

Investigations on Morphological and Pomological Characteristics of Chestnut Genotypes in İkizce and Şenbolluk Natural Areas of Ordu Vicinity

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Abstract

This study has been carried out to contribute to the conservation of natural plant genetic resources and to determine the morphological and pomological characteristics of chestnut genotypes in İkizce and Şenbolluk natural areas of Ordu vicinity. For this aim, morphologic characteristics such as lower and upper leaf surface colour, leaf surface brilliance, leaf pubescence, leaf stalk length, leaf length and wideness were investigated. Nut and kernel weight, nut size, nut height, length and width, colour, brightness, thickness and hardness of nut shell, kernel colour, testa peeling and taste status were also investigated as nut characteristics.

The lower and upper leaf surface colour of nut genotypes varied from intense green to clear green. The leaf surfaces varied from bright to mat, the leaf stalk lengths from 8.8 to 19.4 mm, leaf length from 145.0 to 237.6 mm, leaf wideness from 42.6 to 82.0 mm. Average nut weight varied between 1.83- 11.45 g, kernel weight between 1.34-9.71 g, nut width between 11.37-21.41 mm, nut length between 18.79-35.28 mm, nut height between 17.13-30.88 mm, shell colour between typical chestnut colour and intense colour, shell thickness between 0.28-0.58 mm, testa peeling between very easily and difficult, kernel colour between clear and dirty yellow.

INTRODUCTION

Anatolia, is regarded as the origin of many fruit species, as well as that of the chestnut. *Castanea sativa* Mill. has a rich natural flora in the area of the Marmara and West Anatolia, spreading out from east of Black Sea region to west (Ülkümen and Özbek, 1950; Soyly, 1984; Serdar and Bilgener, 1995). The total chestnut production of the world is around 450.000 tonnes. China is the leading producing nation, with 100.000 tonnes, followed by Turkey with 65.000 tonnes (Anonymous, 1997).

The first breeding studies on chestnut began in USA in early 19th century (Bounous et al., 1995). The fruit and tree characteristics of chestnut grown in the natural flora of Anatolia were studied by Ayfer et al. (1977). In this works researchers selected 24 genotypes for the second period of selection program in the Marmara and West Black Sea regions, out of which 13 were suggested to growers in the following years (Ayfer et al., 1982; Ayfer and Soyly, 1995). In another work by Serdar and Bilgener (1995) five chestnut genotypes were selected in Erfelek in Sinop. Özkarakaş et al. (1995) determined 23 promising genotypes in Aegean region of Turkey. Another selection program was carried out in Salıpazarı in Samsun by Balta et al., (1996). In a recent study by Serdar and Soyly (1999) some important selection characteristics such as earliness, testa peeling, kernel colour, the colour- brightness- thickness and hardness of nut shell, nut size and fruitfulness were investigated. Similar characteristics were also determined by Akça and Yılmaz (1999) in Niksar district of Tokat in Turkey.

According to these reports, the Black See region of Turkey can be regarded as a source of chestnut diverse populations, distributed from east to west. Among these regions, Ordu province, with total 31.725 number trees and with 402 tonnes of production is an important chestnut population area (Anonymous, 1996). On the other hand, from

point of the selection studies done in the areas with rich chestnut genotype populations, fruit and tree characteristics of existing genotypes can be determined in more detail. These studies can lead to protect our natural flora like the chestnut genotypes of Çanakkale Kaz mountain (Tan and Tan, 1999; Tan, 1999; Göschl, 1999). Especially in recent years the works on protection and determination of the natural genetic sources in Europe are popular and many investments have been done on this subject (Kahn, 1985; Hawtin, 1999).

The main aim of this study, which was carried out in Ünye County, is to determine some fruit and tree characteristics of natural genotypes. This will also contribute to the aspect of protecting our natural genetic resources.

MATERIAL AND METHOD

This study has been carried out in İkizce and Şenbolluk natural areas of Ordu vicinity in 1998 and in 1999. The fruit and tree characteristics of total 29 genotypes were determined in detail. As reported from many researchers, the most important characteristics are fruitfulness, shell number in hush ell, nut and kernel weight (g), nut size (number of nut/100 g), nut height, length and width, nut shell colour, brightness, thickness and hardness, kernel colour, testa peeling and earliness (Ayfer et al., 1982; Hadrovic et al., 1984; Ayfer et al., 1986; Özkarakas et al., 1995; Serdar and Bilgener, 1995; Ayfer and Soylu, 1995; Balta et al., 1996; Serdar and Soylu, 1999).

Some leaf and tree characteristics have also been studied. While leaf and fruit samples, were taken from all genotypes selected in 1998, the fruit samples were taken from the selected four genotypes in the second year. Ten fruit and leaf samples were taken from each type.

RESULTS AND DISCUSSION

The leaf characteristics of chestnut genotypes are given in Table 1. In the genotypes the upper and lower leaf colour varied from dark-green to clear green. While the upper leaf colour of the genotypes was mostly dark green or green, the lower leaf colour was generally clear green. The leaf surface varied between bright and mat. The pubescence on leaf was apparent only in one genotype. The apex of the leaves of genotype 9 and 10 was dense, and the shape of apex was mostly wedge, pointed and bow shaped. The leaf stalk length varied between 8.8 mm (in genotypes 7 and 23) and 19.4 mm (in genotype 27). While the leaf length was in the range of 145.0 mm (in genotype 13) and 237.6 mm (in genotype 15), the leaf wideness varied between 42.6 mm (in genotype 27) and 82.0 mm (in genotype 5).

The some tree and fruit characteristics of chestnut genotypes are given in Table 2 and Table 3. Average nut weight of genotypes varied between 1.83 and 11.45 g, and average kernel weight between 1.34 and 9.71 g. The numbers of fruit in 100 g were between 9 and 63. Nut size was in the range of 11.37-21.41 mm width, 18.79-35.28 mm length, and 17.13-30.88 mm height. The nut shell colour was typical to chestnut or dark colour and mostly mat or sometimes bright. The thickness of nut shell of the genotypes varied between 0.28-0.58 mm, and the shell hardness of genotypes were generally middle hard and very hard. The testa peeling of the genotypes changed from very easy to difficult. The kernel colour was in the range of very clear to dirty yellow. The taste status was generally scaled as good and very good. The values on nut characteristics obtained in our work were generally lower than those of previous researchers who conducted selection work on chestnut.

Only three out of 29 genotypes studied were found to have an average nut and kernel weight (genotypes 3, 4, and 7). Balta et al. (1996) stated that they found some genotypes having nut weight between 5.07-15.74 g, kernel weight between 3.95-14.00 g and shell thickness between 0.25-0.79 mm. On the other hand, Serdar and Soylu (1999) obtained genotypes having 5.2-16.0 g nut weights. In this study chestnut genotypes had very dark to pubescent leaf colour, clear brown to bright shell colour and shell thickness between 0.34- 1.01 mm, and kernel colour varying from cream to clear cream. The

peeling properties of the testa could be scaled as between easy to difficulty.

Özkarakaş et al. (1995) also obtained some chestnut genotypes with 8.85 to 18.51 g nut weights, and with 0.36-0.62 mm shell thickness. Similar results to our findings were reported in another selection work conducted by Serdar and Bilginer (1995) in Erfelek county of Sinop in Turkey. Although many selection works have been carried out on chestnut in Turkey, most of the selected genotypes don't meet the requirements of the growers. But those works also help to save the natural resources of a country. For instance; many isolated natural botanical gardens were established in the UK, Germany, Belgium, France, Spain, Italy and in our neighbour Greece. However, there are only a few botanical gardens in Turkey e.g. the Çanakkale Kaz mountain. This shows how weak the attempts were in the past to save our natural resources (Hawtin, 1999; Tan, 1999).

So far thousands of different genotypes were obtained from many selection works, which should be regarded as our natural richness. Care should be given to save their natural flora. If this is not done we will have to continue to import fruit species from other countries conducting breeding work on this fruit crops such as the USA, Germany, UK, Italy, France or Canada.

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Tables

Table 1. Some leaf characteristics of 1998 of the chestnut genotypes investigated in this study.

Types	Leaf upper colour ¹	Leaf bottom colour	Leaf surface ²	Leaf Pubescence	Apex of leaf frequency and shape ³	Leaf stalk length (mm)	Leaf length (mm)	Leaf width (mm)
1	DG	G	B	-	S-W	18.2	230.0	64.0
2	DG	G	M	+	S-W	15.6	204.0	69.4
3	G	CG	M	-	S-P	11.8	154.4	60.6
4	CG	CG	M	-	S-B	13.4	190.0	63.8
5	DG	G	B	-	S-B	17.8	228.5	82.0
6	G	CG	B	-	S-P	14.2	149.0	70.2
7	G	CG	M	-	S-P	8.8	156.8	60.6
8	G	CG	B	-	S-W	13.2	160.8	63.8
9	DG	CG	M	-	S-W	17.4	216.4	55.0
10	DG	G	M	-	D-W	14.0	180.6	68.8
11	DG	G	M	-	S-W	14.2	174.2	65.0
12	G	CG	M	-	S-W	12.0	202.0	69.8
13	DG	G	B	-	S-W	11.8	145.0	61.4
14	CG	CG	M	-	S-W	12.0	187.6	65.6
15	DG	G	B	-	S-W	19.2	237.6	80.8
16	G	CG	M	-	S-P	11.0	222.4	70.6
17	G	CG	B	-	S-P	15.4	223.0	81.6
18	G	CG	M	-	S-B	18.0	193.2	78.2
19	DG	G	M	-	S-P	12.8	188.6	71.4
20	G	CG	M	-	S-P	16.8	200.8	76.0
21	DG	G	B	-	S-W	15.4	174.0	61.6
22	G	CG	M	-	S-W	15.2	211.6	78.8
23	G	CG	M	-	S-P	8.8	173.2	66.4
24	G	CG	B	-	S-W	15.8	166.4	64.8
25	G	CG	M	-	S-P	10.0	160.2	79.2
26	G	CG	B	-	S-P	15.0	201.2	73.8
27	G	CG	M	-	S-P	19.4	161.2	42.6
28	DG	G	B	-	S-P	15.4	206.0	77.4
29	G	CG	M	-	S-W	10.2	184.6	69.0

(1) Leaf colour: DG; Dark Green, G; Green, CG; Clear Green

(2) Leaf surface: B; Bright, M; Mat

(3) Frequency and shape: S: Sparse, D: Dense, W: Wedge, B: Bow, P: Pointed.

Table 2. Some tree and fruit characteristics of 1998 in chestnut genotypes investigated.

Types*	Average fruit weight (g) (45 % moisture)		Nut size (number of nut/ 100 g)	Nut sizes (mm)		
	Shell	Kernel		Width	Length	Height
1	3.11	2.46	31	14.42	20.91	20.62
2	3.27	2.45	31	14.80	22.41	22.31
3	11.45	9.71	9	21.41	35.28	29.63
4	11.15	9.15	9	20.32	31.01	30.88
5	4.51	3.88	22	21.90	23.30	21.84
6	4.15	3.12	29	15.69	23.79	22.18
7	10.73	9.68	9	21.16	34.10	30.72
8	2.80	2.23	38	14.13	20.13	19.57
9	1.83	1.34	63	11.37	19.09	17.84
10	2.92	1.96	39	13.40	20.68	20.13
11	3.39	2.39	30	15.63	21.81	20.18
12	3.09	2.17	37	13.12	23.71	21.93
13	3.16	2.64	30	14.91	21.96	19.47
14	2.78	1.93	40	12.13	21.95	20.26
15	3.57	2.71	27	14.06	22.64	20.18
16	3.01	2.61	31	15.35	22.75	19.54
17	3.29	2.74	30	13.38	22.83	19.09
18	3.98	3.22	26	15.18	23.10	20.74
19	5.79	4.83	18	13.17	23.21	21.72
20	3.78	2.88	30	14.76	23.30	21.37
21	4.12	3.27	21	16.03	24.13	21.64
22	3.37	2.38	33	14.30	22.44	20.58
23	3.40	2.71	28	14.71	23.79	21.46
24	3.09	2.60	34	13.22	21.70	19.37
25	3.84	2.69	27	14.29	24.43	22.36
26	3.42	2.78	30	14.78	22.88	19.46
27	3.12	2.64	32	14.02	21.94	20.18
28	2.70	1.94	41	12.46	18.79	17.13
29	3.14	2.39	36	13.08	21.80	19.64

* The values for the genotypes 3, 4, 7 and 19 were obtained from the average of two years.

Table 3. Fruit characteristics of 1998 in chestnut genotypes investigated in this study.

Types*	Nut shell characteristics				Testa peeling ⁴	Kernel colour ⁵	Taste status ⁶
	Colour ¹	Brightn. ²	Thickn.	Hardness ³			
1	7	6	0.32	2	6	10	7
2	9	4	0.28	2	7	1	9
3	7	6	0.58	2	7	9	8
4	1	7	0.46	2	1	1	9
5	9	4	0.42	2	5	7	8
6	7	4	0.46	1	7	7	4
7	1	6	0.38	3	1	1	9
8	4	6	0.36	1	9	10	8
9	9	6	0.31	2	7	9	4
10	7	6	0.52	1	7	1	8
11	7	7	0.29	1	5	9	8
12	9	4	0.58	2	5	7	8
13	9	4	0.34	2	6	1	9
14	7	4	0.54	2	5	9	4
15	7	6	0.34	2	5	1	7
16	9	4	0.46	3	6	9	7
17	4	4	0.52	2	8	7	7
18	7	7	0.42	2	1	1	9
19	9	6	0.42	3	6	9	10
20	7	6	0.54	2	5	9	7
21	7	9	0.39	3	8	7	9
22	7	6	0.44	2	5	7	7
23	9	7	0.51	2	9	9	8
24	8	7	0.42	2	9	9	9
25	9	8	0.38	1	1	9	7
26	9	6	0.54	1	8	8	7
27	9	4	0.54	2	7	7	8
28	1	7	0.33	1	9	9	4
29	7	6	0.50	2	5	9	7

* The values for the genotypes 3, 4, 7 and 19 were obtained from the average of two years⁷

(1) Colour scale: 9-10; typical chestnut colour, 7-8; dark, 4; clear brown, 1-2-3; very dark

(2) Brightness: 9-10; very bright, 6-7-8; bright, 4; mat, 1-2; pubescence.

(3)Hardness: 3; soft, 2; middle hard, 1; very hard.

(4)Testa peeling scale: 9-10; very easy, 7-8; easy, 5-6; middle easy, 1; difficult

(5)Kernel colour: 9-10; very clear, 7-8; cream, 1; dirty yellow.

(6)Taste scale: 9-10; very good, 7-8; good, 4; middle, 1; low (Serdar and Bilgener, 1995).