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Correlations among Important Fruit Quality and Plant Characteristics of Some Fig Genotypes

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Abstract: Experiments were carried to determine correlations of important fruit and plant characteristics using 30 fig genotypes. The correlation coefficients between these traits were calculated using SAS program. Fruit weight, fruit diameter, fruit length, neck length, ostiolium width, abscission of the stalk from the twig, ease of peeling, fruit skin cracks, thickness of the fruit skin, texture of skin, fruit ribs, fruit internal cavity, TSS (total soluble solids), pH, acidity, TSS/acidity, trunk diameter, shoot length, yield per tree were traits examined in the study. According to five-year data, fruit weight was found to have positive correlation by fruit diameter (r = 0.92; $P < 0.01$), fruit length (r = 0.81; $P < 0.01$), neck length (r = 0.35; $P < 0.01$), ostiolium width (r = 0.23; $P < 0.01$), trunk diameter (r = 0.26; $P < 0.01$), fruit skin cracks (r = 0.26; $P < 0.01$) and negative correlation by TSS (r = -0.26; $P < 0.01$) and fruit ribs (r = -0.21; $P < 0.01$). Relations between some traits such as ostiolium width, abscission of the stalk from the twig, ease of peeling, fruit skin cracks, texture of skin and fruit ribs are deviated based on the years. Some relationships between fig fruit characteristics exist, which may help researchers to solve some problems such as ostiolium width and fruit skin cracking. These studies may contribute to producing fruit with a good quality and help to evaluate new cultivars.

Key words: Fig genotype**,** fruit quality, plant characteristic, correlation.

1. Introduction

Fig (*Ficus carica* L.) is among the oldest fruits and is known to humans for long times [1]. Being a major fruit species in the region, fig is grown commercially in most of the countries on the coast of the Mediterranean. Turkey is the prime producer of dried and table fig in the world. Recently, there is increasing interest in exotic fruits from world markets [2]. Table figs are accepted as exotic fruits in western and northern European countries where they cannot be cultivated. Nevertheless, these countries are developing an increasing interest in fresh figs [3]. Therefore, there is competition not only between fig production countries but also between fig importing countries [4].

Being cultivated in many parts of Turkey, fig has accumulated a wide range of variability with respect to different quantitative traits. Information on genetic associations under a particular environment will help in formulating the most effective breeding program and could simplify the selection approaches. The purpose of present studies was to determine of correlations between important fruit quality and plant characteristics of some fig genotypes.

2. Materials and Methods

Eight cultivars (“Sarilop”, “Bursa Siyahi”, “Goklop”, “Yediveren”, “Yesilguz”, “Morguz”, “Sari Zeybek” and “Akça”) and 22 selections were included in the study. The cultivars are the most widely grown and the genotypes were selected from the Mediterranean Region of Turkey described in a previous study [5]. Fruit weight, fruit length, fruit width, neck length, ostiole width, TSS (total soluble solids), pH, acidity (%), TSS/acidity ratio, abscission of the stalk from the twig, ease of peeling, fruit skin cracks, fruit shape, the shape of the fruit stalk, the thickness of the fruit skin, the fruit internal cavity, trunk diameter, shoot length and yield per tree were determined. The correlation coefficients between these

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traits were calculated using SAS program [6].

3. Results and Discussion

Both dried and fresh Turkish figs are desirable in the world markets, due to their big size. Crucial correlations were obtained between the fruit weight and width, fruit length and neck length which are among the parameters used for determining fruit size in fresh fig (Table 1). Correlations between these parameters were found to be significant throughout this five year-period. Fruit width and length are important in determining the fruit shape. These two parameters along with the weight could be used for working out the fruit size. In the study, it was established that in parallel with an increase in fruit width (0.92**), fruit length (0.81**), neck length (0.35**), ostiole width (0.23*) and fruit skin cracks (0.26**), there was a decline in TSS (-0.26*) and fruit ribs (-0.21*). It is clear that the bigger the fruit size is, the more the ostiole width and skin cracks are and the less the TSS, which are all essential parameters in determining the quality of figs.

There was no variation among the experimental years regarding the correlation between the fruit weight and skin cracks. A bigger ostiolium width is an unfavorable characteristic since it may let certain diseases into the fruit [7]. On the other hand, fruit skin cracks may cause quality loss particularly in transportation and storage. It was found out that as the neck length increased, fruit skin thickness also improved which was a remarkable correlation throughout these five years. A bigger TSS led to a smaller ostiole width (-0.32*) and less acidity (-0.21*).

TSS along with the fruit acidity is an essential factor which determines the fruit quality. In commercial fig production bigger fruits with a smaller ostiole width and TSS ratio but without any fruit skin cracks are preferable. Hence, in order to obtain figs in these standards, it is advisable that genotypes which are not too big should be preferred for improvement process. A direct proportion was observed between the pH and TSS/acidity while there was a negative correlation between the pH and the acidity value all through five-year period.

It was also found out in this period that as the trunk diameter increased, so did the fruit size (fruit width 0.26**, fruit width 0.24* and fruit length 0.26**) while the ostiolium width was smaller (-0.26*). This could be related to the increase in the fruit size with age and the bigger trunk diameter. Indeed, Botti et al. [8] reported that fruit size could continue to grow until the tree gains its final shape. It was observed that a decrease in shoot length led to a higher yield (-0.23*). This reveals that efficient shoot formation in a tree which yields fruit in a few buds close to the edge of annual shoots is important for a good harvest.

Easy abscission of the stalk from the twig is crucial for quality collection since otherwise the fruit skin sticks to the twig causing a drop in market value. A negative correlation was observed between the abscission of the stalk from the twig and ostiole width (-0.26*), pH (-0.27**) and TSS/acidity (-0.22) while a linear relation with the acidity (0.24*). Significant relations were observed between the abscission of the stalk, skin thickness and remained unchanged according to years. It was established for easy to peel genotypes that their pH and TSS/acidity were high (0.32** and 0.36**, respectively), however their acidity and yield were low (-0.34** and -0.27**, respectively) in addition to rather hard abscission rate (-0.33**). Skin thickness is an important feature for endurance transport and storing. Skin thickness was observed to be in direct proportion with the increase in fruit weight, fruit diameter and the shoot length, but inverse relation with the ease of peeling.

There appeared to be a significant inverse proportion all throughout the years with the skin texture and the abscission of the stalk from the twig (-0.67**). Fruit rib indicates vulnerability of the fruit

Table 1 Coefficients of correlation of important fruit quality and plant characteristics of some fig genotypes (average of five years).

Trait	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19
V1	0.92**	0.81**	0.35**	0.23*	-0.26**	-0.08	0.13	-0.18	0.26**	-0.10	0.17	0.04	0.11	0.26**	0.19	-0.02	-0.21*	-0.15
V2		0.85**	0.38**	0.31**	-0.22*	0.05	-0.05	-0.04	0.24*	-0.16	0.19	0.03	0.08	0.22*	0.24*	-0.05	-0.14	-0.11
V3			0.59**	0.30**	-0.18	0.14	-0.15	0.11	0.26**	-0.18	0.22*	-0.03	0.16	0.15	0.20	-0.01	-0.18	-0.03
V4				0.51**	-0.15	0.19	-0.22*	0.19	-0.10	-0.16	0.16	0.00	0.10	-0.09	0.36	-0.02	-0.04	0.25*
V5					-0.32**	0.11	-0.21*	0.10	-0.26**	0.06	0.10	-0.26**	0 .03	0.19	0.30**	0.00	0.01	0.36**
V6						0.15	-0.06	0.37**	-0.02	0.03	-0.10	0.01	0.01	-0.08	-0.07	0.00	0.12	-0.04
V7							-0.62**	0.57**	0.04	0.07	-0.18	-0.27**	0.32**	0.07	0.20*	0.07	-0.03	0.10
V8								-0.82**	-0.01	0.21*	0.00	0.21*	-0.34**	0.11	0.15	-0.04	0.06	-0.27**
V9									0.00	-0.07	-0.10	-0.22*	0.36**	-0.04	-0.25*	0.02	-0.18	0.33**
V10										-0.01	-0.07	0.20	0.09	0.12	-0.22*	-0.14	-0.06	0.23*
V11											-0.23*	0.04	-0.09	0.32**	-0.05	-0.13	-0.13	0.07
V12												0.08	-0.27**	-0.17	0.04	-0.11	-0.03	0.02
V13													-0.33**	-0.21*	0.05	-0.67**	0.25*	0.14
V14														0.14	-0.22*	0.06	-0.05	0.04
V15															-0.07	0.02	-0.22*	-0.10
V16																0.02	0.20	-0.09
V17																	-0.34**	-0.33**
V18																		0.17

* Significant at 5% level; ** Significant at 1% level.

v1 = fruit weight; v2 = fruit diameter; v3 = fruit length; v4 = neck length; v5 = ostiolium width; v6 = TSS; v7 = pH; v8 = acidity; v9 = TSS/Acidity; v10 = trunk diameter; v11 = shoot length; v12 = yield per tree; v13 = abscission of the stalk from the twig; v14 = ease of peeling; v15 = fruit skin cracks; v16 = thickness of the fruit skin; v17 = texture of skin; v18 = fruit ribs; v19 = fruit internal cavity.

skin cracks and it was correlated with abscission from the twig. Fruit internal cavity adversely affects the endurance of fruit to transport conditions; such fruits are readily damaged during transport. Fruit internal cavity increases in parallel with bigger neck length (0.25*), ostiole (0.36**), TSS/acidity (0.33**) and the trunk diameter (0.23*). On the other hand, a negative correlation was observed between the internal cavity and the fruit acidity (-0.27**), and the skin texture (-0.33**). The relations between the skin texture and the fruit internal cavity remanded unchanged through this five-year period.

Relations between such traits as ostiolium width, abscission of the stalk from the twig, ease of peeling, fruit skin cracks, texture of skin and fruit ribs varied depending on the years. There exit certain relationships between fig fruit characteristics, which may help researchers solve some problems related to ostiolium width and fruit skin cracking. Such studies may contribute to enhancing fruit quality and to evaluating new cultivars.

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