

Research Article

PHYSICAL AND CHEMICAL CHARACTERISTICS OF SELECTED FIG TYPES IN
BATMAN CENTRAL DISTRICT

Mikdat SIMSEK*

Received: 10.07.2010

Accepted: 10.20.2010

ABSTRACT

The objectives of this study were to select of fig types which had good quality and determine their physical and chemical characteristics. Turkey has great variations and distributions in both wild and cultivar forms of figs. No studies have been made about the selection and their physical and chemical characteristics of fig types grown in Batman central district by researchers up to now. Therefore, this studies were very significant. At the end of the study, six fig types were selected and their physical and chemical characteristics were determined. In these characteristics, it was determined that titrable acidity, total soluble solid content, fruit weight and ostiolum width changed from 0.13% to 0.29%, from 18.48% to 24.35%, from 44.52 g to 117.03 g and from 43.96 mm to 65.87 mm, respectively. According to the weighted ranked method, in all the fig types, 72-35 and 72-38 types which had the higher score were evaluated to be best table fig types.

Key Words: Fig, Chemical and physical characteristics, Selection.

BATMAN MERKEZ İLÇESİNDE SEÇİLEN İNCİR TIPLERİNİN FİZİKSEL VE
KİMYASAL KARAKTERİSTİKLERİ

ÖZET

Bu çalışmanın amaçları iyi kaliteye sahip olan incir tiplerini seçmek ve fiziksel ve kimyasal karakteristiklerini belirlemektir. Türkiye, incirin hem yabani ve hem de kültür formları açısından büyük varyasyon ve dağılımlara sahiptir. Araştırmacılar tarafından Batman merkez ilçesinde yetişen incir tiplerinin seleksiyonu ile fiziksel ve kimyasal karakteristikleri konusunda bu güne kadar hiçbir çalışma yapılmamıştır. Bu yüzde, bu çalışma çok önemlidir. Bu çalışma sonunda, altı incir tipi seçilmiş ve fiziksel ve kimyasal karakteristikleri belirlenmiştir. Bu karakteristikler içinde titre edilebilir asitlik, toplam çözünebilir kuru madde içeriği, meyve ağırlığı ve ostiol çapının sırasıyla % 0.13 ile % 0.29, % 18.48 ile % 24.35, 44.52 g ile 117.03 g ve 43.96 mm ile 65.87 mm arasında değiştiği belirlenmiştir. Tartılı derecelendirme metoduna göre, tüm incir tipleri içinde daha yüksek puan alan 72-35 ve 72-38 en iyi sofralık incir tipleri olarak değerlendirilmiştir.

Anahtar Kelimeler: İncir, Fiziksel ve kimyasal karakteristikler, Seleksiyon.

INTRODUCTION

Fig is one of the most important fruit species grown in the Mediterranean countries (Condit, 1947). Some temperate fruit species as well as figs are also originated in Turkey (Ozbek, 1978). A lot of regions of Turkey contain rich fruit types and the fig is one of the most significant one among them (Aksoy et al., 1992; Bostan et al., 1997; Kuden and Tanriver,

1997). The fig is widely grown and extended to the Aegean and the Mediterranean regions as well as the South East Anatolia.

In a 100 g edible portion, figs contain 80 calories, 1.2 g proteins, 20.3 g carbohydrates, 0.3 g fats and considerable amount of vitamin A and B (Westwood, 1978). As cultivars for fresh consumption possess less total soluble solid content, they are consumed more than dried fruits (Kabasakal, 1990).

¹Department of Horticulture, Faculty of Agriculture, Bingol University, Bingol, TURKEY.

*Sorumlu Yazar: miksimsek2001@yahoo.com

According to FAO statistics the world's largest fig producing country is Turkey. The world fig production is 1,056,820 tonnes. The fig production of Turkey is 285,000 tonnes and this production is 27% of the world's total fig production. The fig export of Turkey is 177.900 tonnes, whereas Turkey represents 52% of total world fig exports (Anonymous, 2005). Recently there has been a big demand for fresh figs in the European markets. So, the fresh figs from Turkey should have a big market in the near future (Polat and Ozkaya, 2005). To increase in the fig export, in addition to transportation and packaging, its quality should be good, too. For example, Bursa Siyahi is one of the best quality fresh fig cultivar grown in the country and there is an increase in its export (Caliskan, 2003). Therefore, the fig selection studies have begun since 1990's with the experiments of Kaska *et al.* (1990) then continued Aksoy *et al.* (1992). After that, the fig studies were carried by a few researchers (Ilgin and Kuden, 1997; Polat and Ozkaya, 2005; Alper, 2006; Caliskan and Polat, 2008; Simsek and Kuden, 2008; Simsek, 2009a; Simsek, 2009b).

No studies have been made about fig in Batman central district up to now. Therefore, the aims of this study were to select and determine the chemical and the physical characteristics of the fig types in this district. Then, these types were to make their adaptations in the same ecological conditions with some fig types and varieties which had domestic or foreign. Afterwards, it was to determine the best fig types and/or cultivars at

the end of this adaptation study. Finally, it was necessary to produce them.

MATERIALS AND METHODS

This study was carried out in Batman central district in the South East Anatolia Region during 2008-2009. Twenty fig trees were determined primarily from thirty trees as subjective. Then, in twenty types, six fig types were selected according to the weighted ranked method (Table 1) of Aksoy (1991). In this research, 30 fruits were randomly selected from the each fig tree in each year. Harvested fruits were immediately transferred to ice boxes and stored at 0°C. Then, they were analysed with 3 replication and ten fruits in each replication for the each year. The fruit weight was measured with a scale sensitive to 0.01 g. The fruit length and width, neck length, ostiole width were measured by a digital compass. The total soluble solid content was determined with a hand-held refractometer. Titrable acidity was determined by titrating with 0.1 N NaOH to an endpoint of pH 8.10. The fruit shape index was calculated by dividing the width by length. In addition, the peeling of skin and the fruit skin cracks also were evaluated as subjective. According to the Table 1, it was multiplied weighting factor with classification point for each property of the types. Then, the scores of all properties of each genotype were collected. Moreover, the data of six fig types which had high score were subjected to analysis of variance using JMP 5.0.1 program. The means were separated by Turkey's test at 0.05 levels.

Table 1. Evaluation according to the weighted ranked method of the selected fig types.

Characteristics	Weighing Factor (coefficient)	Classification and Points			
Fruit weight	40	<20.0 g	0	20.1 -30.0 g	2
		30.1 -40.0 g	4	40.1 -50.0 g	6
		50.1 -60.0 g	8	> 60.0 g	10
Fruit shape index	9	I<0.9	8	I=0.9-1.1	10
		I>1.1	6		
Neck length	6	<5.0 mm	0	5.1-10.0 mm	10
		10.1-15.0 mm	6	>15.0 mm	2
Fruit skin cracks	10	none-little	10	medium	6
		high	0		
Peeling of skin	10	easy	10	medium	6
		difficult	0		
Ostium width	5	0.0-2.0 mm	10	2.1-4.0 mm	8
		4.1-6.0 mm	6	>6.1 mm	2
Total soluble solid content	10	< 13.0%	2	13.1-16.0%	4
		16.1-20.0%	10	20.1-25.1%	8
		> 25.1%	6		
Titrable acidity	10	< 0.050%	0	0.051-0.125%	6
		0.126-0.225%	8	0.226-0.300%	10
		> 0.301%	4		
Total	100				

RESULTS AND DISCUSSION

According to the average values in the two years, total points of the selected types were changed from 714 (72-41 type) to 924 (72-38 type) (Table 2). These results were found partly different from those of Simsek

and Kuden (2008). They determined the total point changed from 559 to 950. The reasons of different between the results of the these studies in term of the total point can say the fruit quality characteristics, maintenance and environmental conditions.

Table 2. Scores according to the weighed ranked method of the selected fig types (Average of years 2008-2009).

Accession Number	Titrable Acidity	TSS	Fruit Weight	Fruit Shape	Neck Length	Skin Cracking	Peeling of Skin	Ostium Width	Total Points
72-32	80	80	320	90	60	100	60	40	830
72-33	100	100	240	54	0	100	100	30	724
72-35	80	100	400	90	60	100	60	30	920
72-37	100	80	400	54	0	100	100	30	864
72-38	80	100	400	54	60	100	100	30	924
72-41	100	80	240	54	0	100	100	40	714

Considering 2 years mean results (2008 and 2009), some chemical characteristics (titrable acidity, TSS, TSS/titrable acidity and fruit juice pH) of the selected fig types were found statistically different from each other at 5% levels (Table 3). According to the average values of chemical characteristics, the titrable acidity changed from 0.13% (72-38 type) to 0.29% (72-33 type). These results were lower than those of Kuden et al. (2008). They determined the titrable acidity ratio was changed from 0.18% to 0.48%. TSS ratio of the selected types changed from 18.48% (72-38 type) to 24.35% (72-41 type). These results were higher than those of Koyuncu (1997). He determined the TSS ratio changed from 11.90% to 24.30% in. Table fig types and

cultivars between 16.1% and 25.1% with respect to the TSS contents have high quality (Aksoy (1991). TSS/acidity changed from 64.81 (72-33 type) to 125.78 (72-32 type). These results were lower than those of Caliskan and Polat (2008). They determined the TSS/acidity changed from 272.80 to 67.70 in 2001 and from 338.00 to 85.00 in 2002. In addition, fruit juice pH changed from 5.04 (72-35 type) to 5.82 (72-33 type). They determined the fruit juice pH changed from 4.53 to 5.65. In addition, the chemical characteristics of the selected fig types were different from each other. The reasons of these differences can change according to the genetic characteristics, maintenance requirements, harvested early or later and the ecological conditions.

Table 3. Some chemical characteristics of selected fig types (Average of years 2008-2009).

Accession Number	Titrable Acidity (%)	TSS (%)	TSS/Titrable Acidity	pH
72-32	0.17 c	21.72 b	125.78 ab	5.43 bc
72-33	0.29 a*	18.53 c	64.81 c	5.82 a
72-35	0.17 c	18.63 c	109.02 b	5.04 d
72-37	0.23 b	23.50ab	102.44 b	5.67 ab
72-38	0.13 d	18.48 c	142.32 a	5.25 cd
72-41	0.23 b	24.35 a	107.00 b	5.42 bc
LSD	0.02	1.83	27.15	0.36

*p < 0.05, there are some significant differences among the genotypes to all parameters measured by Tukey's test.

Considering 2 years mean results (2008 and 2009), some physical characteristics (fruit weight, fruit width, fruit length, ostiole width, neck length and fruit shape index) of the selected fig types were found statistically different from each other at 5% level (Table 4).

Fruit weight is very significant for fresh consumption in fig (Aksoy et al., 1992). Therefore, the length, width and the weight of the fruit were measured to quantify (Condit, 1941). According to the average values, the fruit weight changed from 44.52 g (72-33 type) to 117.03 g (72-38 type). These results were found better than those of Ozeker and Isfandiyaroglu (Ozeker and Isfandiyaroglu, 1998). They determined the fruit weight changed from 30 g to 90 g. The fruit length changed from 36.05 mm (72-33) to 46.80 mm (72-35). The results in this study were found to be lower than those of Bostan et al. (1997).

They determined the fruit length changed from 62.00 mm to 38.50 mm. The fruit width changed from 43.96 mm (72-33) to 65.87 mm (72-38). These results were higher than those of Kuden et al. (2008). They determined the fruit width changed from 49.97 mm to 32.97 mm. No neck was observed in 3 types (72-33, 72-37 and 72-41), while the others had necks and their neck lengths changed from 5.73 mm (72-38) to 8.44 mm (72-32 type). These values were similar to those of Polat and Ozkaya (2005). They determined the neck length was changed from 0.00 mm (no neck) to 8.01 mm. The fruits with neck that are too long one are not desired by the table fig industry. Fruit shape index changed from 1.08 (72-32 and 72-35 types) to 1.49 (72-38 type). These results were different from those of all the Abbas types of Ilgin (1995). She determined the fruit shape index changed from 1.20 to 1.40 of

Abbas types. The fruit shape index can change according to the genetic characteristics. In addition, the ostiolum width changed from 2.50 mm (72-32 type) to 5.68 mm (72-38 type). These results were between those of (Aksoy et al., 1992). They determined the ostiolum width changed from 0.60 mm to 9.10 mm. In general, high ostiolum width is an undesirable characteristics.

In addition, the fruit skin crack was little in 2 fig types (72-35 and 72-38) and

absent in the other types. The peeling of skin was medium in 2 fig types (72-32 and 72-35) and easy in the other types. The results with respect to the fruit skin crack and the peeling of skin in this research were similar to Simsek 2009a and 2009b). The fruit skin crack and the peeling of skin can change according to the genetic characteristics and ecological conditions.

Table 4. Some physical characteristics of the selected fig types (Average of years 2008-2009).

Accession Number	Fruit Weight (g)	Fruit Length (mm)	Fruit Width (mm)	Fruit Shape Index	Neck Length (mm)	Ostiolum Width (mm)
72-32	55.01 bc	43.15 ab	46.59 b	1.08 b	8.44 a	2.50 d
72-33	44.52 c	36.05 c	43.96 b	1.22 b	0.00 d	4.56 b
72-35	62.07 b	46.80 a	50.43 b	1.08 b	7.02 b	4.35 b
72-37	62.57 b	42.08 abc	47.63 b	1.14 b	0.00 d	4.42 b
72-38	117.03 a*	44.27 a	65.87 a	1.49 a	5.73 c	5.68 a
72-41	49.53 c	37.12 bc	46.59 b	1.26 ab	0.00 d	3.57 c
LSD	12.09	6.44	7.25	0.26	1.14	0.64

*p <0.05, there are some significant differences among the genotypes to all parameters measured by Tukey's test.

In this study, according to the scores of the selected fig types, the best type was 72-38. Turkey is the world's largest fig producing country (Turkey represent more than half of the world fig export). To increase in the fig export, in addition to transportation and packaging, its quality should be good, too. The selected types should be done of their adaptations in the same ecological conditions with standard fig types and cultivars. Then, as a result of adaptation, the most significant fig types and cultivars can produce and can contribute to the economy of our country. As a conclusion, I am of the opinion that if the production and growing processes of the fig types are controlled scientifically, these results can be much more satisfactory.

REFERENCES

Aksoy, U. 1991. Descriptors for fig (*Ficus carica* L. and related *Ficus sp.*) Ege Univ. Faculty of Agric. Dept. Hortic. Izmir, Turkey.

- Aksoy, U., Seferoglu, G., Misirli, A., Kara, S., Sahin, N., Bulbul, S. ve Duzbastilar, M. 1992. Ege Bölgesi koşullarına uygun sofralık incir çeşit seleksiyonu. Türkiye I. Ulusal Bahçe Bitkileri Kongresi, 9-13 Ekim, 1992, 1:545-548.
- Alper, M.S. 2006. Şanlıurfa ilinde yetiştirilen incirlerin morfolojik ve pomolojik olarak belirlenmesi. Harran Üniv. Fen Bil. Enst. Yüksek Lisans Tezi (Basılmamış), 55 s. Şanlıurfa.
- Anonymous, 2005. <http://apps.fao.org/page/collections?subset=agriculture>.
- Bostan, S. Z., Islam, A. and Aygun, A. 1997. A study on pomological characteristics of local fig cultivars in Northern Turkey. *Acta Hort.* ISHS 480:71-73.
- Condit, I.J. 1941. Fig characteristics useful in the identification of varieties. *Hilgardia* 14: 1-69.
- Condit, I.J. 1947. The fig. A new series of plant science books, XIX, p. 221.

- Caliskan, O. 2003. Baz incir çeşit ve tiplerinin Dörtöl köşullarındaki fenolojik, morfolojik ve meyve kalite özelliklerinin belirlenmesi. Mustafa Kemal Üniv. Fen Bil. Enst. Yüksek Lisans Tezi (Basılmamış), Hatay, Türkiye.
- Caliskan, O. and Polat, A.A. 2008. Fruit characteristics of table fig (*Ficus carica*) cultivars in subtropical climate conditions of the Mediterranean Region. *Sci. Hort.* 115 (4): 360-367. DOL 10.1016.
- Ilgin, M. 1995. Kahramanmaraş bölgesi'nde incir seleksiyonu ve selekte edilen bazı önemli tiplerin meyve doğuşları ve dölleme biyolojileri üzerinde çalışmalar. Çukurova Üniv. Fen Bilimleri Enst. Doktora Tezi (Basılmamış), Adana, Türkiye.
- Ilgin, M. and Kuden, A.B, 1997. Table fig selection study in the Kahramanmaraş province of Turkey. Fifth International Symposium on Temperate Zone Fruits in the Tropics and Subtropics. 29th May-1st June, 1996, Acta Hort. ISHS 441: 351-358.
- Kabasakal, A. 1990. İncir Yetiştiriciliği. TAV yayın no: 20, s.96.
- Kaska, N., Kuden, A.B., Kuden, A. and Cetiner, S., 1990. Studies on the adaptation of Aegean figs and figs selected from Cukurova Region in Adana. Cukurova Univ. Journal of the Faculty Agriculture 5(4): 77-86.
- Koyuncu, M.A. 1997. A study on some fruit characteristics in local fig cultivars grown in Hilvan (Sanlıurfa, Turkey), Acta Hort. ISHS 480-1998: 83-85.
- Kuden, A.B. and Tanriver, E. 1997. Plant genetic resources and selection studies on figs in the East Mediterranean and South East Anatolia Regions. First International Symposium on Figs. 49-54, 24-28 June, İzmit, Turkey. Acta Hort. ISHS 480-1998.
- Kuden, A.B., Beyazit, S. and Comlekcioglu, S. 2008. Morphological and pomological characteristics of fig genotypes selected from Mediterranean and South East Anatolia Regions. Proceedings of the Third Int. Symposium on Fig. Acta Hort. ISHS 798: 95-102.
- Ozbek, S.,1978. Özel meyvecilik (Kışın yaprağını döken meyve türleri. Çukurova Üniv. Ziraat Fak. Yayınları No: 128, 482 s.
- Ozeker, E. and Isfandiyaroglu, M. 1998. Evaluation of table fig cultivars in Cesme Peninsula. Acta Hort. ISHS 480: 55-60.
- Polat, A. and Ozkaya, M. 2005. Selection studies on fig in the Mediterranean Region of Turkey. *J. Boti.*, 37(3); 567-574, Pakistan. ISSN (printed): 0556-3321.
- Simsek, M. 2009a. Evaluation of selected fig genotypes from Southeast Turkey. *African Journal of Biotechnology*, Vol. 8 (19), PP.4969-4976, 5 October, 2009, ISSN 1664-5315Q2009 Academic Journals.
- Simsek, M. 2009b. Fruit performances of the selected fig types in Turkey. *African Journal of Agricultural Research*, Vol. 4 (11), pp.1260-1267, November, 2009, ISSN 1991-637XQ2009 5315Q2009.Academic Journals.
- Simsek, M. ve Küden, A.B. 2008. Diyarbakır koşullarında incir genetik materyalinin seleksiyonu ve tanımlanması. Çukurova Üniv. *Fen Bil. Enst. Dergisi*, Cilt 18, Sayı 2, Adana, Türkiye.
- Westwood, M.N. 1978. Temperate zone pomology. W.H. Freeman and Company, San Fransisco, p.428.