.41	14.75±0.28	8.87±0.32	9.09±0.13	4.59±0.13	0.36±0.01	18.00±0.12
K37	19.98±0.44	32.63±0.16	37.34±0.12	0.88±0.01	6.66±0.47	2.16±0.13	28.24±0.49	16.78±0.19	8.67±0.25	5.50±0.18	3.76±0.21	0.11±0.02	20.13±0.18
K46	30.49±0.50	38.44±1.26	47.80±0.75	0.81±0.03	12.9±0.72	2.40±0.12	30.30±0.47	16.38±1.25	8.10±0.11	9.37±0.21	6.93±0.10	0.18±0.01	26.73±0.17
K51	44.84±1.60	44.42±0.30	42.93±0.75	1.04±0.03	6.87±0.45	2.97±0.39	27.58±0.23	14.63±0.29	10.43±1.10	6.68±0.32	3.86±0.20	0.21±0.01	30.02±0.15
K53	25.48±1.30	36.54±0.53	35.95±0.48	1.02±0.01	6.02±0.60	3.89±0.41	23.66±0.37	14.21±0.17	6.19±0.11	6.54±0.12	3.75±0.25	0.20±0.02	20.00±0.12
K57	35.44±1.51	40.23±0.51	43.68±1.34	0.93±0.04	10.72±0.93	3.70±0.24	19.57±0.30	13.16±0.56	7.50±0.29	11.18±0.30	8.65±0.26	0.91±0.01	17.93±0.18
K59	34.57±1.80	39.17±0.61	45.97±0.89	0.86±0.02	9.49±0.28	3.98±0.25	29.15±0.51	13.57±0.28	7.80±0.77	8.37±0.23	4.79±0.21	0.26±0.01	16.17±0.17
K66	29.89±0.48	37.75±0.17	41.66±0.55	0.91±0.01	7.53±0.86	2.00±0.02	31.16±0.54	10.80±0.18	7.59±0.28	7.14±0.11	2.81±0.18	0.25±0.02	24.67±0.24
K70	42.04±1.73	37.37±0.64	56.65±1.71	0.67±0.05	7.77±0.14	1.73±0.29	23,04±0.41	14.66±0.34	7.94±0.08	8.42±0.17	3.99±0.10	0.28±0.01	17.04±0.15
F values	57.07**	27.93**	20.62**	28.12**	12.59**	10.43**	49.32**	30.67**	7.55**	64.04**	61.11**	1241.56**	382.53**

* and ** are statistically significant at 0.05 and 0.01, respectively.

Kuden et al., 1995; Melgarejo, 1996; Bostan et al., 1998; Koyuncu, 1998; Koyuncu et al., 1998; Ozeker and Isfendiyaroglu, 1997; Aksoy et al., 2003; Ferrara and Papa, 2003; Sanchez et al., 2003, Koka, 2003).

The fruits of nine promising types (I15, I16, I17, I27, K13, K22, K37, K53 and K70) could be use in chocolate and confectionary industry due to their small sizes. Furthermore, the I24 (30.10%), I15 (28%) and K51 (30.02%) fig types demonstrated the highest total soluble solid contents, whereas the I16 (16.06%) and K59 (16.17%) fig types showed the lowest total soluble solid content. In addition, the types with high sugar content may be used for jam making and as dried fruit. Because of the large and medium fruits demonstrated by these fig types (K14 “large”, K18, K51, I11 and I12 “medium”), they are recommended for table figs for both domestic and foreign markets.

Conclusions

Results in this study indicated that some quality parameters such as fruit weight, fruit size and total soluble solid content were highly correlated with ostiol width. Moreover, it was observed that the ostiol width was positively correlated with total soluble solid content. Figs having large ostiol widths are not preferred by costumers because of quick fruit decay. Almost all of the parameters evaluated showed significant differences between Ibradi and Kumluca provinces. The fruit length, fruit width and fruit weight of Kumluca were generally higher than those of Ibradi province fruits. It was demonstrated that fig types K14 “large”, K18, K51, K70, I11 and I12 “medium” size performed well in the production of high quality fruit for fresh consumption. On the other hand, fig types I15, I24, K29, K46 and K51 which demonstrated high sweet flavor could be considered for making jam and marmalade. These differences could be the result of genotypic variations and environmental conditions. These results revealed that the selected fig types could contribute to further breeding studies and preservation of germplasm.

ACKNOWLEDGEMENTS

The financial support from the Scientific and Technical Research Council of Turkey (TUBITAK) and the Scientific Research Project Administration Unit of Akdeniz University are gratefully acknowledged.

REFERENCES

Aksoy U, Seferoolu G, Mısırlı A, Kara S, Duzbastılar M, Bulbul S, Can HZ, Sahin N (1992). Sarılop Klon Seleksiyonu. 1st Turkish Horticultural Congress, 1: 545-548, İzmir (In Turkish).
Aksoy U (1995). Present Status and Future Prospects of Underutilized fruit Pro-duction in Turkey. Cah. Options Méditer. 13: 97-107.
Aksoy U (1996). Descriptors for Fig (Ficus carica and related *Ficus* sp.) Ege University, Faculty of Agriculture, Department of Horticulture, İzmir, Turkey.
Aksoy U (1998). Why figs? An old test and a new perspective. Acta Horticulturae, 480: 25-26.
Aksoy U, Can HZ, Hepaksoy S, Sahin N (2001). Incir Yetistiriciligi. Türkiye Bilim-sel ve Teknik Arastirma Kurumu. Turkiye Tarımsal Arastırma Projesi Yayinlari, Tarim Orman ve Gida Teknolojileri Arastırma Grubu, Izmir (In Turkish).
Aksoy U, Can HZ, Mısırlı A, Kara S (2003). Fig (*Ficus carica* L.). Selection Study For Fresh Market in Western Turkey. Acta Horticulturae, 605: 197-203.
AOAC (1995). Official methods of analysis. Vol II, 16th ed. Association of Official Analytical Chemists, Washington, DC.
Bostan SZ, İslam A, Aygün A (1998). A Study on Pomological Characteristics of Local Fig Cultivars in Northern Turkey. Acta Horticulturae, 480: 71-74.
Chessa I, Nieddu G (1990). Caratteristiche del Patrimonio Genetico del Fico İn Sardegna. Agricoltura Ricerca, XII(112-113): 39-48 (In Italian).
Cetiner E (1981). Turkiye Bitki Kaynaklari Meyve ve Bag Envanteri. Ege Bolgesi Zirai Arastıima Enstitüsu Yayinlari. No. 19, Menemen, Izmir (In Turkish).
Condit IJ (1947). The Fig. Waltham, Chronica Botanica.
Condit IJ (1941). Fig Characteristics Useful in The Identification of Varieties. Hil-gardia, 14(1): 1-69.
Eroglu AS (1982). Project of Fig Researches. Fig Selection (Breeding). Erbeyli Fig Research Institute. Erbeyli-Aydın/Turkey (In Turkish).
FAO (2008). hhtp://faostat.fao.org/site/ 567/. updated 16 December 2009.
Ferrara E, Papa G (2003). Evaluation of Fig Cultivars for Breba Crop. Acta Horticulturae, 605: 91-93.
Flores A (1990). La Higuera (Mundi P, Ed.) p. 190. Madrid, Espana (In Spanish).
Ilgın M (1995). Kahramanmaras Bolgesinde Incir Seleksiyonu ve Selekte Edilen Bazı Onemli Tiplerin Meyve Doğuşları ve Döllenme Biyolojileri Üzerine Çalışmalar. Çukurova University, Graduate School of Applied and Natural Science, (PhD Thesis), Adana/Turkey (In Turkish).
Ilgın M, Küden AB (1996). Table Fig selection Study in The Kahramanmaraş Province of Turkey. Acta Horticulturae, 441: 351-357.
IPGRI, CHIEAM (2003). Descriptors for Fig. International Plant Genetic Re-sources Institute, Rome, Italy and International Centre for Advanced Mediterra-nean Agronomic Studies, Paris, France, p. 52.
Kabasakal A (1990). Fig Growing (Turkish). TAV Press, No 20, Yalova, Turkey.
Karadeniz T (2003). A Study on Some Fruit Characteristics and Propagations of These by Hardwood Cuttings of Local Cultivars Grown in Ordu (Turkey) Acta Horticulturae, 605: 107-112.
Koka T (2003). Studies on Local Fig (*Ficus carica* L.) Germplasm in Albania. Acta Horticulturae, 605: 87-89.
Koyuncu MA (1998). A Study on Some fruits Characteristics in Local Fig Cultivars Grown in Hilvan (Urfa, Southern Turkey). Acta Horticulturae, 480: 83-86.
Koyuncu MA, Bostan SZ, Islam A, Koyuncu F (1998). Acta Horticulturae, 480: 87-90.
Koyuncu MA (2004). Promising Fig (*Ficus carica* L.) Genetic Resources from Birecik (Urfa) Region of Turkey. Eur. J. Hort. Sci. 69 (4), pp. 153-158.
Kuden AB, Tanrıver E, Kaska N (1995). Çukurova Bölgesine Önerilebilecek Bazı İncir Çeşit ve Klonlarının Saptanması.Türkiye II. Ulusal Bahçe Bitkileri Kongresi. 1: 663-667.
Kuden AB, Tanrıver E (1998). Plant Genetic Resources and Selection Studies on Figs in the East Mediterranean and South East Anatolia Regions. Acta Horticulturae, 480: 49-54.
Melgarejo P (1996). La Higuera. (*Ficus carica* L.) Universidad Politécnica de Va-lencia. p. 83. Orihuela, Espana.
Ozbek S (1978). Özel Meyvecilik. Çukurova Üniversitesi Ziraat Fakültesi Yayınları, No 28, p. 486, Adana (In Turkish).
Ozeker E, İsfendiyaroğlu M (1998). Evaluation of Table Fig Cultivars in Çeşme Penunsula. Acta Horticulturae, 480: 55-60.
Ozkaya M (1997). Antakya Yöresinde Yetiştirilmekte olan İncirlerde Seleksiyon Çalışmaları. M.K.Ü. Fen Bilimleri Enstitüsü, Bahçe Bitkileri Ana Bilim Dalı, (MSc Thesis), p. 150. (In Turkish).
Pilando L, Woolstad RE (1992). Compositional Profiles of Fruit Juice Concen-trates and Sweeteners. Food Chem. 44: 19-27.
Sanchez MJ, Melgarejo P, Hernandez Fca, Martinez JJ (2003). Chemical and Morphological Characterization of Four Fig Tree Cultivars (*Ficus carica* L.) Grown Under Similar Culture Conditions. Acta Horticulturae, 605: 33-36.
SAS Institute (1987). SAS® User's Guide. Release 6.03 Edition. Cary, North Carolina, SAS Institute Inc.
Sen B, Yılmaz H, Saglamer M (1993). Sofralik incir seleksiyon ve cesit adaptas-yon projesi. Alata Bahçe Kulturleri Araştırma Enstitüsü, Erdemli (In Turkish).
Storey WB (1975). Figs. Advances in Fruit Breeding. Ed:Janick, J. and Moore, J.N. Purdue University Press, Indiana, USA., pp. 569-589.
Sugiyma N, Roemer K, Bünemann G (1989). Sugar Patterns of ExoticFruits from the Hannover Market, Germany. Gartenbauwissenschaft, 56(3).
Wang L, Jiang W, Ma K, Ling Z, Wang Y (2003). The Production and Research of Fig (*Ficus carica* L.) in China. Acta Horticulturae, 605: 191-196.
Wills RBH, Lim JSK, Greenfield H (1987). Composition of Australian Foods 40, Temperate Fruits. Food Technology in Australia Vol. 39 (II)
Yang JS, Zhao YF, Zhou YH, Mi L (1994). Observation on the Performance of Introduced Promising Fig Cultivar Masui Dauphine. CAB Abstracts AN: N021191.