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CAPACITATEA DE ADAPTARE IN CONDITIILE DIN BELARUS A UNOR SOIURI ROMANESTI DE CIRES SI VISIN

ADAPTABILITY POTENTIAL OF ROMANIAN CHERRY CULTIVARS IN BELARUS

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Abstract

The article presents the results of adaptability study in the conditions of Belarus for 7 cherry cultivars of Romanian breeding. All studied Romanian cherry cultivars are found to have relative resistance to cherry leaf spot and monilial blight in the conditions of central part of Belarus. Meanwhile, not all Romanian cherry and sweet cherry cultivars can realize their genetic potential in Belarus due to insufficient tree and flower bud winter hardiness, which was presented by occasional fruiting and weak general tree health. Cultivar 'Rival' is selected and recommended for use in cherry breeding for the traits complex –winter hardiness, cherry leaf spot and monilial blight resistance, fruiting rate, self-fertility, large fruit, high tastiness.

Cuvinte cheie: cireş şi vişin, soiuri, rezistenţa la ger, înflorire, fructificare, rezistenţă la boli, Belarus
Key words: cherry, cultivar, winter hardiness, flowering, fruiting, cherry leaf spot resistance, monilial blight resistance, Belarus.

1. Introduction

Stone fruits, in particular, cherry fruits are the most desired in the fruits market. The commercial success in fruits crops cultivation is predetermined by proper choice of cultivars at most. The selectable and suggested modern cultivars should be characterized by high productivity and adaptability to the local climate conditions, good commercial, taste and processing fruit qualities.

At the present time, 7 sour cherry and 9 sweet cherry cultivars have been zoned and admitted for commercial cultivation, as well as 7 sour cherry and 13 sweet cherry cultivars for home gardening in Belarus. The Fruit Crop Breeding Department of the Institute for Fruit Growing has a collection of 280 sour cherry and 301sweet cherry cultivar accesses. The cultivars and hybrids collection of different genetic and geographic origin pass through the primary study. The cultivars study make possible to select the best genotypes for our climate conditions. By accessions origin, the studied cultivars can be classified in to geographic groups: European, North American, East European and the local breeding cultivars.

The success of breeding is determined by parent material and its study is of high importance. Genetic diversity of the parent material is a base of successful fruit crops cultivars creation with a combination of various environmental factors resistance, and of high quality fruits. The very critical element of parent form selection process is to search for the new sources from the different centers of origin. Fruit crops breeding study results show the use of parent forms from the different centers of origin makes the best results (Kanishina, 2006; Kazlouskaya, 2009).

The cherry cultivars bred in Romania are very interesting in this way and have a number of benefits. The cherry breeding programs have being carried out in Romania since 1951 (Branişte, 2007).The certain results have been achieved in cultivar creation which are resistant to the main diseases and have high quality fruits.

The new sources of resistance to the main diseases and high quality fruits engagement will make possible to obtain cultivars having the complex of economically valuable traits for commercial and home cultivation. The study of Romanian cultivars in Belarus will result in reveal the most adaptive genotypes to the Belarusian conditions for set up commercial trial. Thus, one of the aims in our study was to identify the potential of Romanian cherry and sweet cherry cultivars in Belarus by assessment the number of economically and biological valuable traits which determinate cultivar value.

2. Material and methods

The study was carried out in the cherry field genebank of the Institute for Fruit Growing in 2016 - 2018. The objects of the study were Romanian cherry cultivars planted in 2013. The Belarusian sour cherry cultivar 'Vyanok' and sweet cherry cv. 'Syubarovskaya' served as standards. Tree planting scheme was 4 × 3 m. The soil maintenance in inter-row spacing was sward, in rows-herbicidal fallow. Treatments to prevent diseases and pests were made every year. Pruning of trees was made according to spaced-tiered system. The main economical and biological value study was carried out according to 'The program and methodology for fruit, berry and nut crop cultivars study' (VNIISPK, 1999).

Winter conditions in 2015-2016 were characterized by unsteady temperature and high rate of precipitation. Abnormally warm weather was detected in December, by 5-13 °C above normal. The winter weather was observed in the last days of the month (29-31). In January, low temperatures prevailed. The distortion from the normal reached up to 8-13 °C. In the first ten days of the month, the temperature dropped to -19.3 °C. The minimum temperature on the soil surface was dropped to -23.7 °C. In February, an unusually warm weather was observed - 7 °C above the normal. During the period from December to February, 61 days of thaw were observed. In 2016, the vegetation period began in March with an elevated temperature (+2 °C, which is 4 °C above the normal) and sufficient amount of precipitation (39 mm or 93% of the monthly normal). In April, unstable weather increased by 6 °C above normal was noted, the average air temperature and excess precipitation in the first half of April and decreased by 1 °C, with no precipitation - in the second half. The changeable weather continued in the rest of the growing season.

The winter of 2016-2017 can be characterized by a moderate temperature regime with smooth fluctuations of negative and positive temperatures. The regular decrease in air temperature from the end of November 2016 lasted until the middle of the second decade of February 2017, when the beginning of the warm period in February was noted in the daytime from +0 to +5 °C, with a gradual increase in average daily temperature in March and April. The warmest period was marked by the end of March - the beginning of April, when the daytime temperature rose to +18 °C. The coldest period was observed from January 5 to 10 at night, and on December, 7th at night a decrease in temperature to -22 °C was noted. The most unfavorable period for fruit crops was recorded from April 12 to May 2, when daytime air temperature ranged from +3 to +13 °C, and at night from -1 to -5 °C, and from May 9 to 12 at night. The time was marked by a decrease in temperature from -1 to -3 °C, which negatively affected the stone fruits crops flowering, including cherry and sweet cherry.

The winter 2017-2018 was noted for unusually warm weather conditions without sharp fluctuations in positive and negative temperatures. In December, the air temperature during the daytime was above 0 and only on days 19-21 dropped to -2 °C. At night, the temperature dropped to -4 °C. January was also warm. The average air temperature was -3 °C, the minimum - -16.0 °C. Similar weather persisted in February. The average temperature was -6.0 °C, the minimum - -19 °C.

3. Results and discussion

During the study period (years 2016-2018), meteorological conditions in general facilitated good plant growth and development. However, it was not without stressful situations both during the winter period (sharp fluctuations of negative temperatures, frequent thaws, lack of snow cover) and during the growing season (alternation of excessive moisture with no precipitation, low or high positive temperatures during flowering).Thus, the contrasting weather conditions observed during the research period allowed a comprehensive object-based assessment of genotypes by a complex of features and the selection of the most adaptive, productive samples.

The study of the cherry cultivar assortment from Romanian breeding program was represented by the genotypes with very early, early or medium fruit ripening terms (table 1). The ‘Rival’ cultivar deserved the most attention, characterized by high-quality fruits: taste score (4.6 scores) and average fruit weight (6.0 g), which are higher than those of standard cultivar ‘Vyanok’.

The studied sweet cherry cultivars were classified into early (‘Ponoare’), middle-early (‘Tentant’, ‘Izverna’) and middle term ripening (‘Daria’) cultivars by terms of ripening. All cultivars were remarkable with large fruits (over 6.3 g), dark red skin color, tough pulp (‘bigarreau’ type) and high fruit taste (4.6-4.8 scores), which corresponds to or exceeds the values for these traits of the standard cv. ‘Syubarovskaya’.

The Romanian cherry cultivars adaptability in the conditions of Belarus was evaluated by several characteristics, such as wood, flowering, and fruiting frost damage level, cherry leaf spot and monilial blight damage (table 2).

For the study cherry cultivars frost damage to wood did not exceed 1.0 score (very weak frost damage) in the years of research. At the same time, the trees of the Belarusian standard cultivar ‘Vyanok’ did not have any wood damage associated with the negative temperature effects in the winter. Sweet cherry was more sensitive to low temperatures. So, even the trees of standard cultivar ‘Syubarovskaya’ had frost damage to wood of 1.0score every year. The wood frost damage to the study sweet cherry cultivars differed by the year and reached the score of 3.0 for cultivars ‘Tentant’ and ‘Daria’ in 2017. The wood frost damage to cultivars ‘Izverna’ and ‘Ponoare’ was 2.0 scores in 2017.

During the study period, the flowering score for the cherry cultivars studied was 1.0-5.0. The weakest flowering was observed on ‘Timpuriu de Pitesti’ cultivar, from 1.0 score in 2017 to 4.0 in 2018. In the research years weak flowering was the result of frost damage of vascular fiber bundles under the flowering buds during the winter period and, as a result, generative system suppression. The flowering rate of the studied sweet cherry cultivars was lower than that of cultivar ‘Syubarovskaya’ used as standard. So, if the flowering and fruiting score of standard cultivar trees was estimated to be not lower

than 2.0 scores, the trees of the studied cultivars did not flower and bear fruits, or had single flowers and fruits (0-1.0 scores) in the study period. The main effect on these characteristics, like on cherry, was made by the winter conditions, after which the frost damage to the vascular system under the flower buds was noted. 'Tentant' cultivar showed up to 100% flower buds died after the winter of 2017.

The sour cherry trees fruiting during the research years was weak (single fruits) or completely absent, except 'Rival' cultivar, the trees of which fruited at the level of the standard cultivar 'Vyanok' (2.0, 3.0 and 5.0 scores, respectively, in 2016-2018). The 'Timpuriu de Pitesti' trees did not bear fruit in 2017 (0 scores). As for sour cherry, weak fruiting or even lack of fruiting was observed for the studied sweet cherry cultivars.

An important cultivar adaptive factor is the resistance to the most limiting agents for crop cultivation in the region. In Belarus, the main cherry diseases are cherry leaf spot and monilial blight. According to the study results, 'Tarina' and 'Rival' cultivars resistance to monilial blight was established. The infection of the studied cherry cultivars with cherry leaf spot agent was at the level of the standard cultivar 'Vyanok'. The damage score to the studied cultivar trees was at least 2.0 scores (10% leaves affected). The sufficient sweet cherry resistance to the cherry leaf spot agent was noted, the damage to trees did not exceed the score of 1.0, as in the standard cultivar 'Syubarovskaya'. All the cultivars studied werealso resistant to monilial blight.

For further adaptability evaluation of the studied cherry cultivars the general health of the trees was evaluated. So, the 'Rival' trees are found to have good health, moderate growth gain and sufficient foliage (4.0 scores) in 2018, which, together with the values presented in table 2, indicated sufficient adaptability of this genotype in Belarus. The good health of trees was noted for cultivars 'Timpuriu de Pitesti' and 'Tarina' however, weak fruiting (single fruits) in the years of study indicated these samples did not fully realize their genetic potential in Belarus. The general health of the sweet cherry trees at the end of the growing season in 2018 was assessed as weak, with insufficient foliage and growth, which indicates the lack of adaptability of the studied genotypes in Belarus. The 'Tentant' trees were completely inhibited and by the end of the growing season their death was observed, which indicated poor winter hardiness and lack of resistance of this cultivars to central part of Belarus weather conditions.

The cultivar 'Rival' was additionally characterized by self-fertility trait under Belarus climatic conditions.

Thus, according to the research results, it was established that the studied cherry cultivars of Romanian breeding showed insufficient adaptability to the conditions of Belarus. The exception was the cherry cultivar 'Rival' selected by the complex of adaptability, high fruit testiness and self-fertility traits. In the conditions of Belarus, the studied sweet cherry cultivars of Romanian breeding were characterized by high quality fruits and resistance to the main diseases (cherry leaf spot, monilial blight) which is of high breeding value. However, the insufficient winter hardiness and, accordingly, the weak flowering and fruiting, as well as the general health of the trees indicated the lack of adaptability of the Romanian sweet cherry genotypes to the Belarusian central part conditions.

4. Conclusion

All the studied cherry cultivars of Romanian breeding in the conditions of the central part of Belarus showed relative resistance to cherry leaf spot and monilialblight. At the same time, the most of the Romanian cherry cultivars studied do not realize their genetic potential in the conditions of Belarus due to insufficient tree and flower bud winter hardiness, which is expressed by single fruiting and weakened general health of the trees.

According to the complex of traits (winter hardiness, resistance to cherry leaf spot and monilial blight, fruiting score, self-fertility, large fruit, high quality taste), cherry cultivar 'Rival' is recommended for use in breeding as a source of these traits.

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Tables

Table 1. Romanian cherry cultivar characteristics and terms of fruit ripening in Belarus

Cultivar	Ripeness term	Fruit weight, g	Fruit color	Fruit toughness	Taste, score
Sour cherry					
'Vyanok' (st.)	middle-late	5.5	dark red	middle	4.6
'Tarina'	very early	4.5	dark red	middle	4.4
'Timpuriu de Pitesti'	early	4.5	dark red	middle	4.4
'Rival'	middle	6.0	dark red	middle	4.6
Sweet cherry					
'Syubarovskaya' (st.)	early	5.5	dark red	middle	4.6
'Tentant'	middle-early	7.5	dark red	'bigarreau'	4.6
'Daria'	middle	6.5	dark red	'bigarreau'	4.6
'Izverna'	middle-early	6.3	dark red	'bigarreau'	4.6
'Ponoare'	early	6.5	dark red	'bigarreau'	4.8

Table 2. Romanian cherry cultivar characteristics

Cultivar	Frost damage, score			Flowering, score			Fruiting, score			Cherry leaf spot damage, score			Monilial blight damage, score		
	Year														
	16	17	18	16	17	18	16	17	18	16	17	18	16	17	18
Sour cherry															
'Vyanok' (st.)	0	0	0	4.0	3.0	5.0	2.0	3.0	5.0	2.0	2.0	1.0	1.0	1.0	1.0
'Tarina'	1.0	1.0	0	2.0	2.0	5.0	1.0	1.0	1.0	2.0	2.0	2.0	0	0	0
'Timpuriu de Pitesti'	1.0	1.0	0	2.0	1.0	4.0	1.0	0.0	1.0	2.0	2.0	0.0	1.0	1.0	0
'Rival'	1.0	1.0	0	4.0	3.0	5.0	2.0	3.0	5.0	2.0	2.0	2.0	0	0	0
Sweet cherry															
'Syubarovs-kaya' (st.)	1.0	1.0	1.0	3.0	2.0	5.0	2.0	2.0	5.0	1.0	0	0	0	0	0
'Tentant'	2.0	3.0	1.0	1.0	0	3.0	0	0	1.0	1.0	1.0	1.0	0	0	0
'Daria'	1.0	3.0	1.0	1.0	1.0	3.0	1.0	0	1.0	0	0	1.0	0	0	0
'Izverna'	1.0	2.0	1.0	1.0	0	2.0	1.0	0	1.0	1.0	1.0	1.0	0	0	0
'Ponoare	1.0	2.0	1.0	1.0	1.0	5.0	1.0	1.0	2.0	1.0	1.0	1.0	0	0	0