

Identify the main characteristics of some cornelian cherry germplasms

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Abstract

Cornelian cherry is widely distributed in world and East Azerbaijan, Qazvin States of Iran as well. There are different fruit quality and quantity characteristics for this crop. The current study was conducted to identify the main characteristics of cornelian cherry among the germplasms. Eighteen germplasm are selected and evaluated. Amount of 20 samples of each germplasm were taken per replicate. The following characteristics were measured among the germplasms; fruit length rang (from 1.48 to 2.40 cm), fruit width rang (from 1.08 to 1.60), fruit length/width ratio rang (from 1.2 to 1.84), fruit fresh weight rang (from 1.57 to 3.52g), fruit dry matter weight rang (from 0.44 to 0.85), SSC rang (from 9% to 23/5%), pH (from 2.95 to 3.32), moisture content rang (from 63.19% to 80.30%), fruit flesh weight rang (from 1.26 to 3.01) flesh/stone ratio rang (from 2.89 to 6.87), stone length rang (from 1.08 to 1.62cm), stone width rang (from 0.51 to 0.72cm), stone length/width ratio rang (from 1.2 to 1.84) and stone weight rang (from 0.27 to 0.64). According to the results, T.S2, Ka2 and R.Q2 were the largest fruit and Ka5 showed the sweetish test.

Key words: Cornelian cherry germplasm; East Azerbaijan; Qazvin; Iran.

Abbreviations: CRD-Completely randomized design; SSC-soluble solid content.

Introduction

Cornelian cherry (*Cornus mas* L.) commonly known as dogwoods, contains about 45 species of trees, shrubs, and herbs with woody rhizomes. The genus is distributed throughout the northern hemisphere, with centers of diversity in eastern Asia, eastern North America, the Pacific Northwest, and the mountains of Central America (Murrell, 1993). Turkey is an important centre of cornelian cherries (Ercisli *et al.*, 2007), especially northern Anatolia (Yilmaz *et al.*, 2009).

It is widely distributed in Azerbaijan and Qazvin States of Iran. The cornelian cherry fruits contain a great amount of vitamin C having juicy, sour and sweetish taste. Fruits of some species are not only consumed fresh but also can be used to produce jam,

jelly, stewed fruit, marmalade, pestil (a locally dried fruit pulp product), syrup and several types of soft drinks. It is also used for medicinal purposes due to properties of leaves and fruits (Browicz, 1986), ornamental and honey plant purposes as well (Mamedov and Craker, 2002). However, there is wide usage of this crop, but there have been no studies on cornelian cherry.

It has widely distributed in Arasbaran forestry's in East Azerbaijan State of Iran more than other areas, and most of usage are in wood industrial purposes (Mosadegh, 1999). There have been very limited studies related to selection of cornelian cherry in Iran. Some of the studies on cornelian cherry conducted to determine some morphological and physiological characteristics (Mosadegh, 1999, Jazayeri, 1999 and Bayan, 1981).

While there have not been enough studies on this fruit, grown naturally in this country, selection studies were initiated for long time ago in other countries. For example, Rudkovsky (1960) selected two type of cornelian cherry having large fruits, cold resistant and a rather fruitful type among the naturally grown population in Russia. In another

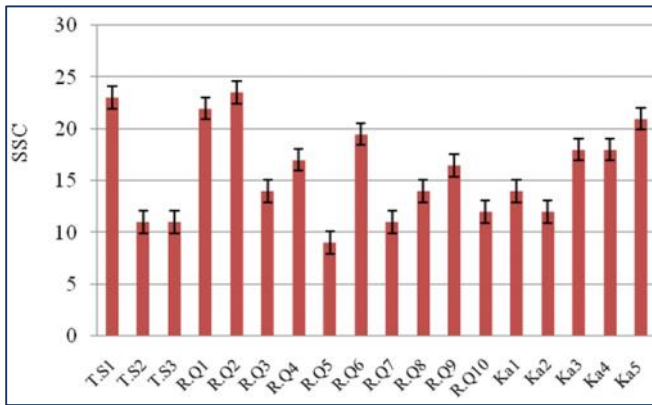


Fig.1. Mean Comparison of SSC on different germplasm. S: Tarom-Sofla, R.Q: Rodbar Qazvin, Ka: Kalibar, East Azerbaijan

study conducted in Yugoslavia, five different types of various their fruit size and shape were selected (Krgovic, 1987). Again, in Azerbaijan, Imamaliyev

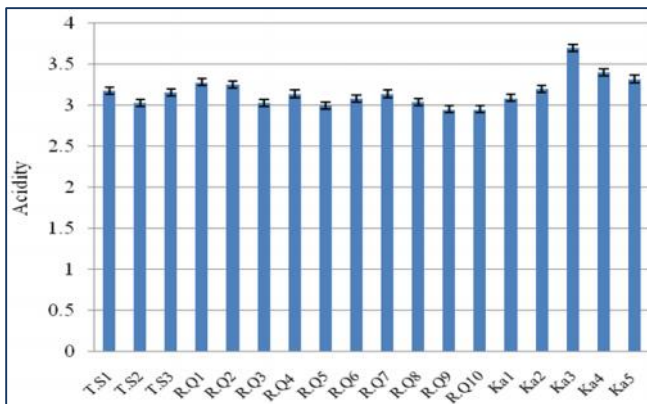


Fig.2. Mean comparison of pH on different Germplasm. TS: Tarom-Sofla, R.Q: Rodbar Qazvin, Ka: Kalibar, East Azerbaijan

(1977) determined 47 wild cornelian cherry types, which had different morphological characteristics. Similar selection studies were also reported in some other countries such as Czechoslovakia and Australia (Hricovsky *et al.*, 1977; Pirc, 1990).

A study was conducted by Svitlana (2004), in the study reported that, the main collection of

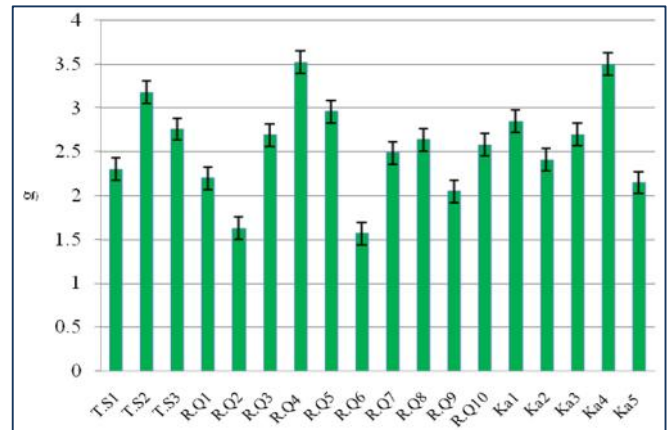


Fig.3. Mean comparison of fruit fresh weight on different germplasm, TS: Tarom-Sofla, R.Q: Rodbar Qazvin, Ka: Kalibar, East Azerbaijan

Cornelian cherry genotypes is located at the Hryshko National Botanical Gardens in Kiev, operated by the Ukrainian National Academy of Sciences. The genetic pool consists of over a hundred wild and cultivated genotypes from Ukraine, Bulgaria, Slovakia, the United Kingdom, Austria and Georgia. The collection represents a wealth of biological and economic potential. There are some investigations regarding the physical and chemical properties of cornelian cherry fruits, their antioxidant capacity, phenol, ascorbic acid, as well as anthocyanin contents (Tural & Koca, 2008; Vareed, Reddy, Schutzki, & Nair, 2006; Klimenko, 2004; Guleryuz, Bolat, & Pirlak, 1998).

The fruits of the cornelian cherry can be dark red, cherry red, pink or yellow. They can be oval, pear shaped or bottle shaped. Average fruit weight ranges from 5.0 to 8.0 grams. The stone makes up 7.5 to 11.0% of the total fruit weight. In the wild, yield ranges from 2.8 to 4.8kg per bush. With ideal amounts of sunshine and rain, yields can reach 10 kg per bush (Kosykh, 1967; Leontiak, 1976). Under cultivation, the cornelian cherry regularly bears abundant yields of large, juicy fruits; yield per plant ranges from 30 to 80 kg (Klasterky, 1960; Lancaster, 1990).

Materials and methods

In the current study, eighteen germplasm of cornelian cherry of East Azerbaijan and Qazvin States were selected. Measurements were

performed immediately after harvesting. Fruits of any foreign material such as leaves, branches, pieces of dust and soil were removed. The study

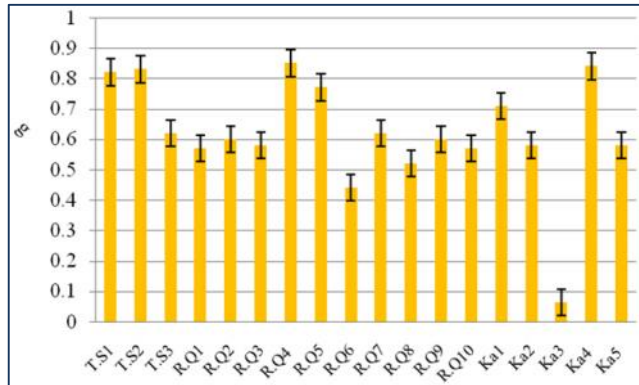


Fig.4. Mean Comparison of fruit dry weight on different germplasm, TS: Tarom-Sofla, R.Q: Rodbar Qazvin, Ka: Kalibar, East Azerbaijan

was conducted in a completely randomized design (CRD) with twenty germplasm from each area within 3 replications. Following parameters such as fruit shape, fruit length, fruit diameter, fruit length to diameter ratio, fresh weight and dry weight, sugar and acidity percentage were measured from each germplasm. Stones tip form, stones length, diameter, stones length to diameter ratio, stone weight also were measured from the populations. In the present study, fruit characteristics were categorized according to the following criteria:

Fruit size was categorized as followed:

Small size < 2g weight

Medium size = 2 to 3g weight

Large size = 3 to 4g weight

Super large size > 4g weight

Fruit shape was categorized as followed:

Spherical shape <1.25 length to diameter ratio

Oval shaped = 1.25 to 1.45 length to diameter ratio between

Elongated shape >1.45 length to diameter ratio

Fruit weight and stones weight were measured in the laboratory using an electronic precision balancer. Fruit stones were divided to small, medium, large and super large as followed:

Small stones < 0.2 g stones weight

Medium stones = 0.2 to 0.3g stones weight

Large stones = 0.3 to 0.4g stones weight

Super large stones > 0.4g stones weight

Stones tip were divided to three forms; rotund, acuminate and acute. Stones forms were categorized in to three shapes as followed:

Spherical shape <1.3 diameter stones to length ratio

Oval shape = 1.3 to 1.5 diameter stones to length ratio

Oblong shape > 1.5 diameter stones to length ratio

For the drying samples used 70 °C in an oven. A manual refractometer (MT098) was used to measure SCC. The data were collected and analysed, means were compared by LSD method at a $p \geq 0.5\%$.

Results

Fruits and stones characteristics of the cornelian cherry germplasm from Qazvin and East Azerbaijan States were studied. For this study, 10 germplasm from Rodbar, 3 germplasm from Tarom Sofla, Qazvin and 5 germplasm from Kalibar, East Azerbaijan of Iran were collected and evaluated. The information's are presented in Table 1 and Table 2, and Figs.1, 2, 3 and 4.

Means of fruit length were different in the germplasm, which were from 1.48 to 2.40cm. Lowest fruit length was belonging to the R.Q4 from Rodbar and highest fruits length was belonging to the R.Q1 in Rodbar, Qazvin State. Means of fruit diameter ranges were measured from 1.08 to 1.60 cm. This was lowest in R.Q4 in Rodbar, Qazvin State and the highest fruit diameter was measured in T.S2 in Tarom Sofla, Qazvin State. Most of the fruit diameter was observed in abdominal parts of the fruits and lowest was observed in the apical end of the fruits. The highest fruit diameter was calculated in T.S1 in Tarom Sofla, and R.Q1, R.Q6, R.Q7, R.Q8 & R.Q10 in Rodbar, Qazvin State and Ka4 from East

Table 1. Fruit characteristics of the germplasms

Regions	Code Name	Flesh/Seed Ratio	Flesh (g)	Length/Diameter ratio	Fruit Diameter (cm)	Fruit Length (cm)
Youzbash Chaie, Tarom-Sofla	T.S1	4.06±0.10	2.10±0.04	1.40±0.05	1.46±0.04	2.04±0.06
	T.S2	5.67±0.32	3.00±0.12	1.40±0.03	1.60±0.03	2.28±0.01
	T.S3	3.70± 0.17	1.70±0.08	1.37±0.01	1.35±0.01	1.86±0.01
Hir, Rodbar, Qazvin	R.Q1	5.30± 0.40	2.30±0.14	1.84±0.09	1.31±0.05	2.40±0.03
	R.Q2	5.10± 0.30	2.95±0.03	1.49±0.01	1.57±0.01	2.33±0.01
	R.Q3	6.87±0.84	2.55±0.12	1.48±0.01	1.49±0.01	2.20±0.01
	R.Q4	3.94±0.75	1.26±0.1	1.37±0.01	1.08±0.03	1.48±0.03
	R.Q5	5.16±0.44	2.08±0.18	1.38±0.01	1.46±0.01	2.01±0.04
	R.Q6	4.96±0.59	2.20±0.15	1.49±0.02	1.44±0.04	2.15±0.03
	R.Q7	4.10± 0.39	1.65±0.13	1.57±0.01	1.25±0.01	1.96±0.01
	R.Q8	4.49± 0.70	2.10±0.25	1.46±0.03	1.45±0.03	2.12±0.01
	R.Q9	5.34 ± 0.30	2.40±0.04	1.52±0.01	1.42±0.01	2.16±0.01
	R.Q10	4.60 ± 0.36	1.99±0.08	1.45±0.04	1.40±0.03	2.03±0.03
Kalibar, Villages, East Azerbaijan	Ka1	3.77±0.46	1.82±0.1	1.37±0.01	1.38±0.03	1.89±0.06
	Ka2	3.96±0.47	2.54±0.17	1.30±0.01	1.56±0.03	2.05±0.03
	Ka3	3.72 ± 0.30	2.17±0.05	1.22±0.02	1.50±0.01	1.83±0.03
	Ka4	2.80± 0.15	1.60±0.07	1.20±0.01	1.38±0.03	1.67±0.04
	Ka5	5.80± 0.21	1.36±0.07	1.23±0.03	1.25±0.03	1.54±0.05

TS: Tarom-Sofla R.Q: Rodbar Qazvin Ka: Kalibar, East Azerbaijan

Azerbaijan State. The lowest fruit diameter was measured in Ka3 from the East Azerbaijan State. Fruit length to fruit diameter ratio range was

measured from 1.2 to 1.84cm, this was lowest in Ka4 in East Azerbaijan State and the highest was measured in R.Q1 germplasm in Rodbar, Qazvin State (Table 1).

The mean of soluble solid content (SSC) range was measured from 9.00 to 23.50 %. The lowest SSC was measured in the R.Q3 germplasm in Rodbar area from Qazvin State and the highest SSC was indicated in Ka5 in East Azerbaijan State (Fig.1). Mean of pH ranges were calculated from 2.95 to 3.32, which were low in the germplasm of R.Q7 and R.Q8 respectively in Rodbar, Qazvin. This was high in T.S3, from Tarom, Qazvin (Fig.2). The mean of fruit fresh weight (Fig.3) rang was calculated from 1.57 to 3.52g and mean of dry fruit weight rang (Fig.4) was achieved from 0.44 to 0.94g. Those were low in the germplasm of Rodbar, which were high in germplasm of R.Q2, in Rodbar, Qazvin State. Fruit shapes were from spherical to elongated forms but the majority were oval to elongate shape. The Ka3, Ka4 and Ka5

germplasm were spherical and the rest were elongated and oval shape (Table 1).

Fruit size was from small till large in different population cultivars (Table 1). Most of the cultivars were in medium size from 2 to 3g. Fruit of R.Q4 and Ka5 were small and R.Q2, T.S2, and Ka2 were large in size and the rest were observed medium in size (Table 1). Fruit Stone to pulp ratio range were from 2.89 to 6.87. Which was low in germplasm of Ka4 and it was high in R.Q3 from Rodbar, Qazvin. The colour of the flesh and pill was much closed to red colour (Table 2). The mean of fruit stone length range were obtained from 1.08 to 1.59cm.

The lowest fruit stone length was observed in Ka5 and the highest was identified in R.Q2. Fruit stones diameter ranges were measured from 0.51 to 0.72 cm, this was low in Ka5 and it was high in Ka3 and Ka4 from Kalibar, East

Table 2. Continued: Fruit characteristics of the germplasms

Areas	Code Name	Fruit Size	Shape	Flesh Colour Grade	Peel Colour Grade
Youzbash Chaie, Tarom-Sofla	T.S1	M	O	2	3
	T.S2	L	O	2	2
	T.S3	M	O	1	1
Hir, Rodbar, Qazvin	R.Q1	M	E	5	5
	R.Q2	L	E	3	3
	R.Q3	M	E	3	3
	R.Q4	S	O	4	4
	R.Q5	M	O	6	6
	R.Q6	M	E	1	1
	R.Q7	M	E	2	2
	R.Q8	M	E	3	3
	R.Q9	M	E	3	3
	R.Q10	M	O	3	3
Kalibar, Villages, East Azerbaijan	Ka1	M	O	2	2
	Ka2	L	O	4	3
	Ka3	M	Sph	1	1
	Ka4	M	Sph	5	5
	Ka5	S	Sph	3	4

TS: Tarom-Sofla, R.Q: Rodbar Qazvin, Ka: Kalibar, East Azerbaijan, L=Large, M= Medium, S=Small, E=Elongated, O=Oval, Sph= Spherical

Table 3. Fruit stone characteristics of the germplasms

Region	Code Name	Diameter (cm)	Length (cm)	Length/Diameter ratio	Tip Stone Form	Size	Weight (g)
Youzbash Chaie, Taron-Sofla	T.S1	0.68±0.03	1.36±0.01	1.40±0.05	R	L	0.53±0.01
	T.S2	0.69±0.01	1.41±0.01	1.40±0.03	R	L	0.53±0.02
	T.S3	0.63±0.01	1.30±0.04	0.37±0.004	Ac	L	0.45±0.014
Hir, Rodbar, Qazvin	R.Q1	0.56±0.01	1.59±0.01	1.84±0.09	A	L	0.43±0.01
	R.Q2	0.62±0.01	1.62±0.05	1.49±0.01	A	L	0.58±0.03
	R.Q3	0.61±0.01	1.49±0.01	1.48±0.01	Ac	L	0.41±0.12
	R.Q4	0.53±0.03	1.20±0.03	1.37±0.01	R	L	0.32±0.03
	R.Q5	0.62±0.01	1.36±0.01	1.38±0.01	R	L	0.45±0.02
	R.Q6	0.56±0.01	1.45±0.03	1.49±0.02	R	L	0.45±0.02
	R.Q7	0.59±0.01	1.45±0.03	1.57±0.01	R	L	0.40±0.03
	R.Q8	0.57±0.01	1.46±0.01	1.46±0.03	R	L	0.47±0.02
	R.Q9	0.57±0.01	1.42±0.01	1.52±0.01	R	L	0.45±0.02
	R.Q10	0.61±0.01	1.32±0.03	1.45±0.04	R	L	0.43±0.02
Kalibar, Villages, East Azerbaijan	Ka1	0.69±0.01	1.24±0.01	1.37±0.01	A	L	0.48±0.03
	Ka2	0.71±0.01	1.42±0.01	1.32±0.01	A	L	0.64±0.04
	Ka3	0.72±0.01	1.29±0.02	1.22±0.02	Ac	L	0.59±0.04
	Ka4	0.72±0.01	1.24±0.01	1.20±0.01	Ac	L	0.57±0.01
	Ka5	0.51±0.01	1.08±0.01	1.23±0.03	Ac	S	0.27±0.01

E=Elongated, L=Large, S=Small, R= Rotund, Ac= Acuminate, A= Acute, TS: Taron-Sofla, R.Q: Rodbar Qazvin, Ka: Kalibar, East Azerbaijan

Azerbaijan, Iran (Table 2). Fruit stone lengths to fruit stone diameter ratio range were measured from 1.2 to 1.84 cm. This was low in Ka4 and the highest was observed in R.Q1. Fruit stone weight range was from 0.27 to 1.43g. The lowest fruit stone weight was measured in Ka5 and it was highest in Ka2 in Kalibar, East Azerbaijan State of Iran. Fruit stone shape was identified long in all of the cultivars. The fruit stone tip form was rotund, acuminate and acute, but most of the fruit stone tips were rotund. There were some of the germplasm with acute stone tip such as Ka1, Ka2, R.Q1 and R.Q2. Fruit stone sizes were identified large in all of the germplasm except Ka5 (Table 2).

Discussion

Our finding supported by a previous research, which was conducted by Svitlana (2004). He reported that the fruits of the cornelian cherry could be dark red, cherry red, pink or yellow. Form-wise, they can be oval, pear shaped or bottle shaped. An average fruit weight ranges was from 5.0 to 8.0g. The stone makes up 7.5 to 11.0% of the total fruit weight. Total sugar content ranges were from 8.0 to 11.0%. Organic acids content ranges were from 1.3 to 1.9%. Vitamin C content ranges were from 101 to 193 mg %. Anthocyanin content ranges were

from 670 to 850 mg% in the skin, and it was from 36 to 121 mg% in pulp.

Cornelian cherry genotypes from different provinces of Turkey were studied. Fruit weight ranged were from 1.0 to 6.5 grams, fruit length were from 1.3 to 2.8 cm, fruit width were from 0.9 to 2.3 cm, flesh to stone ratio were from 2.0 to 9.4, soluble solids content were from 8.0 to 22.5%, and vitamin C content was from 36 to 122 mg/100g. The trees were found growing anywhere from 300 to 1200 meters above sea level (Ercýslý, 2004). A study was conducted regarding cornelian cherry in Turkey. They mentioned that: fruit length range was from 1.95 to 1.20cm, fruit diameter range was from 0.74 to 1.5 cm, fruit weight range was from 0.55 to 3.44g, fruit stone length range was from 1.01 to 1.54 cm, fruit stone width range was from 0.51 to 0.71cm and fruit stone weight range was from 0.11 to 0.51g (Vedecko, 2006). However, there were no significant differences between the Cornelian cherry genotypes from Turkey and Iran except fruit weight and flesh/ fruit stone ratio. In the current study, major population of cornelian cherry from Iran has been studied. There were no studied more about and should consider on fruit quality and quantity of cornelian cherry.

Conclusion

Based on the results from the current study, can conclude that the germplasm of R.Q4 showed lowest dry weight, fresh weight and flesh weight but the highest fruit weight, flesh/ fruit stone ratio were performed in T.S2, Ka2 and R.Q2 germplasm. Ka5 was sweetest germplasm among the collected cultivars. High pH was measured in R.Q7 and R.Q8 germplasms of Rodbar, Qazvin State. However, more research on this topic needs to identify the best germplasm of cornelian cherry in Iran.

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