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DETERMINATION OF SOME PHYSICAL AND CHEMICAL PROPERTIES OF NATIVE CORNELIAN CHERRY (*CORNUS MAS* L.) DISTRICT OF ALMUS (TOKAT)

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Abstract

The present study was realized in 2013-2014 on different type of cornelian cherry grown from seed, in the district of Tokat Almus, Turkey. The determination of some physical and chemical properties was studied. For this purpose, in this region, 40 cornelian cherry trees have been identified and were recorded by GPS. The evaluation was based on the observations and particular type selection criteria. In this regard, nine genotypes of cornelian cherry were subjected to the analysis. The fruit width ranged between values of 8.41 and 10.67 mm, the average fruit height between 13.51 to 18.84 mm, and the average fruit weight between 0.78 to 1.73 g were determined. As results provided by physico-chemical analysis were the pH between 2.60 and 4.02, soluble solids (TSS) 11.4-15.5 % and the titratable acidity were up to 0.37.

Key words: *Almus, Cornelian Cherry, pH, pomological, soluble solids.*

INTRODUCTION

Thanks to its geographical location, our country is the home of many plant species. Also, the climate is also the homeland of cornelian cherry. Therefore, Anatolia has a very rich cornelian population (Ülkümen, 1973). In 2013, the cornelian cherry production was 11.838 tons, and the production area was 1.675 decares (Anonymous, 2014). The cornelian cherry populate Belgium and Southern Europe, especially Germany. Thereby, the cornelian cherry appear like tall shrubs and small trees and can be found in the form of sorting between 5 to 8 meters (Ercişli, 2004a; Tetera, 2006). Usually, in our country, cornelian is found in the wild form in mountainous areas and riverbeds (Mert and Soylu, 2006). Unlike Tokat Almus, the dogwood populations are scattered in other counties (Gerçekçioğlu, 1998). Quality is a hard core of the fruit species with very different families, the cornelian cherry being a fruit with shape and coloration. Fruit varies from elliptical cylinder and 2-2.5 cm long and is dark red in color. The fruit varies from elliptical cylinder and 2 – 2.5 cm long and is dark red in color. The fruit contain high amounts of sugar and vitamin C between 7-9 % (Feyzioğlu and Ayan, 2002). Cornelian fruit is very rich in phenolic compounds, anthocyanins and total flavonoids. Although the antioxidant capacity varies according to the maturity period, is very high, as in all red fruits. Therefore the cornelian cherry fruit is a natural source of antioxidants (Gündüz et al., 2013).

In recent years, the cornelian cherry is grown by consumers both for ornamental and its health value, facing a demand from the pharmaceutical industry (Bijelik et al., 2012). Cornelian cherry shows diversity with regard to the fruit shape, massiveness, color, taste and nutritional value due to open pollination. Therefore genotype is a potential genetic resource for breeding programs (Ercişli, 2004a). Antioxidant properties of cornelian cherry fruit with outstanding antimicrobial, antiallergenic and in terms of human health is a very valuable fruit characteristics regarding antihistamines (Çelik et al., 2006). However, herbal preparations are used for patients with diabetes (Jayaprakasa et al., 2005).

Cornelian cherry is used in wood industry because of its powerful and flexible features. It is also an important source of nectar and honey in terms of the flowering period. Cornelian cherry has high levels of air pollution tolerance, protects from erosion and is used as a hedge plant in landscaping in urban areas. In this way it is able to tolerate the high levels of air pollution (Bijelic, 2008). Although it is widely known, cornelian cherry is a fruit species neglected in our country. A large part of the cornelian cherries are grown either in mixed gardens or in breeding places. This constitutes a major problem in reaching the fruit harvest (Ercişli, 2004a). This problem can only be solved successfully with the selection of promising genotypes and their controlled propagation. Because cornelian cherry pollination of the plant, over the centuries many different characteristics occurred. In terms of ensuring the standardization of type, cornelian cherry with desired properties should be selected within populations (Gerçekçioğlu, 1998). Selection is made in our country working in different regions (Access et al., 1992; Turkoglu et al., 1999; Yalcinkaya and Eti, 2000; Karadeniz, 2002; Pırlak et al., 2003). Naturally-grown cornelian cherry promising genotypes in Tokat (Almus) were identified some physical and chemical properties have been investigated in this study.

MATERIALS AND METHODS

This study was conducted to determine the physical and chemical properties of 9 different genotypes of cornelian cherry in Tokat (Almus). Coordinates and altitude of the genotypes are presented in Table 1.

In our research in terms of physical properties the fruit, fruit size and fruit weight was examined. Chemical properties as the juice pH, soluble solids (TSS) have been examined and titratable acidity ratio (Smiley, 1977; Karaçalı, 1990; Cemeroğlu, 2007) also. Neck fruit shape index was determined by the proportion of fruit transverse (Gundogdu, 2006). Measuring and weighing fruit from trees was made for 30-60 fruits randomized taken.

Table 1. Promising genotypes of Cornelian cherry coordinates and elevations

Genotypes Number	East Coordinates	North coordinates	Altitude
60 ALM 01	37318787	4469704	1069
60 ALM 02	37319061	4469802	1065
60 ALM 03	37319150	4469836	1052
60 ALM 04	37319049	4469806	1041
60 ALM 05	37319060	4469796	1035
60 ALM 06	37318775	4469704	1058
60 ALM 07	37318788	4469737	1060
60 ALM 08	37319009	4469833	1032
60 ALM 09	37319112	4469834	1047

Fruit digital calipers were used in the measurement, with a sensitivity of 0.01, while the precision of the weighing was 0,001 grams. The amount of fruit soluble solids (TSS) was determined using a hand refractometer, and the pH of the juice was identified using a pH-meter. The titratable acidity (TEA) was determined using a titration method (Yarılgaç and Yıldız, 2001).

RESULTS AND DISCUSSIONS

The results of the weighted ratings were determined as genotypes mentioned above. Physical and chemical properties of those genotypes which are presented in tables 2 and 3. The average fruit weight of the genotype is seen as the most promising low 0.78g (60 ALM 04), and the highest 1.73 (60 ALM 01), respectively. The average width of the fruit was between 8,41mm (60 ALM 04) and 10.67 mm (ranged from 60 ALM06). The lowest average fruit size values were 13.51 mm (13 ALM 05) and highest average was 18.84mm (13 ALM 01). Previous research studies on cornelian cherry fruit weight were differing regarding the length and width, the major effect on the pomological characteristics being due by environmental factors as well as genotype (Güleryüz et al., 1998; Demir and Kalyoncu 2003).

We obtained values that are supported by earlier work selection. Another study which was conducted by Erzincan, fruit weight ranged between 1.44 – 4.24 g, most of the fruit size being between 9.6 – 15.8 mm and 14.1 – 22.8 mm (Selçuk and Özrenk, 2011). Oblak (1980), presented that the average fruit weight in the studied population, which grows naturally in Slovenia was 1.78 grams. Bolu, Zonguldak, Karabük and Bartin grown in natural population between 1996-1998 in the provinces and in the manufacturer's garden were conducted to determine the best cornelian cherry. Such studies were found that the average fruit weight was between 1.02 and 4.07 grams (Yalcinkaya and Eti, 1999). Derebucak district of Konya in a study of ten different types of cornelian cherry, naturally grown, showed that the weights were between 3.65 – 4.57 g (Turkoglu et al., 1999). In another study, in Konya the selection of the fruit weight was determined being between 1.496 g and 4.116 g (Demir and Kalyoncu, 2003). Another study, realised by Rural and Koca (2008) in Samsun shows that the weight of the fruit that grows naturally was between 0.39 - 1.03 g, the fruit length between 14.24 mm – 22.20 mm, and most of the fruit varies between 9.59-13.21mm

Table 2. Some physical properties of promising cornelian cherry genotype (2013-2014)

Genotype number	Weight (g)	Width (mm)	Height (mm)	Shape index
60 ALM 01	1.73 ± 0.14	10.64 ± 0.14	18.84 ± 1.36	1.77 ± 0.19
60 ALM 02	1.32 ± 0.10	10.52 ± 1.01	14.94 ± 1.24	1.42 ± 0.06
60 ALM 03	1.02 ± 0.08	09.55 ± 0.96	14.64 ± 1.85	1.53 ± 0.43
60 ALM 04	0.78 ± 0.05	08.41 ± 0.29	13.96 ± 2.06	1.66 ± 0.28
60 ALM 05	1.13 ± 0.07	09.83 ± 0.35	13.51 ± 0.53	1.37 ± 0.17
60 ALM 06	1.46 ± 0.16	10.67 ± 0.44	17.47 ± 1.61	1.64 ± 0.32
60 ALM 07	1.24 ± 0.21	10.24 ± 1.06	15.08 ± 0.80	1.47 ± 0.02
60 ALM 08	1.17 ± 0.11	10.29 ± 0.83	14.44 ± 0.72	1.40 ± 0.41
60 ALM 09	1.01 ± 0.13	09.69 ± 0.18	14.09 ± 1.40	1.45 ± 0.75

Table 3. Promising chemical properties of the cornelian cherry genotype (2013-2014)

Genotype number	pH	TSS (%)	TEA
60 ALM 01	3.12 ± 0.35	11.4 ± 0.24	0.35 ± 0.04
60 ALM 02	3.56 ± 0.40	11.8 ± 0.65	0.37 ± 0.08
60 ALM 03	4.02 ± 0.15	13.8 ± 0.32	0.35 ± 0.03
60 ALM 04	3.88 ± 0.66	14.9 ± 1.28	0.28 ± 0.07
60 ALM 05	3.80 ± 0.10	17.2 ± 0.87	0.30 ± 0.08
60 ALM 06	3.60 ± 0.24	15.2 ± 0.37	0.26 ± 0.15
60 ALM 07	3.92 ± 0.32	15.0 ± 0.20	0.36 ± 0.10
60 ALM 08	2.60 ± 0.18	15.5 ± 1.24	0.33 ± 0.03
60 ALM 09	3.28 ± 0.25	15.1 ± 2.49	0.32 ± 0.06

The results of this study show closeness with our obtained results, the highest values in terms of the weight of the fruit being low in both studies. We consider that the results are dependent on the genotype and the environmental conditions, the shape of the fruit affecting the quality of the fruit. The evaluation showed that the lowest index value was 1.37 for 13 ALM 05 genotype. 60 ALM 01 genotype had the longest length, with the highest value of shape index 1.77. This value is lower than 2.50 found in cornelian cherry genotype from Serbia (Bijelic, 2012).

As well as fresh, the cornelian cherry are consumed and processed in fruit industry, due to their physical and chemical properties. The pH of the promising occurring kızılcık genotypes soluble solids (TSS) and titratable acidity (TA) is given in percentage in Table 3. PH 2.60 in the genotype (60 ALM 08) to 4.02 (60 ALM 03) in between, while the soluble solids ratio of 11.4 (60 ALM 01) to 15.5 (60 ALM 08) ranged. The lowest rate in the amount of titratable acidity 0.28 (60 ALM 04), and the highest ratio 0.37 (60 ALM 02) respectively. Selcuk and Özrenk (2011), the pH 2.9-5.7 in a similar study conducted in cornelian cherry have found in the water soluble dry matter

content of 9.0-17.7. In a population study carried out in Slovenia, the average amount of TSS in the cornelian cherry grown naturally was 20.6 %, total sugar was found to be 7.42 % and the pH 3.38 (Oblak, 1980). Another study which was conducted in Trabzon, has been reported to range between 8% and 13.5% of the total dry matter (Karadeniz et al., 2001). In another study conducted in Zonguldak amount of soluble solids it has been reported to be between 12.1 to 16.9%. Tural and Koca (2008), the amount of soluble solids in chemical analysis they have found in cornelian cherry have been obtained through selection between 28.19% and 15.88%. The same researchers have found the total amount of 1.10 to 2.53% for acidity. Total acidity between 4.69% and 1.24% was found in similar studies (Smiley et al., 1998; Strain, et al., 2000; Demir and Kalyoncu 2003). In particular, the same kinds of chemical compounds (or type) of the year even though the ecological differences are greatly influenced by the environment and maintenance requirements (Gerçekçioğlu, 1998).

CONCLUSIONS

Our results have shown that it is consistent with the results provided by other genotypes grown both inside and outside the country. However, it is expected to give better results with a different cultivation technology. Also, characterıstıcs such as phenolic compounds, the antioxidant capacity, the pollen biology and others can provide more information about the genotype's value. Research like this will shed light our study and the genetic material can be considered as the promising genotypes.

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