

GENETIC RESOURCES OF *PRUNUS* SUBGENUS *CERASUS* (GRAY) IN THE TROYAN REGION, BULGARIA

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Abstract

Local plant genetic resources of Prunus sp. in the Forebalkans region of the Troyan municipality. The present study was conducted during the spring-summer period of 2019-2020. A number of expeditionary studies were conducted to search for local genotypes and varieties of the genus Prunus subgenus Cerasus (Gray) in the Forebalkans region. Three local genotypes were selected and described in the present study, and the Oblachinska variety was accepted as a standard.

Their main morphological characteristics have been studied: height, diameter, stem length, color, biochemical analysis, the taste of the fruits.

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Cherry SCHAT has a higher dry matter content of 16.50% and total sugars of 4.70%. Larger amounts of tannins contain the fruits of the SCHB 0.104%. The highest content of total polyphenols was obtained at cherry SCHAT 163.14 mg/g. Anthocyanins have a higher content in cherries SCHB 41.94mg%. All three local genotypes are suitable for fresh consumption and processing

Key words: *Prunus subgenus cerasus (Gray), sour cherries, genetic resources, biochaemical compounds*

INTRODUCTION

There has been a growing interest in the recent years in the conservation and research of the gene pool of cultivated and wild fruit species, as well as products from them. The study of genotypes of local origin allows the selection of species in order to preserve, preserve and increase the biodiversity of local flora (Ivanova et al., 2009; Vieira et al., 2009; Kikindonov et al., 2017). In response to the increased demand for organic fruit, there is an alternative to the rich fund of local genetic resources. (Bozovic et al., 2013; Ferreira et al., 2016; Pereira-Lorenzo et al., 2018; Kumar et al., 2019; ; Minkov et al. Mihova, 2020). Many forms and genotypes of the local gene pool of fruit varieties have increased resistance to a number of economically important diseases. Therefore, the management of plant genetic resources is a priority management in selection programs (Bozhkova et al., 2006; Dzhuvinov et al., 2016; Minkov et al. Mihova, 2020).

The cherries and the sour cherries are among the most widely consumed fruits in temperate latitudes. They are an economically important

fruit species in Bulgaria. The total area of their plantation amounts to 11,443 ha and 1,672 ha, respectively. The production of these fruits is growing annually. In recent years, many new plantations have been created in different regions of the country (Malchev et Zhivondov, 2016; Kamenova et al., 2019; Antognoni et al., 2020). The cherries are valuable fruits with specific nutritional and medicinal properties and are widely used in folk medicine and culinary cuisine of Bulgarians from ancient times to the present day. They are extremely rich in organic acids (malic, citric, oxalic, etc.), mineral salts, various macro- and micronutrients, B vitamins, with the highest content of vitamins. With and especially on vitamin P, the value, especially for black-red colored fruits reaches 2000-2500 mg%. Their sugars are mainly glucose and fructose, the latter being in minimal quantities, which allows their consumption by diabetics. The presence of tannins in them gives a pronounced astringent tart taste. The presence of pectin substances in fruits facilitates the excretion and excretion of toxins from the human body, lowers blood cholesterol. The species grown in our country

can be divided into two groups - for processing and fresh consumption (Dinkova, 2009; Bandi et al., 2010). Sour cherry (*Prunus cerasus* L.) is an autochthonous and heterogeneous species. Their sugars are mainly glucose and fructose, the latter being in minimal quantities, which allows their consumption by diabetics. The tannins in these fruits gives a pronounced astringent tart taste. The presence of pectin substances in fruits facilitates the excretion and excretion of toxins from the human body, lowers blood cholesterol. The species grown in our country can be divided into two groups - for processing and fresh consumption (Dinkova, 2009). Sour cherry (*Prunus cerasus* L.) is an autochthonous and heterogeneous species. Long-term cultivation in varieties of agri-environmental conditions and the use of different types of propagation (both by shoots and seeds) has led to numerous genotypes. In some cases, indigenous varieties are at high risk of extinction due to the introduction of foreign varieties that may have higher yields or are better known on world markets (Hjalmarsson and Ortiz, 2000; Rodrigues et al., 2008; Rakonjac et al., 2010). All these factors create the need for a detailed description and evaluation of the gene pool of cherries, which is the purpose of this study. The complete characteristic, as well as the protection of the autochthonous varieties is considered to be of great importance in order to avoid the loss of sustainable, adapted to the specific conditions of mountainous regions in Bulgaria).

The aim of the present research is to mark, describe, study and preserve the gene pool of indigenous forms of cherries with valuable biological and economic qualities, distributed in the Fore-Balkan region in the Middle Central Balkan Mountains.

MATERIALS AND METHODS

The current study was conducted during the summer period 2020-2021. A number of expeditionary studies were conducted to search for valuable varieties and forms in the region of Troyan and its adjacent villages and neighborhoods. The trees are grown at an altitude of 400-750 m, in non-irrigated conditions and without plant protection measures. The soils are gray and dark gray forest. The average annual precipitation for the

study period was 772.03 mm. The biological and morphological features of the fruits have been established according to the methodology for studying plant resources in fruit growing (Nedev et al., 1979). Their dimensions (mm) are determined; mass (g); fruit stalk length (mm); coloring of the fruit skin; taste qualities; Their main biochemical composition was studied: dry matter (%) - refractometric; total, invert sugar and sucrose - by the method of Shoorl. The organic acid content was determined by titration with 0.1 N NaOH solution; Ascorbic acid (mg/%); Pectin (mg/%) - According to Melitz; The sugar-acid index was calculated by Stanchev et al. (1958); Sensory analysis (Malchev and Zhivondov, 2016).

The obtained results were subjected to mathematical analysis using the methods of correlation and regression analysis, coefficient of variation (CV%) (Lidanski, 1998). The software products used during the study was "MS Excel Analysis ToolPak Add-Ins".

RESULTS AND DISCUSSIONS

During the expeditionary study of the gene pool of genus *Cerasus* in the region of the town of Troyan was found a great variety of old cultivars and genotypes of sour cherries. Three representatives' genotypes of local cherries were identified, marked and described, with valuable biological and economic qualities, common in the region of Troyan and the surrounding villages and neighborhoods. Their fruits reached ripening stage from mid- the end of June. It has been established that in the reproduction is usually carried out by shoots. The morphological characteristics of selected forms and cultivars of fruits and their qualities were determined. The fruit size is a hereditary feature of fruit species, cultivars, forms (Stoichkov et al., 1958). The size and color of fruit in the present study vary widely.

SCHT - the most common cherry, spread on rivers, capes, roads. The crown is spherically elongated, than the Oblachinska variety, with larger leaves. The average fruit weight is of 3.2 g, with light fruit flesh and juice. More pleasant and sweet than the Oblachinska variety. They ripen in the last ten days of June. Resistant to economically important diseases.

SCHB - forms a relatively large globular crown. The fruits are 5.04 g, with dark red fruit flesh and juice, sweeter and more pleasant than Oblachinska. The fruits reach harvest maturity at the end of the second, beginning of the third ten days of June. It is found exclusively in the area of the village of Balkanets. In 2020, this form of cherry showed a strong sensitivity to

late brown rot, as the period of growth and ripening coincided with unfavorable climatic conditions - rainfall and high humidity. Polish resistance to cylindrosporiosis, fungal powdery mildew and powdery mildew syndrome, which adversely affects fruit quality, has been observed (Stoyanova et al., 2014).

Table 1. Biometric indicators of fruits of local cherry genotypes

Genotype	Year		Fruit weight (g)	Stone weight (g)	Fruit length (mm)	Average width (mm)	Fruit stalk length (mm)	Fruit shape index (mm ³)
Oblachinska	2020	average	3.10	0.26	15.33	16.31	24.17	17.19
		STDEV	0.57	0.05	0.42	0.84	2.01	1.74
		CV	18.31	19.86	2.71	5.16	8.30	10.11
	2021	average	3.72	0.33	16.11	17.70	26.76	21.29
		STDEV	0.29	0.07	0.41	0.75	2.86	1.88
		CV	7.69	20.45	2.53	4.24	10.70	8.82
SCHB	2020	average	6.00	0.28	17.60	20.83	32.31	32.53
		STDEV	0.82	0.08	1.19	0.95	2.55	4.48
		CV	13.61	28.17	6.74	4.50	7.89	13.79
	2021	average	4.07	0.38	16.26	18.85	28.60	24.45
		STDEV	0.26	0.06	0.73	0.52	3.63	1.65
		CV	6.35	16.64	4.51	2.78	12.70	6.75
SCHT	2020	average	2.80	0.20	13.88	16.41	43.28	15.91
		STDEV	0.63	0.07	0.68	0.78	5.36	1.99
		CV	22.59	33.33	4.93	4.73	12.39	12.56
	2021	average	3.55	0.28	15.30	17.40	36.68	19.67
		STDEV	0.47	0.04	0.66	0.99	5.52	2.75
		CV	13.23	15.06	4.33	5.68	15.05	13.97

The main biometric indicators of the marked and described local genotypes of cherries were taken into account during the study. In terms of fruit weight, with small variations, it is highest measured in the Balkanets form (average about 5 g). For the rest, it is in the range of 3-4 g. The lowest bone weight was measured in SCHAT (0.24 g) with almost the same coefficient of variation in the two years (CV = 19.86 and 20.45, respectively), and the highest form Balkanets (0.33 g). The height of the fetus in the studied autochthonous genotypes is in the range of 13.88 mm at SCHAT in 2020 to 17.60 mm at the SCHB in the same year. The coefficient of variation in relation to this indicator in all genotypes is low. The SCHB(19.84 mm) has the largest average diameter. The fruits of the SCHAT form are the highest 19.26, the smallest and with the longest

stalk 25.80mm are the fruits of Oblachinska with a diameter of 18.62/ 16.37. A significant difference is observed in the length of the handle in SCHAT from (43.28 mm) in 2020 to (24.17 mm) in Oblachinska in the same year, which is determined by the average coefficient of variation. The SCHAT genotype described in our study is characterized by low fetal weight and volume, but a very long stalk (Table 1). In the case of cherry varieties, the SCHB Genotype has a higher fruit weight (5.35 g) on average for the two years and the lowest on the stone (0.29 g). (Table 1).

The highest dry matter content of the studied genotypes was in SCHAT (from 16 to 17.6% in the two years of study), and with the lowest - 12.00-12.5% in SCHB. Oblachinska has very close values to SCHAT.). The amount of total sugars varies from 12.36 mg% in the SCHB

(2020) to 4.35 mg% in 2021. Smaller amplitudes are observed in Oblachinska (7.5-8.2 mg%) in the two years of study. In the ratio of total sugars, the share of invert sugar predominates. The highest value in relation to this indicator was reported at Oblachinska (7.5%), followed by the SCHB(6.5%). In the Cherry genotypes studied, sucrose ranged from 0 to 5.8% during the individual years of study.

The highest amount of organic acids is in the Oblachinskaya genotype (1.08%), followed by SCHAT (0.87%) in 2020. The fruits of the Oblachinskaya and SCHAT genotypes are slightly richer in polyphenolic compounds with just over 331 mg%. Regarding the acidimetric coefficient for cherries, the highest value was reported for SCHAT (13.23%) and the lowest for Oblachinska (9.59%).

Table 2. Biochemical analysis of fresh sour cherry fruits

Variety	Year	DM by Re (%)	Total sugars (%)	Inverted sugar (%)	Sucrose (%)	Acids (%)	Total polyphenols (mg/g)	Tannins (%)	Anthocyanins (mg%)	Sugar/acid index
SCHAT	2020	16.5	4.7	4.7	0.0	0.87	163.14	0.083	38.23	5.40
	2021	15.0	9.9	4.35	5.27	0.47	499.07	0.083	16.61	21.06
SCHB	2020	12.0	12.6	6.5	5.8	0.67	329.7	0.083	13.55	18.81
	2021	12.5	4.35	4.35	0.0	0.80	114.3	0.104	41.94	5.44
Oblachinska	2020	17.6	7.5	7.5	0.0	1.08	161.06	0.163	39.43	6.94
	2021	16.0	8.2	3.85	4.13	0.67	501.6	0.104	84.52	12.24

The data in Figure 1 show an established positive linear relationship with a high coefficient of determination $R^2=0.9$ between the measured dry matter and fruit weight; fruit

size and sugar-acid index; between fruit weight and dry soluble matter; total polyphenols and fruit size of the different genotypes sour cherries.

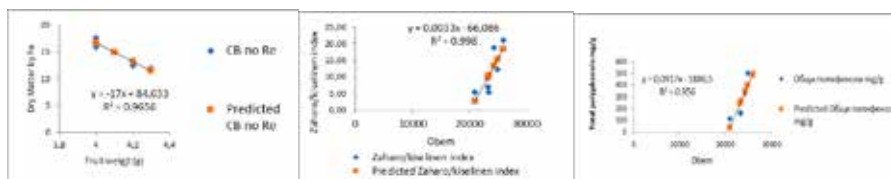


Figure 1. Linear relationship between dry matter and fruit weight; fruit size and sugar-acid index; between fruit weight and dry soluble matter; total polyphenols and fruit size

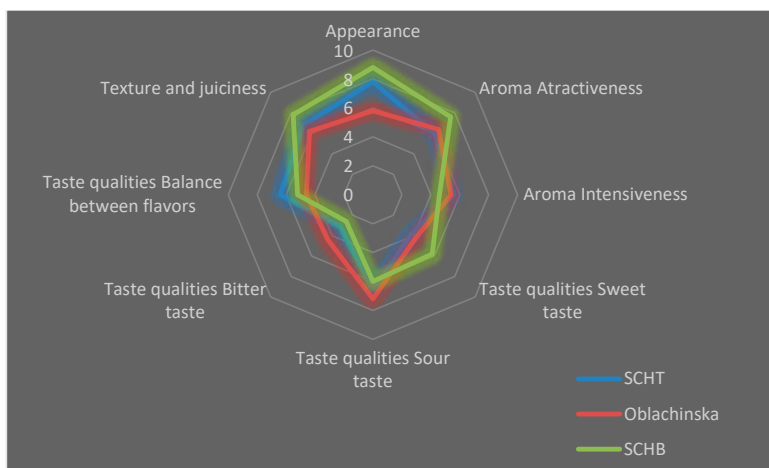


Figure 2. Sensorial analysis of Global Taste Quality

Figure 2 presents the sensory characteristics of the developed genotypes sour cherries. The fruits are evaluated by trained evaluators on indicators of appearance, Aroma attractiveness and intensity, taste qualities - sour, bitter, sweet taste, texture and juiciness evaluation. For all developed variants. In terms of attractive appearance, the SCHB stands out, followed by the SCHAT. The highest score (Very good - 6.05) is given to the SCHB genotype (5.78). It surpasses other genotypes in terms of flavor, taste and texture.

CONCLUSIONS

The described genotypes are adaptive for breeding in the conditions of semi-mountainous and mountainous regions. The forms are appreciated and appreciated by the local population, suitable for both fresh consumption and processing. Due to their attractive appearance, taste and economic qualities, the found and described genotypes would be suitable for inclusion in breeding programs. The SCHAT is more common in Troyan, while the SCHAT is located mainly among the population in a small village near the town. The fruits of the SCHB have the greatest weight, height and volume, with dark red fruit flesh and juice, sweeter and more pleasant than others in terms of sensory characteristics.

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