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Determination of Fruit Characteristics of Some Turkish Walnut (*Juglans Regia L.*) Cultivars Grown in Bozdoğan District (Aydin)

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Abstract

This study was carried out to determine the fruit characteristics of some standard walnut cultivars grown in Bozdoğan district of Aydın during the years of 2003 and 2004. Fruits samples have been collected from 10-12 year-old trees in established walnut gardens in the maturation period. Traits like the total weights of the fruits, kernel weights, kernel ratios, shell thicknesses, height and width of the fruits, sticking to the shell, shell color and roughness, kernel fullness, decayed kernel, all outbreak and harvest dates have been determined. In standard fruit samples of the first year, fruit weights ranged from 18.87g (Yavuz) to 10.44 (Kaman); kernel weights were 8,68 (Yavuz) – 5,53 (Yalova 3); kernel ratio varied between % 63,57 (Şebin) – 45,11 (Şen 1). In the data of the second year, fruit weights were 18,21g (Yavuz) - 11,25 g (Bilecik, Şebin); kernel weights were found between 11,50g (Yavuz) and 7,01 g (Kaman); kernel ratio were between the values of % 67,56 (Bilecik) and 51,11 (Yalova1). Shell thickness ranged from 1.76mm (Yalova1) to 1.12 (Kaman 1).

Key words: Bozdoğan, Fruit Characteristics, Selection, Walnut,

INTRODUCTION

Anatolia is rich in terms of walnut trees, which grow up of seeds and genetic structures of which are totally different from each other [1, 2]. Due to the negligence for many years, the desired level in our walnut production has not been reached and growing the standard cultivars has not been spread. Turkey has regressed to the third rank after USA and China in walnut production, although being at the first rank until 1970's. The number of our enclosed walnut gardens is still low. Major walnut producing countries have rapidly increased their production and export and thanked to the enclosed walnut gardens which they have been established by multiplying the standard walnut cultivars in a vegetative way. Growing was carried out with the cultivars adapted well to the region conditions in terms of both higher fruit and yield quantity. According to the recent statistics, approximately existing of 4,5 million walnut trees in our country, 120 thousand tones of shelled walnuts are produced, and the yield per tree varies between 25 and 30 kg/tree [2]. For this reason, selection studies still keep their importance in our country. It is required in Turkey that the walnuts grown up from the seed undergo a selection and highly qualified types are determined, standardized, and after their adaptations, suitable cultivars for each region are expanded. Types which are acquired after the selections carried out in different parts of our country have made into standard cultivars. And then, these cultivars are grown in different ecologies, are adapted and their traits are determined. The aim of this study was to determine the development performances of some standard cultivars grown in Bozdoğan ecological conditions of Aydın, Turkey.

MATERIAL AND METHOD

This study has been carried out in the district of Bozdoğan, Aydın in the years of 2003 and 2004. Walnut cultivars, named Yalova 1, Yalova 3, Yalova 4, Kaman 1, Yavuz, Bilecik, Şen 1 and Şebin, have been taken from the 10-12 year-old standard walnut gardens which are established in Bozdoğan; and fruit samples have been taken from the established and enclosed gardens. Fruits have been collected at the harvest time of walnut cultivars. These samples then have been kept for 24 hours in a flowing-air drying train of 30 °C to provide a homogenous drying. The five have been marked from each cultivar, 20 fruits have been taken from each tree, and their traits, such as fruit weight (g), kernel weight (g), kernel ratio (%), shell thickness (mm), fruit width (mm), fruit length (mm), fruit height (mm), shell color, shell roughness, shell break, kernel fullness, kernel defect, kernel color, decayed kernel, graininess and kernel removal rate have been examined [3, 4-6].

RESULTS AND DISCUSSION

Fruit characteristics of standard cultivars harvested in the year 2003 are given in Table 1. As can be seen in Table 1, it has been determined that fruit weights (g) varied between 10.44 (Kaman 1) and 18.87 (Yavuz); kernel weights (g) varied between 5.53 (Yalova 3) and 8.68 (Yavuz); kernel ratios (%) varied between 45.11 (Şen) and 63.57 (Şebin); shell thicknesses (mm) varied between 1.16 (Kaman) and 1.76 (Yalova 1). Fruit characteristics of the fruits taken in 2004 are given in Table 2. As it can be seen in Table 2, it has been determined that fruit weights (g) varied between 11.25 (Bilecik and Şebin) and 18.21(Yavuz); kernel weights (g) varied between 7.01(Kaman1) and 11.5(Yavuz); kernel ratios (%) varied between 51.11(Yalova

1) and 67.56 (Bilecik); shell thicknesses (mm) varied between 1.12 (Kaman1) and 1.68 (Yalova 1). According to statistical evaluations of both years, while significant differences have been found in terms of the cultivars ($p<0.05$), fruit weights and kernel weights, no difference has been observed in terms of kernel ratio.

Table 1. Some fruit characteristics of the cultivars (2003)

Cultivar	Fruit weight *	Kernel weight *	Nut length	Nut height	Nut width	Shell thickness (mm)	Kernel ratio (%)
Kaman1	10,44±0,23**c**	6,51±0,47**c**	36,28±0,39	30,62±0,18	33,52±0,17	1,16±0,02	58,68
Yalova1	18,12±0,30**a**	7,98±0,16**ab**	44,54±0,23	34,45±0,43	36,58±0,21	1,76±0,04	46,67
Yalova3	13,71±0,35**b**	5,53±0,28**d**	40,39±0,37	31,73±0,25	33,05±0,32	1,36±0,03	46,88
Yalova4	13,79±0,19**b**	7,25±0,17**bc**	45,68±0,54	32,83±0,33	33,62±0,22	1,24±0,05	55,13
Yavuz	18,87±0,25**a**	8,68±0,32**a**	53,74±0,62	38,31±0,29	40,64±0,28	1,25±0,04	47,65
Bilecik	12,35±0,34**b**	6,68±0,14**c**	38,26±0,26	33,61±0,19	34,26±0,16	1,19±0,02	52,56
Şen 1	18,32±0,58**a**	8,34±0,36**a**	12,64±0,27	40,25±0,21	40,65±0,25	1,34±0,02	45,11
Şebin	10,63±0,29**c**	6,54±0,15**c**	37,78±0,21	33,26±0,39	31,11±0,17	1,22±0,05	63,57

* Mean separation within columns by LSD multiple test at, 0.05 level

Çelebioğlu [7] has used some local and foreign walnut cultivars under Yalova conditions in his studies, and for Yalova 1, he has found the fruit weight as 15.5 g, the kernel weight as 6.5 g, and kernel rate as 46.40%; for Şebin, he has found the fruit weight as 10.1 g, the kernel weight as 7.2 g, kernel rate as 64.40%; for Midland, he has found the fruit weight as 14.1 g, the kernel weight as 6.2 g, kernel rate as 44.00%; and for Hartley, he has found fruit weight as 12.1 g, the kernel weight as 5.7 g, kernel rate as 43.80%. Ferhatoğlu et al. [8] have determined the shelly walnut weights as

Table 2. Some fruit characteristics of walnut cultivars (2004)

Cultivar	Nut weight*	Kernel weight*	Nut length	Nut height	Nut width	Shell thickness	(%) Kernel ratio
Kaman1	12,54±0,58**d**	7,01±0,26**c**	38,18±0,34	31,06±0,22	33,74±0,32	1,12±0,02	61,00
Yalova1	17,02±0,21**ab**	9,20±0,54**b**	44,42±0,19	34,43±0,25	36,14±0,24	1,68±0,02	51,11
Yalova3	11,87±0,32**d**	7,03±0,32**c**	41,15±0,21	32,07±0,18	33,49±0,31	1,40±0,04	51,16
Yalova4	14,25±0,22**c**	8,89±0,19**bc**	44,84±0,27	33,47±0,16	34,78±0,25	1,18±0,03	59,99
Yavuz	18,21±0,43**a**	11,5±0,21**a**	52,73±0,39	38,39±0,21	40,20±0,32	1,29±0,02	61,19
Bilecik	11,25±0,50**d**	7,12±0,15**c**	39,00±0,24	33,25±0,32	33,90±0,20	1,23±0,03	67,56
Şen 1	15,87±0,39**b**	8,76±0,42**bc**	12,92±0,36	39,65±0,14	40,79±0,29	1,32±0,05	51,19
Şebin	11,25±0,15**d**	7,10±0,17**c**	36,12±0,25	33,02±0,27	31,71±0,19	1,24±0,03	61,11

* Mean separation within columns by LSD multiple test at, 0.05 level

As can be seen from Table 3, it has been observed that the harvest date is the middle September when the shell colors was normal in 6 types, light in 2 types; full kernel removal of the yield was normal in 5 cultivars, easy in 3 cultivars; shell break was easy in 6 cultivars, medium in 2 cultivars; and no kernel defect was observed.

Table 3. Some fruit characteristics of the cultivar (2003-2004)

Cultivar	Shell Color	Kernel color	Kernel Removal Rate	Shell Roughness	Kernel Defect	Shell Break	Kernel Fullness	Harvest Date
Kaman1	Dark	Dark	Medium	Rough	No	Easy	Good	21-26 Sep
Yalova1	Dark	Dark	Medium	Medium	No	Medium	Very Good	13-18 Sep
Yalova3	Dark	Dark	Medium	Medium	No	Easy	Good	18-23 Sep
Yalova4	Medium	Medium	Easy	Medium	No	Easy	Good	20-25 Sep
Yavuz	Dark	Yellow	Medium	Medium	No	Easy	Very Good	23-28 Sep
Bilecik	Light	Dark	Medium	Rough	No	Medium	Good	20-25 Sep
Şen 1	Light	Yellow	Easy	Medium	No	Easy	Good	15-20 Sep
Şebin	Dark	Dark	Easy	Medium	No	Easy	Good	15-20 Sep

17,4 g for Yavuz-1, and 12,6 g for Şebin under Yalova conditions. The same researchers have noted that the kernel ratio was 62% for Şebin. In a research carried out under Malatya conditions for the cultivars of Yalova-1, Yalova-2, Yalova-3, Şebin, Şen-1 (KE-25), Yavuz-1 (KR-2) and 198/110, they have determined that fruit weight (g) varied between 14.2 (Yavuz-1) and 8.2 (Şebin); the kernel weight (g) varied between 4.8 (Şebin) and 7.2 (Yavuz) (1). Şen [2] has recorded that for Yalova 1, the fruit weight is 15.5 g, kernel weight was 7.5 g; for Yalova 3, the fruit weight was 12.1 g, kernel weight was 6.4 g; for Yalova 4, the fruit weight was 12.9 g, kernel weight was 6.8 g; for Şebin 1, the fruit weight was 9.4 g, kernel weight was 6.6 g; and for Bilecik, the fruit weight was 10.4 g, kernel weight was 5.2 g. According to statistical analyses in the data of first year, Yalova 1, Yavuz ve Şen 1 have shown better performance in terms of fruit weight; and according to the data of the second year, those have been Yalova 1 and Yavuz.

In terms of kernel weight, according to the data of the first year, Yavuz and Şen 1; and according to the data of the second year, Yavuz has shown more development when compared to other cultivars. When the data of the first and second year are evaluated, it has been observed that no significant difference exist between the cultivars in terms of kernel ratio.

Şen and Tekintaş [9] have determined 31 promising types in their selection study which was carried out in Adilcevaz district of Bitlis Province. They found the fruit weight as 11.65–23.81 g, kernel weight as 5.45–11.42 g, kernel rate as 39.01–57.53%, shell thickness as 0.53–1.77 mm. Oğuz [4] has determined 16 types in the selection study, carried out in Ermenek and has recorded that the fruit weights varied between 10.45 and 15.88 g, kernel weights between 5.26 and 6.93 g, kernel rates between 41.05 and 50.33%, and shell thicknesses between 1.23 and 1.80 mm. Aşkın and Gün [3] have determined 39 promising types in their study. They determined the fruit weights as 12.56–18.40 g, kernel weights as 7.61–9.92 g, kernel rates as 55.49–64.27%, and shell thicknesses as 0.83–1.36 mm. Balcı et al. [10] have reported that the fruit weights as 11.8-18.7 g, kernel weights as 6.25-9.23 g, kernel rates as 48-60%. Kazankaya et al. [11] have noted after their study undertaken in Çatak that the fruit weights vary between 4.21 and 11.31 g, kernel weights 1.47 and 5.23 g, kernel rates 24 and 57%, and shell thicknesses 0.76 and 2.06 mm.

When we compare the results of our study with the other studies carried out on the same standard cultivars in our country in terms of fruit characteristics; it can be said that the results that we have obtained are better than the results of the studies of Çelebioğlu [7] carried on the cultivars of Yalova 1 and Şebin; of Ferhatoğlu [8] carried on the variety of Yavuz in Yalova conditions; and of Asma et al. [12] carried out in Malatya.

Findings of this study performed in Bozdoğan ecological conditions indicates that standard walnut cultivars have better fruit characteristics. In addition, their other commercial attributes such as yield potentials and resistant to late spring frosts should be identified with further studies.

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