

Phenological and Pomological Characteristics of Local Pear (*Pyrus communis* L) Varieties Grown in Siirt

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ABSTRACT

This research was conducted on the local pear varieties that are grown in Siirt Central district, Tillo, Sirvan, Erüh, Kurtalan, Pervari districts and in their villages. Thirty local pear variety samples, which has high quality and high market value were collected between 2014 and 2015. Pomological characteristics and phenological observations were evaluated on selected fruit trees and collected fruit samples. Bud burst, beginning of flowering, full flowering, end of blooming, flowering time and number of days from full bloom to harvest, and harvest data were collected in order to determine phenological characteristics of local pear types grown in Siirt province. Fruit weight was found between 27.33 and 300.26 g, while fruit size was observed to be between 30.95 and 93.64 mm, width of fruit between 33.61 and 73.21 mm, fruit stalk length between 21.68 and 52.65 mm, fruit stalk thickness between 0.38 and 4.53 mm, Width of core was ranging from 2.48 to 6.12 mm, while length of core was ranging from 6.52 to 10.85 mm. Soluble solid content was found to be between 8.75 to 14.50 % , whereas titratable acidity was observed to be within the range of 0.85-3.27 % and pH of pear juice was observed to be between 3.54 and 4.67. Moreover, the grittiness and taste properties were also determined on the rind and pulp color of the local pears.

Keywords: Pear, phenology, pomology, *Pyrus communis* L., Siirt

INTRODUCTION

Turkey has very variable climatic and soil conditions and its geographical position makes the country a favorable growing ground for many fruit species. While Theophrastus does not consider the cultural history of pear in Turkey, many researchers have shown that Anatolia is one of the important gene centers (Bostan and Şen, 1991; Ülkümen, 1938).

World pear production is approximately 25 million metric tons according to 2014 data and Turkey is in the 5th place with 462.336 tons (%1,8) of production. China is the leading country with more than 17 million metric tons of pear produced followed by the Argentina with 771.271 tons USA with 754.415 tons and Italy with 701.558 tons (FAO, 2017).

Local varieties that do not have economic value and often consumed in the family or sold in local markets are of great genetic value and are indispensable for breeding trials (Bostan and Şen, 1991). For this reason, it is important to highlight local pear varieties that are suitable for different environmental conditions of Turkey.

Turkey's rich genetic diversity provides a source of breeding material to fruit breeders. The protection and use of germplasm resources as breeding material are among the main tasks of plant breeders. It is necessary to select genotypes that are fertile, resistant to various diseases and pests, and capable of meeting certain climate and soil conditions (Güleryüz and Ülkümen, 1977). Local varieties with economic value and novel genetic diversity are required to be protected as genetic material or for controlled cultivation, in order to prevent them from extinction over time (Edizer and Güneş, 1997)

In this study conducted in and around Siirt Province; it is aimed to prevent the loss of local pear genotypes (some of Turkey's local varieties), to determine some phenological, pomological and morphological features, to detect pear genotypes with high fruit quality to identify the problems encountered in pear farming and to suggest practical solutions to these problems.

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MATERIALS AND METHODS

This research was conducted in Siirt Central district and Tillo, Eruh, Kurtalan, Pervari, and Şirvandı districts between 2014 and 2015. The material of the study was grafted and seed-grown pear genotypes that have been cultivated for many years in the villages of Siirt province and its districts. In each year, 10 fruit samples were randomly selected from different directions and samples were taken from each tree during harvest season. The collected samples were brought to the laboratory for determining their pomological properties. Some pomological properties, such as fruit weight, fruit width, fruit size, fruit stem size, fruit stem diameter, number of seeds, seed width, and seed size were measured. In addition, chemical characteristics; soluble solid content, pH, and titratable acidity were measured in fruit juice. Selected pear trees were observed in March in order to record phenological observations. Bud burst, beginning of flowering, full flowering, end of flowering, flowering time, time from full flowering to harvest and harvest dates were collected for phenological parameters.

RESULTS and DISCUSSION

The average values of the data obtained from 30 local pear genotypes collected in 2014 and 2015 are presented in Tables 1 and 2. It was determined that the fruit weights of local pear varieties and genotypes were changed between 27.33-300.26 g according to two-year average. 56 SS 15 (Yabani karçin) is the smallest variety with 27.33 g; 56 SM 06 (Kulundi) was the largest variety with 300.26 g. According to Özrenk (2002) fruit weights of 81 pear genotypes collected from Erzincan province were between 6.23 and 190 g. In another study conducted in the Aegean Region, the average fruit weights of the selected varieties were between 21.3 and 337.0 g (Ünal, et al 1997). Fruit weights of pears collected from Tokat Central district were reported to be between 54.05 and 197.94 g (Edizer and Güneş, 1997).

According to our observations fruit widths ranged between 33.61 and 73.21 mm whereas, fruit length ranged between 30.95 and 93.64 mm, fruit stem lengths ranged between 20.72 and 58.49 mm and fruit stem thickness ranged between 0.38 and 4.77 mm. The mean fruit length were found to be between 30.95 mm (56 SS 15) and 93.64 mm (56 DB 03).

According to previous observations fruit lengths for the varieties were between 40-90 mm (Karadeniz and Şen, 1990), 93.10 to 43.30 mm (Bostan and Şen, 1991), 54.04 to 82.95 mm and 45.52 to 92.32 mm (Karadeniz and Kalkışım, 1996), 9.52 cm and 5.22 cm (Yarılgaç and Yıldız, 2001), 39.9 to 85.4 mm (Serdar, et al. 2007), 94.13 to 35.15 mm (Uzun ve Karadeniz, 2010), and between 37.89-108.18 mm (Özkaplan ve Yarılgaç, 2010).

Table 1. Two years (2014 and 2015) mean values of fruit weight, length, width, shape index, stem length and thickness of local pear varieties and genotypes collected from Siirt Province.

Sample No	Genotypes	Fruit					
		Weight (g)	Length (mm)	Width (mm)	Fruit Shape Index (U / G)	Handle Length (mm)	Handle Thickness (mm)
1	56 SM 01	56.52	54.38	41.99	1.29	29.24	3.40
2	56 SM 02	91.73	47.94	46.02	1.03	23.25	3.99
3	56 SM 03	165.83	55.26	50.80	1.08	38.48	0.38
4	56 SM 04	152.22	55.57	47.84	1.15	38.36	1.08
5	56 SM 05	206.31	62.91	57.28	1.09	40.41	0.73
6	56 SM 06	300.26	71.72	69.31	1.03	25.00	1.28
7	56 SM 07	151.03	71.61	44.59	1.60	41.76	0.52
8	56 SM 08	64.48	52.08	39.09	1.32	25.95	1.33
9	56 SM 09	44.27	45.44	35.53	1.27	29.39	3.63
10	56 SM 10	66.19	69.29	43.87	1.57	58.49	4.28
11	56 GB 11	68.95	54.35	42.19	1.28	26.29	4.51
12	56GB 12	63.31	59.09	44.48	1.32	25.73	4.44
13	56 SS 13	104.42	56.52	50.30	1.12	26.78	4.77
14	56 SS 14	201.94	76.11	67.90	1.11	21.68	4.57
15	56 SS 15	27.33	30.95	33.61	0.91	39.05	4.48
16	56 AD 16	61.26	42.84	41.96	1.01	30.57	3.39
17	56 AD 17	141.57	60.40	55.74	1.07	36.62	3.12
18	56 Tİ 01	93.05	72.22	46.15	1.56	40.34	3.53
19	56 PR 01	194.60	90.18	56.19	1.60	42.82	4.53
20	56 ŞR 01	44.75	45.59	36.12	1.25	29.68	1.02
21	56 BK 01	51.88	37.65	42.37	0.88	23.96	3.43
22	56 BK 02	49.06	38.49	38.61	0.99	20.72	3.12
23	56 BK 03	84.90	72.82	50.41	1.44	52.65	3.91
24	56 BK 04	106.47	53.05	56.44	0.93	38.77	3.41
25	56 BK 05	137.68	59.41	60.50	0.98	36.06	3.20
26	56 ÜZ 01	37.70	37.99	40.41	0.93	37.68	2.85
27	56 DB 02	161.20	65.03	73.21	0.88	24.47	2.93
28	56 DB 03	94.67	93.64	63.39	1.47	43.06	3.26
29	56 GU 04	278.38	74.03	71.31	1.03	32.97	3.57
30	56 DB 05	235.10	83.77	64.51	1.29	50.80	3.39



Figure 1. Fruit appearance of some selected pear genotypes (Left to right- 56 SS 14, 56 DB 05, 56 GU 04, 56 SM 06 respectively).

In our study, the average fruit width was found to vary between 33.61 mm (56 SS 15) and 73.21 mm (56 DB 02). Plant diameter reports from previous observations were 41-75 mm (Karadeniz and Şen, 1990), 34.1 to 78.5 and 82.0 mm (Bostan and Şen, 1991), 52.16 and 72.32 mm (Karadeniz and Kalkınma, 1996), 45.52 to 92.32 mm (Edizer and Güneş, 1997), 9.00 cm to 5.74 cm (Yarılgaç and Yıldız, 2001), 41.9 to 80.3 mm (Serdar *et al.* 2007), 41.82 to 68.85 mm, and 31.36 to 72.97 mm (Karadeniz and Çorumlu, 2012), and 53.07 and 112.93 mm (Serdar *et al.* 2007).

Table 2. Two-year (2014 and 2015) mean values of the physical and chemical properties of fruit and seeds belonging to local pear varieties and genotypes collected from Siirt Province.

SampleNo	Genotypes	SSC (%)	TA Miktarı (%)	pH	Seednumber	Seed		
						Weight (g)	Length (mm)	Width (mm)
1	56 SM 01	8.75	2.69	4.14	1.5	0.06	7.64	2.48
2	56 SM 02	14.5	3.27	4.56	8.0	0.62	9.82	5.73
3	56 SM 03	13.75	2.23	4.14	5.0	0.25	10.64	4.93
4	56 SM 04	13.5	3.22	4.30	6.0	0.45	9.76	4.83
5	56 SM 05	12.0	3.00	4.26	2.0	0.06	9.63	4.15
6	56 SM 06	12.75	3.05	4.27	6.0	0.39	10.56	5.15
7	56 SM 07	13.2	1.87	4.67	5.0	0.36	11.73	5.07
8	56 SM 08	14.5	1.11	4.21	7.0	0.75	7.84	5.82
9	56 SM 09	11.5	0.85	4.07	7.0	0.63	8.05	4.36
10	56 SM 10	11.1	1.11	4.31	2.0	0.16	10.65	4.74
11	56 GB 11	12.75	1.87	4.10	4.0	0.36	7.93	5.25
12	56 GB 12	13.25	3.06	4.56	6.0	0.62	8.43	4.36
13	56 SS 13	13.2	2.53	4.50	4.0	0.25	9.93	5.05
14	56 SS 14	13.0	2.23	4.18	1.0	0.06	9.74	4.39
15	56 SS 15	12.0	2.66	3.73	8.0	0.62	8.36	6.12
16	56 AD 16	12.7	1.92	4.44	3.0	0.26	8.14	5.63
17	56 AD 17	14.25	1.38	4.42	2.0	0.13	9.65	4.17
18	56 Tİ 01	11.1	2.47	4.43	3.0	0.17	10.64	4.86
19	56 PR 01	14.4	2.58	4.18	1.0	0.06	9.75	4.42
20	56 ŞR 01	13.25	1.33	4.45	6.0	0.75	7.84	5.83
21	56 BK 01	12.25	2.28	4.45	6.0	0.39	7.86	4.94
22	56 BK 02	12.5	3.05	3.54	6.0	0.36	10.35	5.59
23	56 BK 03	14.0	1.41	4.51	4.0	0.36	9.52	5.24
24	56 BK 04	11.6	2.23	4.20	2.0	0.08	6.52	3.34
25	56 BK 05	13.0	2.03	4.20	4.0	0.05	7.44	3.35
26	56 ÜZ 01	11.25	2.90	4.14	6.0	0.47	7.83	5.95
27	56 DB 02	11.5	3.00	3.98	6.0	0.47	8.65	5.19
28	56 DB 03	13.0	2.83	4.16	6.0	0.48	7.84	5.95
29	56 GU 04	14.25	1.92	4.18	4.0	0.26	10.85	4.09
30	56 DB 05	14.0	2.90	4.29	3.0	0.13	9.94	4.83

Fruit stem lengths were 56.72 mm (56 BK 02) and, 58.49 mm (56 SM 10) and fruit stem thicknesses were 0.38 mm (56 SM 03) and 4.77 mm (56 SS 13), respectively, for the local varieties and genotypes evaluated in this study. Fruit stem length was found to be between 23.7-56.6 mm in 22 local pear varieties grown in Artvin province, Camili region (Demirsoy ve ark., 2007). In a study conducted in the South Eastern Anatolia Region on 15 local pear varieties, the shortest stem length was 18 mm, and the longest stem length was 42.8 mm, while the shortest stem diameter was 3.1 mm and the longest stem length was 5.6 mm (Kaplan, 1997).

Seed counts of varieties and genotypes were between 1.0 and 8.0; seed widths were ranging from 2.48 to 5.95 mm; and seed lengths were between 7.44 and 11.73 mm.

The water-soluble dry matter content of pear varieties and genotypes was between 8.75% and 14.5%. pH values ranged from 3.54 to 4.67 and titratable acidity was observed to be between 0.85% and 3.27%. Soluble solids content (SSC) in our study varied between 8.75% (56 SM 01) and 14.5% (56 SM 08). Previously reported water-soluble dry matters were ranging from 14.0% to 17.8% (Karadeniz and Şen, 1990), 9% to 16.2% (Bostan and Şen, 1991), 10.60% to 14.10% (Karadeniz and Kalkisim, 1996), 10.88% to 15.44% (Edizer and Güneş, 1997), 9.80% to 17.00% (Yarılgaç and Yıldız, 2001), 9% to 15.1% (Serdar *et al.* 2007), 18% to 8.5% (Uzun and Karadeniz, 2010), 7.0% to 16.25% (Özkaplan and Yarılgaç, 2010), 11.0% to 16.2% (Öztürk and Demirsoy, 2010), 7.0% - 19.7% (Çiftçi *et al.* 2011), and 7% to 16.6% (Özrenk, 2002).

pH values in our study varied between 3.54% (56 BK 02) and 4.67% (56 SM 07). Özrenk (2002), who investigated the fruit and tree characteristics of 81 genotypes in Erzincan province found that pH values changed between 3.20 and 5.71. In other previously conducted studies pH ranges of; 3.35- 5.18% (Bostan and Şen, 1991), 3.15- 4.62% (Karadeniz and Kalkışım, 1996), 5.8 - 3.73% (Uzun and Karadeniz, 2010), 3.80- 6.25% (Özkaplan and Yarılgaç, 2010), and 3.3- 0.6% (Bostan and Acar, 2012), were reported.

Titratable acidity in our study changed between 0.85 (56 SM 09) and 3.27 (56 SM 02). According to Özrenk (2002) the amount of titratable acid varied between 0.09% and 0.63%. Furthermore, the amounts of titratable acid reported in the previous observations were; 0.097% - 0.258% (Karadeniz and Kalkışım 1996), 0.240% - 2.451% (Yarılgaç and Yıldız, 2010), 0.12% - 0.52% (Serdar *et al.*, 2007), 0.07-0.60% (Uzun and Karadeniz, 2010), 0.07-0.66% (Özkaplan and Yarılgaç, 2010), 0.21% - 1.02% (Öztürk and Demirsoy, 2010), 0.04% - 0.72% (Çiftçi *et al.*, 2011) and 5.7 - 4.6% (Bostan and Acar, 2012).

CONCLUSIONS

As a result of the evaluations made on local pear varieties and genotypes, cultivated in and around Siirt Province, according to weighed rating method; 56 PR 01, 56 SS 14, 56 DB 05, 56 GU 04, 56 SM 06, 56 SM 05, 56 AD 17 genotypes with high scores in fruit weight, fruit flavor and periodicity were found to be superior to the other genotypes.

The local variety is the first to be sold in the local market, which is the earliest maturing but not durable to be stored in the region. The latest harvested genotype was 56 UZ 01 (local name Shiti). Local genotype 56 DB 02 was, generally collected in early September and buried in the straw and sold in local markets until the end of March, due to its very hard flesh.

It was observed in the study areas that pear cultivation is not conducted in closed gardens, rather in scattered form, on trees and on the edges of roads, spontaneously or grafted onto wild pears. It has been observed that the pear trees in the region are not given adequate care with cultural practices (pruning, weed fighting, cleaning dried branches and cutting shoots etc.) to prevent the spread and harm of the diseases.

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