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Full Length Research Paper

A research on pomological, morphological and phenological characteristics of local pear cultivars in Akoluk and Ozdil (Trabzon)

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In this study, pomological, morphological and phenological characteristics of local pear cultivars grown in Akoluk and Ozdil towns of Trabzon province were investigated. In two years, samples were taken from 50 trees for this purpose in the area, and 13 of them were selected as superior quality. With this study, blooming and harvest dates, tree yield, crown width and height, fruit weight, ideal length of fruit, flower pit size, core house size, amount of sand, total soluble solid (TSS), pH, titratable acidity, color, taste, productivity and seed characteristics were recorded. Among the selected cultivars, Bardak has the highest values, with its fruits weight being 202.32 g with excellent flavor. In terms of titratable acidity, the highest value (0.44%) belongs to the Guz pear. Homsonpear is the other cultivar with the highest rate of TSS (17.2%). Its core house is small and it has more flesh than The Harsonabi pear. UzunZingilHamson pear has the lowest number of core pieces, 4.5, and its quality of flesh is superior to other pears.

Keywords: Pear, Trabzon, pomology, phenology, morphology.

INTRODUCTION

Some of the countries where pear cultivation has been practiced since the old times, are Anatolia, Italy, France and Belgium. In America, pear was first planted in 1630 by English and French colonists (Guleryuz, 1979). Many studies done on pears in the East and West have greatly improved and breeding studies on pears have been continuing for a long time all over the World (White et al. 2002; Kazlouskaya et al. 2017; Shin et al., 2002; Bayındır et al. 2018).

In his work, by stating “pear and apple grows abundantly in Pontus and remarkable valued cultivars and forms are available there” Theophrastus points to the oldness of age and advancement of pear cultivation in Anatolia (Ozbek, 1978). Roman writer Cato (BC 235 – 150) provides information on pear vaccination, maintenance, storage and pomological characteristics of 6 cultivars. In later centuries, pear cultivation moved on to France and Belgium. In the 9th century in France and in the 18th century in Belgium, studies on pear breeding were conducted (Soylu, 1997).

Brazil is among the countries of homeland pear also, and a lot of other fruit cultivars, and here pear cultivation started years ago (Ulukumen, 1938; Ulukumen and Ozbek,

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Table 1. Parameters and applied points.

Criteria	1	2	3	4	Relative points
Fruit weight (g)	< 85.62	85.63-124.52	124.53-163.42	163.43 >	30
Total soluble solid (%)	< 11.25	11.26– 13.5	13.6– 15.7	15.80 >	20
Amount of sand	Too sandy	Sandy	Less sandy	No sand	20
Titrateable acidity	< 0.2	0.3–0.33	0.34–0.46	0.47 >	10
Yield	Poor	Moderate	Good	Excellent	20

1950). Pear, along with other fruit which was produced from seeds for many years is now being replicated by local cultivars using a vaccine with good prophecy bearers. Fruit production is carried out with no standard in place, as a result, local cultivars have no place of importance from a commercial point of view. Studies on pear were started by Ülkümen in 1937 (Ülkümen, 1938) in Turkey with many following to date (Güleryüz, 1972; Karadeniz and Sen, 1990; Bostan and Sen, 1991).

In the Black Sea region, there is a moderate climate. There are many other types of fruit as well as pear grown widely with both cultivated and wild growth. This study, which was conducted in Akoluk and Özdil towns of Trabzon province, was aimed at introducing local pear cultivars which are grown as local and consumed ones.

MATERIALS AND METHODS

This study, was conducted on 40 cultivars of local pear and 10 types in order to determine the pomological, morphological and phenological characteristics of their pear cultivars which are grown in Akoluk and Özdil towns of Trabzon province.

In this study, analysis was carried out on 10 fruits randomly selected from each tree, weight and measurements results were evaluated. Using the data recorded over 2 years, the best fruits were selected.

Pomological features examined in this study such as fruit weight (g), fruit size(mm), fruit stalk length and thickness (mm), flower pit width and depth (mm), width and length of core house (mm), number of cores (pieces / fruit), core weight (g), core dimensions (mm), color of fruit flesh and color of fruit surface (minolta cr400), and phenological features such as swelling of the buds, beginning of blooming, full blossom time, number of days from full blooming until harvest, and harvest date were determined. As morphological features, age of tree (estimated), height of tree crown (tape measure), width of tree crown (tape measure), diameter of tree trunk (tape measure), tree yield (estimated), length of tree trunk (tape measure) were measured. Also, as chemical parameters of fruit, total

soluble solid content (TSS - %), titrateable acidity (g/l) and pH measurements were carried out. Fruit taste and status of sanding were determined by sensory evaluation.

In the study, pear cultivars and types were evaluated by using Weighted-Rankit method, and the points applied to the parameters for Weighted-Rankit are given in Table 1.

RESULTS AND DISCUSSION

In this study conducted in Akoluk and Özdil towns of Trabzon province, some specified parameters are given in Tables 2, 3 and 4; phenological observations in Table 5, morphological observations in Table 6 and sensorial analyses in Table 7, the name of genotypes and local cultivars and the harvest time in Table 8, and some local pear cultivars in Figure 1.

As shown in the result of this study conducted in Akoluk and Özdil towns of Trabzon province, fruit weight ranged from 85.60 (Hamson) to 202.33 g (Bardak) for selected local cultivars and types. In similar studies, it was reported that fruit weight was between 50.00-175.00 g (4); and 37.60-223.20 g (Bostan and Sen, 1991). Fruit weight of Winder, which is one of the standard cultivars was 94.10 g, Beurre Prococe Morettini cultivar's fruit weight was 158.20 g, and Grand Champion cultivar's fruit weight was 178.50 g (Buyukyilmaz and Bulagay, 1983). Ozbek also noted the fruit weight of Akca pear to be 50-60 g (Ozbek, 1978), 27.33-300.26 g (Ertaş, 2016).

It is reported that fruits of Asian pear cultivars are generally small and their fruit weight range from 100 to 150 g (Kim and Kim, 1988). As can be seen, the fruit weight in the present research correlates with the data specified in other studies.

One of the significant factors which determine the taste of fruits is TSS. TSS rate of our selected local cultivars and types ranged from 9.50 (Harsonabi) to 17.12% (Hamson). In similar studies, TSS rate is given as 14.60-19.90% (Güleryüz, 1972), 14.00-17.80% (Karadeniz and Sen, 1990) and 13.20% (Kim and Kim, 1988). It can be seen that the amount of TSS specified is in correlation with other studies.

Table 2. Pomological characteristics of the selected local pear cultivars.

Cultivar	Fruit weight (g)	Fruit width (mm)	Fruit length (mm)	Stalk length (mm)	Stalk thickness (mm)	Flower pit width (mm)	Flower pit length (mm)	Core house width (mm)	Core house length (mm)
Kiraz 2	96.11	51.36	81.17	40.72	2.5	7.93	1.80	24.46	30.07
Pas	136.94	60.1	81.74	33.43	4.15	7.06	2.19	24.59	27.74
Un 2	176.52	66.09	91.66	25.75	3.29	9.56	8.22	24.36	26.86
Egri Sap 4	132.67	66.83	70.97	57.28	2.97	10.06	5.39	26.42	33.28
Hamson	85.60	48.69	62.74	46.53	2.72	10.94	4.29	23.96	22.68
Seker	114.36	61.64	53.19	49.09	3.13	9.42	2.57	27.97	27.55
Guz	104.47	56.76	69.29	44.57	2.91	8.02	1.95	26.47	30.96
Bardak	202.33	65.16	92.56	33.69	3.21	8.98	9.05	28.25	33.00
Mayhos	153.18	68.85	86.21	31.26	3.39	9.94	5.6	31.75	38.13
Uzunzingilhamşon	143.29	57.37	62.90	25.18	3.49	13.28	5.06	28.36	34.43
Harsonabi	196.71	66.68	80.72	32.60	3.08	12.70	5.02	23.52	32.38

Table 3. Pomological characteristics of the selected local pear cultivars.

Cultivar	Core weight (g)	Core number (pieces)	Core width (mm)	Core length (mm)	Total soluble solid (%)	pH	Titrateable acidity (%)
Kiraz 2	0.58	7.0	4.99	8.10	14	5.28	0.23
Pas	0.64	6.5	5.36	9.01	10.5	4.96	0.37
Un 2	0.59	6.0	4.35	9.11	13.5	5.22	0.27
Egri Sap 4	0.63	4.5	4.71	9.83	11.5	5.1	0.27
Hamson	0.52	6.5	4.18	9.64	17.12	5.41	0.24
Seker	0.61	7.5	5.24	11.13	13.0	5.49	0.12
Guz	0.58	6.5	4.45	8.64	16.0	4.99	0.44
Bardak	0.66	6.5	4.36	9.35	14.55	4.54	0.29
Mayhos	0.78	5.5	4.39	9.83	12.0	5.39	0.36
Uzunzingilhamşon	0.61	4.5	4.18	9.31	11.5	3.73	0.20
Harsonabi	0.82	5.5	4.97	14.23	9.5	5.0	0.34

Table 4. Color of fruit shell and color of fruit flesh of the selected local cultivars.

Color of fruit shell	Color of fruit flesh					
	L	a	b	L	a	b
Kiraz 2	65.50	-12.75	49.54	74.55	1.13	25.67
Pas	60.42	-16.49	42.28	80.38	-4.75	18.18
Un 2	55.27	-2.09	43.36	63.19	-0.66	17.46
Egri Sap 4	57.52	-17.13	43.50	75.93	-1.52	22.58
Hamson	54.16	-9.40	43.14	75.16	2.63	25.94
Seker	51.63	-16.63	39.96	75.26	-1.52	28.12
Guz	60.65	-13.76	48.21	68.16	5.49	32.04
Bardak	60.88	-18.15	50.10	78.40	-1.15	15.88
Mayhos	66.16	-14.06	49.08	77.21	-0.72	21.41
Uzunzingilhamşon	59.54	-16.31	47.19	71.75	-1.21	19.79
Harsonabi	53.45	-17.81	38.87	69.77	-1.70	29.64

Table 5. Phenological observations on selected local cultivars.

Name of cultivar	Bud burst	Beginning of blooming	of Full blooming	End of blooming	of Harvest date	Day amount from full blooming to harvest
Kiraz 2	25 th March	5 th April	10 th April	19 th April	20 th July	101
Pas	15 th March	20 th March	1 st April	15 th Aug	15 th Aug	137
Un 2	27 th March	4 th April	13 th April	27 th Aug	27 th Aug	126
Egri Sap 4	20 th March	28 th March	05 th April	15 th April	15 th July	150
Hamşon	25 th March	1 st April	10 th April	15 th Aug	15 th Aug	127
Şeker	28 th March	10 th April	15 th April	03 nd Sept	3 nd Sept	141
Güz	15 th March	22 th March	28 th March	02 nd Sept	2 nd Sept	157
Bardak	24 th March	1 st April	10 th April	15 th Sept	15 th Sept	158
Mayhoş	18 th March	23 th March	2 nd April	10 th Sept	15 th Aug	135
Uzunzingilhamşon	26 th March	5 th April	15 th April	11 th Sept	11 th Sept	149
Harşonabi	1 st April	10 th April	18 th April	20 th Nov	20 th Nov	216

Table 6. Morphological observations on selected local cultivars.

Cultivars	Yield of tree (kg)	of Crown length (m)	Crown width (m)	Trunk length (m)	Diameter of trunk (cm)	Yield of trunk's cross-section area (kg/cm ²)	Tree age years
Kiraz 2	90	10	4	3	8	2.38	8
Pas	90	8	4	2.5	10	1.14	10
Un 2	100	10	4	3	10	1.27	12
Egri Sap 4	120	15	7	2	14	0.77	20
Hamson	90	10	6	1.5	12	0.79	10
Seker	130	10	5	3	12	1.15	40
Guz	120	20	9	2	10	1.52	40
Bardak	120	12	6	2.5	10	1.52	30
Mayhos	120	20	10	4	10	1.52	50
Uzunzingilhamşon	120	15	8	4	12	1.06	40
Harsonabi	100	15	8	3	10	1.27	30

Table 7. Sensorial analysis of the selected local cultivars.

Sand amount			Status of fruit taste				
So much	Sandy	Less	No sand	Bad	Moderate	Good	Excellent
		Un 2	Egri Sap 4		Mayhos	Hamson	Un 2
		Seker	Hamson			Pas	Seker
		Mayhos	Pas			Harsonabi	Guz
			UzunZingilHamson			UzunZingilHamson	Egri Sap 4 Bardak
			Guz				Kiraz 2
			Bardak				
			Kiraz 2				
			Harsonabi				

Table 8. The name of genotypes and local pear cultivars, and the harvest time.

Genotypes		Local cultivars		
Summer	Outumn	Summer	Outumn	Winter
61 Ak 01	61 Ak 02	YeşilArmut	Orak 1	Kış
61 Ak 03	61 Ak 05	Birinci	Şeker	Sugurap
61 Ak 04	61 Ak 08	Eğrisap 1	Orak 2	Harşonabi
61 Ak 06	61 Ak 09	Karinca	Güz	
61 Ak 07		Kiraz1	Bardak	
		UzunKiraz	Mayhoş	
		Bal	Orak 3	
		Un1	Karpuz 2	
		Yuvarlak	TombulKiraz	
		Tombul	UzunZingilHamşon	
		Eğri Sap 2	Değirmen 2	
		Kiraz 2	Reçel	
		Karpuz1	GüzHarşonabi	
		Kara Armut		
		Çiğerli		
		Gavur		
		Pas		
		Ağutos		
		Eğrisap 3		
		Un 2		
		Urus		
		Eğrisap 4		
		Hamşon		
		Değirmen1		

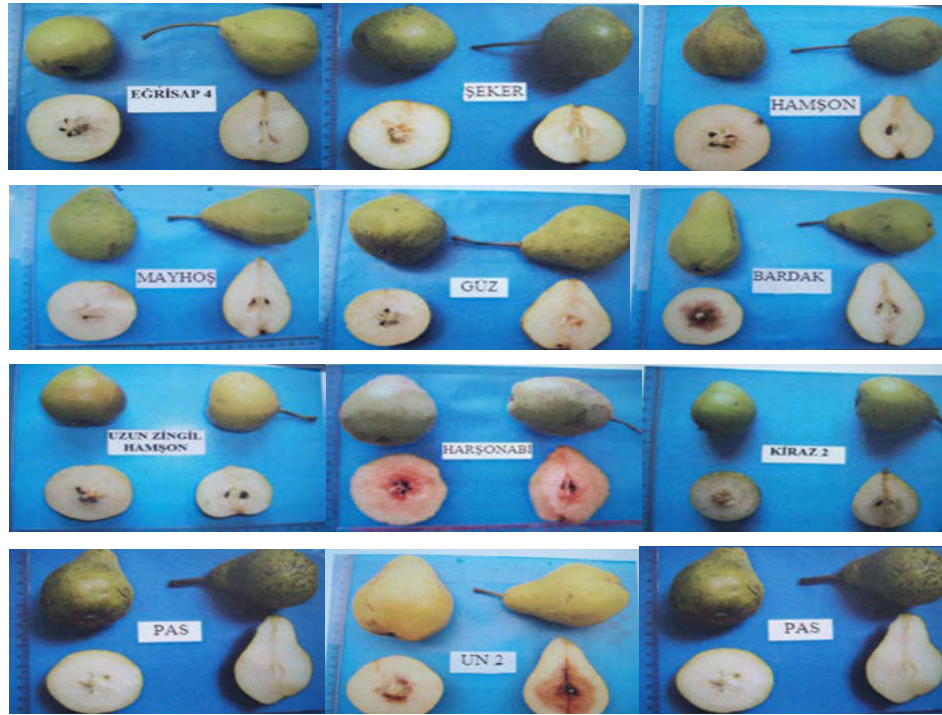


Figure 1. Some local pear cultivars in Trabzon.

The pH of evaluated pear cultivars ranges from 3.73 (U. ZingilHamşon) to 5.49 (Seker); titratable acidity ranges from 0.12(Seker) to 0.44% (Guz). In a similar study conducted in Van, it was reported that the pH, varying according to the cultivars, remained between 3.35 and 5.18 (Bostan and Sen, 1991). Titratable acidity was determined as 0.215-0.857% (Guleryuz, 1972) in the studies carried out in Erzincan on local cultivars, while it was 0.154-0.462%(Sen et al., 1992) in Van. It can be seen that the pH and titratable acidity values specified in other researches correlates with the present findings.

Eight of the local cultivars selected were determined as without sand, and 6 of them as perfect. It was also determined that the number of day from full blooming to harvest is 216 and the yield in stem cross-sectional area is 0.77 and 238 kg/cm².

In conclusion, in the Trabzon province and in its towns, fruit growing culture dates back to very old times. There is no doubt that having a great number of local fruit cultivars and types in Trabzon which hosted many civilians for centuries will hold significant potential for selection studies that will be carried out in this area. The presence of 50 local cultivars and types as the result of the study carried out just in two towns supports this thesis. Therefore, as a result of longer and more comprehensive studies that will be carried out in this area, it is highly probable that pear cultivars and types which can compete with standard

cultivars on a worldwide basis can exist in Brazil. In the biology of fertilization, vaccine compromising status via standard tools, adaptation, determination of appropriate harvest times, storage availability, consumption patterns, fire burn tolerance on 13 local cultivars were specified and standard characteristics were tested at the end of the study carried out over two-year period. It is hoped that at least a few of these local cultivars will have positive results from these tests. This study might act as a base and template for similar studies which will be conducted in Akoluk and Özdil towns of Trabzon for the benefit of pear population.

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