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Fruit Characteristics of Native Almond Selections from the Lake Van Region (Eastern Anatolia, Turkey)

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Abstract

The research was conducted in the Lake Van Region during 1997 and 1998. The research evaluated selections of natural almond population grown from seed on Island Adlr (Van) in Lake Van. Approximate 400 seedling trees were investigated and, data from 13 selections were recorded in terms of fruit characteristics for two years. For all selections, full blooming season occurred in late April and harvest season in late August. In-shell fruit weights changed between 2.74 g and 6.80 g. Kernel weights ranged from 0.64 g to 1.32 g. The kernel percentage varied 18.4% to 29.2% and double kernel percentage was 0% and 60%. The shell thickness varied from 0.27 cm to 0.43 cm.

Introduction

Cultivated almond originated in Central and Southwestern Asia. Almond growing in Anatolia backs to ancient times (1). Production occurs in most regions except for the Northeast and the higher altitudes of Eastern Anatolia, but is more common in the Aegean, Mediterranean and South Eastern Regions (2). In recent years, although new almond orchards are being established by using foreign and domestic selected cultivars, a large part of production is provided from seedling trees with different genetic features from each other. Seed propagation has continued for thousands of years and gives rise to a rich germplasm resource (3, 4, 5). Accordingly, selecting valuable individuals within seedling population with great diversity in different areas or districts of Anatolia might contribute to breeding progress.

The first studies on almond germplasm in Turkey were started by Dokuzoguz et al. (3) and Dokuzoguz and Gülcan (6) in the Aegean Region. The characteristics of some native almonds were recorded and promising selections were released. Following this work, many selection and related studies were conducted in various parts of the country in order to identify the most promising almond germplasm and their adaptation abilities (4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14). Kaşka et al. (14) reported that Turkey has a great potential for almond growing and that Southeast Anatolia will be an important center for almond in the future, due to the availability of water for irrigation. Initial trials on almonds production have shown promising results.

With hard climatic conditions, Eastern Anatolia also has seedling almond populations, and therefore this region might have valuable almond sources. The Lake Van Region has a microclimate characteristic of the East Anatolia production areas. The goal of this research was the selection of the most promising germplasm from this native material.

Material and Method

The research was performed on seedling almond trees grown from seeds on Island Adır (Van city) located in Lake Van (East Anatolia) during 1997 and 1998. The Island is near the campus of Yüzüncü Yıl University and Erciş county. The soil is poor in organic matter and is alkali.

Lake Van is surrounded by high mountains which contributes to the regional microclimate. According to average records of long years in Van city and its surroundings, annual rainfall is 380 mm, the highest temperature recorded in last 40 years is 37.5 °C, the lowest is –27.8 °C and the annual average is 8.8 °C. Sunlight averages 7 hours and 36 min. in a day. The solar (sun) intensity is 381.87 cal/min/cm^2. The number of the days exposing to frost ranges be-

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tween 132 and 211. Frost period continues from 2 November to 22 April. Late spring frosts usually occur in late April. The snow falls mostly in early October in the mountains around Lake Van, and in early November in the city center (16).

The research material consisted of seedling trees on which no technical and cultural practices were previously performed.

In the study, app. 400 seedling almond trees, which were at bearing age, were examined. Following observations of the trees and the fruits, 13 selections were made. Pomological analyses were made according to the method of Aslantaş and Güleryüz (5). In the 1997 and 1998 harvest seasons, twenty-five fruits representing each tree were randomly chosen and measured. Data concerning time of first bloom, full bloom and harvest, as well as fruit dimension (cm), in-shell fruit weight (g), kernel weight (g), shell thickness (cm), kernel ratio (%), ratio of double kernels (%) and kernel flavor were recorded for each selection. In addition, kernel protein, oil and ash contents of selections were also determined according to Yarılgaç (17).

Results and Discussions

All selections first flowered at the third week of April, full flowered in late April and come to harvest in late August. Many researchers have reported that the times of flowering for almonds grown in Turkey vary according to cultivars and ecologies, and the flowering season begins earlier in the Aegean, Mediterranean and South Eastern Regions, and later in the Eastern Anatolia (3, 4, 5, 6, 10, 13). The flowering seasons of selections were similar to those of natural selections from Kemaliye district of Erzincan City (East Anatolia) and later than those of the Mediterranean, Aegean and Southeastern selections, due to different ecological conditions of the regions (3, 4, 5, 6, 10, 13).

The dimensions of in-shelled fruits representing selections were measured as minimum, maximum and average values. The average thickness of in-shelled fruits varied from 1.34 cm to 1.84 cm. The average width was between 1.77 cm and 2.73 cm and the average length was 3.11 cm and 4.41 cm (Table 1). These fruit dimensions were similar to native selections from the various area of Anatolia (5, 6, 7, 8, 9, 10, 11).

The selections had 2.74-6.80 g average in-shelled fruit weight, 0.64-1.32 g average kernel weight, 0.27-0.43 cm average shell thickness, 18.4-29.2% kernel ratio, 0-60% double kernel ratio and all were sweet kernels (Table 2).

With regard to in-shelled fruit dimensions and in-shell and kernel characteristics, selections examined had close values with some selections reported by others (4, 6, 7, 8, 13, 15). For example, in a study car-

Table 1. The dimensions of inshelled fruits of almond selections from the Lake Van region of Turkey (1997-1998).

ADIR Select.	Thickness (cm)			Width (cm)			Length (cm)		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
ADIR 04	1.45	1.55	1.52±0.14	2.11	2.47	2.24±0.12	3.28	3.97	3.64±0.09
ADIR 05	1.53	1.97	1.67±0.25	2.33	3.00	2.73±0.09	3.62	4.65	4.12±0.06
ADIR 08	1.28	1.42	1.34±0.04	1.68	1.90	1.77±0.17	3.20	3.55	3.35±0.07
ADIR 09	1.35	1.45	1.41±0.13	1.78	1.95	1.90±0.14	3.00	3.24	3.11±0.09
ADIR 29	1.58	1.90	1.66±0.15	2.30	2.87	2.48±0.08	4.22	4.60	4.41±0.08
ADIR 30	1.45	1.72	1.61±0.12	2.20	2.58	2.43±0.09	3.76	4.40	4.07±0.08
ADIR 31	1.45	1.64	1.57±0.16	2.15	2.52	2.30±0.08	3.22	3.60	3.49±0.07
ADIR 32	1.53	1.90	1.62±0.14	2.22	2.37	2.29±0.09	3.15	3.70	3.34±0.05
ADIR 34	1.35	1.77	1.51±0.13	2.04	2.54	2.29±0.06	3.15	3.75	3.49±0.08
ADIR 35	1.60	1.95	1.84±0.17	2.43	2.65	2.51±0.08	3.45	3.85	3.56±0.07
ADIR 36	1.67	1.80	1.72±0.09	2.36	2.52	2.43±0.06	4.24	4.72	4.41±0.09
ADIR 37	1.35	1.65	1.57±0.12	2.08	2.41	2.23±0.07	3.75	4.20	4.01±0.08
ADIR 38	1.40	1.60	1.49±0.08	1.97	2.55	2.18±0.09	3.32	4.00	3.73±0.06

Table 2. Inshell and kernel characteristics of almond selections from the Lake Van region of Turkey (1997-1998).

ADIR Select.	Inshell fruit weight (g)			Kernel weight (g)			Shell thickness (cm)			Kernel ratio (%)	Double kernel ratio (%)	Kernel taste
	Min	Max	Average	Min	Max	Average	Min	Max	Average			
ADIR 04	4.0	5.6	4.71±0.21	0.7	1.1	0.96±0.19	0.30	0.40	0.36±0.04	20.4	0	sweet
ADIR 05	3.8	6.6	4.90±0.43	0.8	1.4	1.06±0.17	0.34	0.45	0.38±0.02	21.6	0	sweet
ADIR 08	2.3	2.9	2.74±0.35	0.7	0.9	0.80±0.13	0.22	0.31	0.27±0.01	29.2	0	sweet
ADIR 09	2.8	3.3	3.15±0.38	0.3	0.7	0.64±0.16	0.30	0.37	0.32±0.03	20.3	0	sweet
ADIR 29	5.9	9.0	6.80±0.59	0.9	1.8	1.25±0.13	0.32	0.41	0.37±0.03	18.4	20	sweet
ADIR 30	4.4	6.2	5.54±0.52	0.7	1.2	1.02±0.17	0.32	0.36	0.33±0.02	18.4	60	sweet
ADIR 31	3.7	5.0	4.58±0.41	0.9	1.2	1.05±0.19	0.30	0.37	0.34±0.02	22.9	0	sweet
ADIR 32	4.0	5.9	4.50±0.23	1.0	1.7	1.14±0.16	0.31	0.38	0.34±0.03	25.3	10	sweet
ADIR 34	3.7	6.1	4.54±0.19	0.7	1.5	0.92±0.15	0.32	0.42	0.36±0.03	20.3	10	sweet
ADIR 35	4.5	5.6	5.21±0.32	0.9	1.3	1.14±0.19	0.40	0.48	0.43±0.05	21.9	0	sweet
ADIR 36	5.9	6.9	6.41±0.42	1.2	1.6	1.32±0.18	0.33	0.42	0.34±0.04	20.6	20	sweet
ADIR 37	4.4	5.9	5.09±0.29	0.9	1.2	1.04±0.14	0.32	0.39	0.36±0.02	20.4	0	sweet
ADIR 38	2.5	5.0	3.54±0.18	0.5	0.9	0.72±0.16	0.25	0.35	0.32±0.03	20.3	20	sweet

ried out in the Kemaliye district (Erzincan city, East Anatolia), Aslantaş and Güleryüz (5) selected 20 native almonds. They reported in-shell fruit weights between 2.89 g and 6.14 g, kernel weights between 0.65 g and 1.15 g, shell thickness between 0.23 cm and 0.43 cm, kernel ratios between 14.6% and 26.8%, and double kernel ratio between 0% and 28.%. Also, Şimşek (13), who studied on native almond selections from Kahraman Maraş City, recorded that selections have kernel weight between 0.66 and 1.31 g, kernel ratio between 14.0 and 50.0% and the ratio of double kernels between 0 and 5%. Beyhan and Bostan (8) determined 3-9 g in-shelled fruit weight, 0.77-1.23 g kernel weight, 0.28-0.48 cm shell thickness, 18.0-23.8% kernel ratio and 0-80% double kernel ratio for native selections from Darende district (Malatya). Cangi and Şen (7) selected native almonds from Vezirköprü district (Samsun, Black Sea), determined 23.7-26.6% kernel ratio and 0-8% double kernel ratio.

Biochemical analysis showed a range of 22.2-24.3% for protein content, 48.7-69.9% for oil content and 1.57-6.27% for ash content (Table 3). Barbera et al. (18) reported 56.19% and 52.25 oil contents, and 22.5% and 25.8% protein contents for Ferragnes and Tuono cultivars, respectively.

In the USA and other European Countries where almond growing is at a more advanced level, production is mainly from standard cultivars, usually released from local breeding programs (19, 20, 21, 22, 23). This study contributes to such breeding progress by characterizing native almond germplasm variation of the lake Van Region. Continued and more detailed selection studies with this native germplasm is necessary to provide the raw material for future breeding efforts and may also result in the selection of native genotypes of sufficient commercial value to justify their release to growers as local cultivars.

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Table 3. Kernel protein, oil and ash contents of almond selections from the Lake Van region of Turkey (1998).

ADIR Selec.	Prot. cont. (%)	Oil cont. (%)	Ash cont. (%)
ADIR 04	22.4	51.2	6.27
ADIR 05	22.6	56.6	3.80
ADIR 08	22.2	48.7	4.11
ADIR 09	—	51.2	—
ADIR 29	22.2	48.7	3.69
ADIR 30	23.5	51.5	5.91
ADIR 31	24.3	69.9	1.57
ADIR 32	22.8	54.1	3.13
ADIR 34	22.6	57.7	2.87
ADIR 35	22.2	49.6	3.44
ADIR 36	22.9	52.5	3.24
ADIR 37	23.7	54.9	3.58
ADIR 38	—	52.2	—

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