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EVALUAREA UNOR SOIURI DE CIREŞ OBŢINUTE LA S.C.D.P. IAŞI
ASSESSMENT OF SWEET CHERRY CULTIVARS OBTAINED AT RESEARCH STATION FOR FRUIT GROWING IASI, ROMANIA

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Abstract

The aim of this paper is to present valuable features of sweet cherry cultivars with different maturation ages of the fruits approved at RSFG Iasi between 2017 to 2021. Due to its fruits ripening age being earlier than other fruit-growing species (beginning with May), the cherry represents the first link in the annual chain of fruits production. Analysing the bloom phenophase, it was noticed that the cultivars Margonia and Croma bloom period was about two weeks later than the other cultivars. The maturation age of the fruits was spread over 57 days, starting on May the 21st for cultivar 'Cătălina', ending on July 16th for cultivar 'George'. Statistically, in terms of fruits weight (g) and equatorial diameter (mm), cultivars 'Alexus' (9.4 g and 26.6 mm), 'Elaiaşi' (8.8 g and 25.4 mm), 'Croma' (8.0 g and 24.2 mm), 'Maria' (7.8 g and 23.7 mm) and 'Tereza' (7.8 g and 25.4 mm) were highlighted with superior significant differences in comparison with the control cultivar 'Van' (7.4 g and 25.2 mm). In terms of the fruits content in soluble dry substance, cultivars 'Tereza' (19.2%), 'Alexus' (18.6%), 'Maria' (17.8%) and 'Cătălina' (17.8%) recorded superior significant values in comparison with the control cultivar 'Van' (17.7%). All the studied cultivars presented superior resistance to the fruits cracking phenomenon in comparison with the control cultivar 'Van' (41.8%) recording values below 16%.

Cuvinte cheie: cireş, soiuri, fruct, însuşiri, determinări.
Key words: cherry, cultivars, fruit, traits, measurements.

1. Introduction

The cherry tree is a fruit-growing species of high economic importance, given by the nutritive, technological and commercial traits of the fruits (Grădinariu & Istrate, 2003; Zlati et al., 2019).

Having an earlier ripening age of the fruits in comparison with the other fruit-growing species (starting on May), the cherry represents the first link in the annual chain of fruits production (Budan and Gradinariu, 2000; Ghena and Branişte, 2003; Branişte et. al., 2007).

The main objective of genetic breeding was to obtain new cultivars with improved traits and characteristics, superior to existent cultivars (Kazantzis et al., 2011; Milatović, 2011).

Sweet cherry is a species with moderate claims for water. Thus, grafted on mahaleb, it thrives in the area of Iasi county with annual rainfall below 550 mm (Dumitrescu et al., 1981).

The aim of this paper is to introduce the valuable features of cherry cultivars with different maturation ages of the fruits approved at RSFG Iasi, under the climate conditions of 2017 – 2021.

2. Material and methods

The research was performed between 2017-2021, using eight sweet cherry cultivars approved at Research Station of Fruit Growing (RSFG) Iasi: 'Cătălina', 'Maria', 'Alexus', 'Tereza', 'Elaiaşi', 'Croma', 'Margonia' and 'George' and 'Van' cultivar as control, each cultivar being grafted on mahaleb.

The comparative competition crop was placed linearly in three rows with 3 trees per row, at a 5×4 m distance and guided as free flattened palmette without a support system.

During the five years, meteorological factors were analysed.

On the experimental plantation, measurements and observations were recorded in regards to: vigour of the trees, resistance to anthracnose (Cociu and Oprea, 1989); the main fructification phenophases (Fleckinger, 1960); physical traits (fruit's and stone's weight, fruit's equatorial diameter, fruit/stone ratio, epidermis colour) (UPOV TG/35/7, 2006), chemical and quality traits of the fruits (soluble dry substance, pulp firmness, fruit's shape, stone adherence to pulp, fruits resistance to cracking); productivity (based on the fertility index, representing by percentage of resulted fruits as follows: number fruits obtained at 25-30 days after petals fall, the cultivars considered to be of great productivity recording values above 30-35, Cociu and Oprea, 1989).

The experimental data was interpreted statistically using the method of multiple comparisons (Duncan test, with P ≤ 5%) and calculating the variation coefficient (s%) with the following arbitrary values: 0 – 10% - low variation coefficient; 10 – 20% - average variation coefficient; 20 – 30% - high variation coefficient.

3. Results and discussions

In 2018 (530.5 mm), 2019 (451.0 mm) and 2020 (448.4 mm), quantities below the multiannual limit of rainfall (562.6 mm) were recorded, 2018 recording a 32.1 mm deficit, 2019 a deficit of 111.6 mm and 2020 a deficit of 114.2 mm, while in 2017, the multiannual limit was exceeded, getting 1045.8 mm (a surplus of 483.2 mm) (Table 1).

The studied cultivars showed a medium vigour tree, exception making the Tereza cultivar whose tree vigour was classified as weak. In terms of resistance to diseases, 2017 was a rainy year (Table 1), hence a favorable year to the evolution of pathogens and the cultivars manifested a slight sensitivity to anthracnose (the attack frequency was between 2.8 – 4.1%) (Table 2).

The phenophases of the fructification organs are specific to the biology of each species and the triggering date and their duration are linked to the climatic conditions of each year (Darbyshire et al., 2012).

Observations regarding the main fructification phenophases development were recorded, noticing differences between years based on climatic conditions (Table 3).

The beginning of flowering period was triggered the earliest during 2017 and 2020 and the latest in 2021. Throughout the five years of study, the bloom phenophase took place between the 1st of April and the 3rd of May, the sweet cherry cultivars pollinating one another. Analyzing the bloom phenophase for the studied cultivars, it was noticed that 'Margonia' and 'Croma' cultivars bloom two weeks later in comparison to the other cultivars (Table 3). Late bloom is of high importance to avoid damages caused by late spring frost and hoarfrost (Budan and Grădinariu, 2000).

The fertility coefficient through free pollination represents the main element for estimating the pollinators value. The results recorded about natural fertility in the studied cultivars were between 30.7% ('Van' and 'Croma') and 47.4% ('Margonia'), all the cultivars being classified as of high productivity due to the fertility index recording values above 30%.

In terms of self-fertility, the results recorded during the 5 years show that most of the sweet cherry cultivars are partially self-fertile, recording a low percentage of fertilized fruits between 1.4 at 'Van' and 51.9% at 'Maria' (Table 3). For these cultivars, it is mandatory to plant them alongside with the suitable pollinators for each cultivar.

The fruits maturation period was spread over 57 days, starting with the 21st of May for the 'Cătălina' cultivar and ending on the 16th of July for the George cultivar and the number of days between the end of bloom till maturation was between 39 and 86 days, recording an average variation coefficient (17.9 – 18.5%). In terms of fruit maturation for the studied sweet cherry cultivars, in comparison to the control cultivar 'Van', this phenophase took place two weeks earlier for 'Cătălina', two weeks later for 'Croma' and 'Margonia' and a month later for 'George' (Table 3, Fig. 1).

The size of the fruit (equatorial diameter and the fruit's weight) is a genetic trait specific to every cultivar influenced by the crop technology, the fruits production quantity, the pedoclimatic factors, roostock, etc. (Fotirić Akšić and Nikolić, 2013). These sizes represent a very important factor in defining the market value (Ruisa, 2008). Statistically, the cultivars that got highlighted were: 'Alexus' (9.4 g), 'Elaiaşi' (8.8 g), 'Croma' (8.0 g), 'Maria' (7.8 g) and 'Tereza' (7.8 g), recording significant differences superior to the control cultivar 'Van' (7.4 g). In terms of equatorial diameter (mm), the cultivars that got highlighted were: 'Alexus' (26.6 mm), 'Elaiaşi' (25.4 mm) and 'Tereza' (25.4 mm), recording significant differences superior to the control cultivar 'Van' (25.2 mm) (Table 4).

In terms of stone size, the cultivars recorded a weight between 0.254 – 0.350 g, classified as average size according to the UPOV questionnaire and statistically, the cultivars that got highlighted were: 'Tereza' (0.292 g) and 'Maria' (0.254 g) recording significant differences inferior to the control cultivar Van (0.294 g) (Table 4).

The fruit/stone ratio was between 3.20 ('Maria') and 5.10 ('Margonia') and the cultivars 'Tereza', 'Alexus', 'Elaiaşi' and 'Maria' recorded negative significant differences in comparison to the control cultivar (Table 4).

The values recorded for the fruits content in soluble dry substance are very important, as the fruits taste depends on it (Kappel et al., 1996). According to our results, the cultivars 'Tereza' (19.2%), 'Alexus' (18.6%), 'Maria' (17.8%) and 'Cătălina' (17.8%) recorded superior values than the control cultivar 'Van' (17.7%).

In terms of fruits physical traits for the eight sweet cherry cultivars approved at RSFG Iaşi, the epidermis colour was yellow ('Margonia'), shiny red ('Cătălina', 'Maria') and dark red ('Alexus', 'Tereza',

'Elaiaşi', 'Croma' and 'George'). Cultivars 'Maria', 'Alexus', 'Tereza', 'Elaiaşi', 'Margonia' and 'George' have the fruit as heart-shaped, while Cătălina and Croma have the fruit as kidney-shaped. All the studied cultivars lack pulp adherence to stone and the pulp is was firm, except for 'Cătălina' (early maturation cultivar) whose pulp firmness was medium (Table 5).

Pulp firmness is another important quality trait, especially for fruits aimed for fresh consumption (Kappel et al., 2000).

In comparison to the control 'Van' (41.8%), all the studied cultivars manifested superior resistance to the phenomenon of fruits cracking, with recorded values below 16% of cracked fruits.

4. Conclusions

The cultivars approved at RSFG Iaşi got highlighted by earliness ('Cătălina'), late bloom ('Margonia' and 'Croma'), self-fertility ('Maria'), productivity, high quality of the fruits and lateness ('Croma', 'Margonia' and 'George'), all of them manifesting superior resistance to anthracnose and fruits cracking in comparison with the control cultivar.

The spread of fruits maturation in the studied cherry cultivars ensures a varietal conveyor over 57 days.

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Tables and Figures

Table 1. Climate condition at Iaşi county, 2017– 2021

Years/Annual amount of rainfall (mm) and Average annual temperature (°C)		2017	2018	2019	2020	2021
Annual amount of rainfall (mm)	Multiannual	562.6	562.6	562.6	562.6	562.6
	∑ annual	1045.8	530.5	451.0	448.4	563.6
	Deviation	+483.2	-32.1	-111.6	-114.2	+1.0
Air average temperature (°C)	Multiannual	10.2	10.2	10.2	10.2	10.2
	Annual average	13.0	10.7	11.4	12.1	10.1
	Deviation	+2.0	+0.5	+1.2	+1.2	-0.1

Table 2. Trees features of cherry cultivars (2017-2021 average)

Cultivar	Tree vigour	Resistance to anthracnose *(Coccomyces hiemalis* Higg.*)*		
		Frequency (%)	Intensity (%)*	Attack degree (%)
Cătălina	medium	3.0	4	0.12
Maria	medium	2.9	4	0.12
Alexus	medium	3,9	4	0.16
Tereza	weak	4.0	4	0.16
Elaiaşi	medium	3.8	4	0.15
Van (control)	medium	2.9	5	0.15
Croma	medium	4.1	4	0.16
Margonia	medium	2.8	4	0.11
George	medium	3,1	4	0.12

*- attack intensity degree on a scale of 1 - 6: 1 = 3% attacked area; 3 = 25%; 4 = 50%; 6 = 100% (Cociu & Oprea, 1989).

Table 3. Fructification phenophases of sweet cherry cultivars (2017-2021)

Cultivar/ Phenophase	Beginning of bloom (BBCH 61)	End of bloom (BBCH 69)	Bloom duration (days)	Natural fertility (%)	Self-fertility %	Fruits maturation data	No. of days between end of bloom to maturation
	Limit data (from the earliest to the latest):						
Cătălina	01.04 - 20.04	10.04 - 30.04	10 - 11	33.6	13.1	21.05 - 07.06	39 - 42
Maria	04.04 - 20.04	12.04 - 30.04	9 - 11	41.4	51.9	09.06 - 20.06	53 - 59
Alexus	05.04 - 24.04	15.04 - 01.05	8 - 11	31.5	2.1	10.06 - 23.06	54 - 57
Tereza	06.04 - 25.04	14.04 - 02.05	7 - 9	42.4	19.2	09.06 - 28.06	57 - 58
Elaiaşi	04.04 - 21.04	17.04 - 01.05	11 - 14	32.2	1.9	06.06 - 21.06	51 - 52
Van (control)	05.04 - 22.04	11.04 - 05.05	7 - 14	30.7	1.4	08.06 - 18.06	45 - 59
Croma	09.04 - 20.04	19.04 - 01.05	11 - 12	30.7	2.7	20.06 - 29.06	60 - 63
Margonia	14.04 - 03.05	22.04 - 12.05	9 - 10	47.4	2.6	20.06 -07.07	53 - 60
George	04.04 - 26.04	13.04 - 02.05	7 - 13	31.8	3.6	07.07 - 16.07	76 - 86
Variation coefficient (%)	56.9 – 31.9	25.1 – 11.0	17.6 -14.0	16.5	142.6	47.8 – 25.5	17.9 -18.5

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Table 4. Physico-chemical traits of sweet cherry cultivars (2017-2021 average)

Cultivar	Fruit average weight (g)*	Stone average weight (g)*	Fruit/ stone ratio *	Fruit equatorial diameter (mm)*	SDS (%)*
Alexus	9.4[a]	0.344[a]	3.61[d]	26.6[a]	18.6[a]
Elaiaşi	8.8[b]	0.306[a]	3.52[d]	25.4[b]	17.5[a]
Croma	8.0[c]	0.326[a]	4.12[c]	24.2[c]	17.2[a]
Maria	7.8[d]	0.254[b]	3.20[d]	23.7[c]	17.8[a]
Tereza	7.8[d]	0.292[b]	3.71[d]	25.4[b]	19.2[a]
Van	7.4[e]	0.294[b]	3.92[c]	25.2[bc]	17.7[a]
Cătălina	7.3[3]	0.340[a]	4.65[b]	23.9[c]	17.8[a]
George	7.0[e]	0.318[a]	4.57[b]	21.8[d]	17.4[a]
Margonia	6.9[e]	0.350[a]	5.10[a]	23.7[c]	17.1[a]

*different letters correspond with the significant statistical difference for $P \leq 5\%$, Duncan test.

Table 5. Quality traits of the fruits (2017-2021 average)

Cultivar	Epidermis colour	Pulp firmness	Fruit shape	Stone adherence to pulp	Cracked fruits (%)*
Cătălina	shiny red	semi-firm	kidney-shaped	non-adherent	9.6[c]
Maria	shiny red	firm	heart-shaped	non-adherent	9.0[c]
Alexus	dark red	firm	heart-shaped	non-adherent	8.2[c]
Tereza	dark red	firm	heart-shaped	non-adherent	7.4[c]
Elaiaşi	dark red	firm	heart-shaped	non-adherent	2.7[e]
Van (control)	shiny red	firm	circular	non-adherent	41.8[a]
Croma	dark red	firm	kidney-shaped	non-adherent	15.3[b]
Margo	yellow	firm	heart-shaped	non-adherent	1.8[e]
George	dark red	firm	heart-shaped	non-adherent	4.5[d]

*different letters correspond with the significant statistical difference for $P \leq 5\%$, Duncan test.

Cultivar	May	June			July	
	3rd decade	1st decade	2nd decade	3rd decade	1st decade	2nd decade
Cătălina						
Van						
Maria						
Elaiaşi						
Tereza						
Alexus						
Croma						
Margonia						
George						

Fig. 1. Fruit maturation period