Monitoring of samples of bird cherry (Prunus padus) and red rowan for breeding in the northeast of European Russia

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Abstract. This article illustrates the primary assessment of the introduced varieties of bird cherry and red rowan for a complex of economically useful traits in the period 2015-2019 in the region to select promising conditions for breeding work. The surveys were carried out according to the following indicators: the strength of the growth of varieties, resistance to pests and diseases, winter hardiness in the field, and assessment of the quality of fruits. As objects of research, 15 varieties of bird cherry were used. From bird cherry: form plena, Meteo, Colorata; bird cherry trees Lauhe: In memory of Salamatov (control), Siberian Beauty, Olga Joy, Pomegranate Bunch, Chemalskaya Luxurious, Purple Candle, Unkillable, Chemal Beauty; cherry virgin: Schubert, C. virginsky No.1, C. virginsky No.2; bird cherry: Siori No.1.10 varieties were studied for red rowan: Granatnaya, Vefed, Sorbinka, Rosina, Solnechnaya, Titan, Alaya Krupnaya, Businka, Burka, and Nevezhenskaya (control).

It was found that the studied accessions were not damaged after winter. By the strength of growth in bird cherry trees, varieties with a compact crown were distinguished: Virginskaya No.1 and Chemalskaya Luxurious. The best indicators of fruits were found in bird cherry trees No.1 and No.2, in Memory of Salamatov. Variety of Memory Salamatov with larger clusters and the number of berries per cluster. The minimum share of seeds in the mass of pulp was noted in the varieties Granatovaya Grozd and Pamyati Salamatova. The study of red rowan showed that a more restrained vigor of growth was noted in the varieties Granatnaya and Rosina.

1. Introduction

Among unconventional or uncommon garden crops, varieties and types of red-fruited red rowan and bird cherry deserve attention. The fruits of red rowan and bird cherry in their composition contain many biologically active substances useful for the human body, in this regard, they are valuable for all types of processing and obtaining valuable food [1-8].

For the first time, selection with bird cherry as a fruit crop began in Russia in the second quarter of the 20th century at the branch of the Siberian Research Institute of Horticulture named after M.A. Lisavenko - Bakchar stronghold of northern gardening, and later in the Central Siberian Botanical Garden of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk) [9].
The use of red rowan in Russia is known at the beginning of the 16th century. In the 19th century, in the village of Nevezhino (Vladimir region) and Czechoslovakia (Moravian Mountains), 2 varieties Nevezhenskaya and Moravskaya emerged from the natural population. I.V. Michurin was the first to obtain a series of varieties based on distant hybridization with red rowan. Later T.K. Poplavskaya in Michurinsk bred varieties Vefed, Businka, Sorbinka, and Daughter Kubovoy [10-11].

The work on the selection of red rowan continues in the Central Siberian Botanical Garden of the Siberian Branch of the Russian Academy of Sciences, where a rich complex of the genus Sorbus has been collected. Now the State Register of the Russian Federation includes 16 varieties of bird cherry, of which: 7 varieties of decorative, 8 universal, and 1 variety of technical direction. And for red rowan10 varieties, the main originator of varieties of red red rowan in Russia is the Federal State Budgetary Scientific Institution “Federal Scientific Center named after I.V. Michurin “(Michurinsk). In the Kirov region, there are no natural populations of red rowan and bird cherry thickets with outstanding specimens for selection, therefore we introduced the material of bird cherry and red rowan, which requires a comprehensive study.

2. Materials and methods
The aim of the work was to study the collection of bird cherry and red rowan for a complex of economically useful characteristics in the conditions of the Kirov region.

In this regard, the following tasks were set: to study winter hardiness in the field, the strength of growth, resistance to diseases and pests, to assess the quality of the fruits.

The experiment was laid in a private garden of LLC "Bystry Sad", Yuryansk region, Kirov region on sod-podzolic medium loamy soil, with the following indicators:

- pH - 5.5 (slightly acidic); the degree of saturation with bases - 82%; content: P2O5 - 260 mg / kg of soil; K2O - 170 mg / kg of soil. The arable horizon is 25 cm thick.

The counts and observations were carried out according to the program and methodology [12].

The experiment was laid with a 2-year-old planting stock in 2012 in the fall, according to a 5 x 4 m scheme. The studies were carried out from 2015 to 2018.

For bird cherry, 15 varieties of bird cherry were used as objects of research: including common: form plena, Meteo, Colorata:

- bird cherry Lauhe: In memory of Salamatov (control), Siberian Beauty, Olga Joy, Pomegranate Bunch, Chemalskaya Luxurious, Purple Candle, Unkillable, Chemal Beauty:
- bird cherry virgin: Schubert, C. virginsky No. 1, C. virginsky No. 2;
- bird cherry Siori: Siori No. 1.

For red rowan, 10 varieties were used: Granatnaya, Vefed, Sorbinka, Rozina, Solnechnaya, Titan, Alaya Krupnaya, Businka, Burka, and Nevezhenskaya (control). These varieties were grafted into a 5-6 year old rowan straw former in spring 2013, the planting pattern was 5 x 4 m.

For bird cherry, 15 varieties of bird cherry were used as objects of research: including common: form plena, Meteo, Colorata.

3. Results and discussion
Taking into account the assessment of winter hardiness showed the absence of damage in the varieties of bird cherry. In the red rowan of the Solnechnaya variety, slight damage to the wood was noted (0.6 points). Other researchers also spoke about the good winter hardiness of red-fruited rowan varieties [13-18].

Determination of the growth force of bird cherry varieties at the 7th year of planting showed that the most vigorous according to the experience were the varieties: Colorata - 3.0 m height and 2.5 m3 crown volume, Purple Candle 2.9 m and 2.6 m3, respectively, Virginia No. 2 - 2.9m and 3.4m3.

At the same time, the minimum indicators were noted for (f. Pleno) according to experience - 1.5 m and 0.6 m3. A more compact crown is typical for varieties Virginskaya No. 1 and Chemalskaya Luxurious (crown volume 0.7 m3).

Olgin's Radost variety had a dessert taste (practically without astringency).
In varieties of bird cherry (f. Plena, Meteo, Kolorata), and varieties of Virginia bird cherry Schubert, the fruit taste was mediocre (3.7-3.9 points) and the fruit weight was the smallest (0.5-0.6 g).

Evaluation of the quality of fruits showed that the best indicators were established in selected seedlings of cherry virginsky No. 1 and No. 2, variety Pamyati Salamatova, both in the diameter of the fruit (0.9-1.3 cm) and in the weight of berries (1.1-1.3 g).

The specimen of Siori bird cherry No. 1, although it has rather large fruits (larger in size than that of the bird cherry), does not tie them very much, which is due to the low self-fertility of this species.

The share of seeds in the berry mass of the Pomegranate Grozd and Pamyati Salamatova varieties is minimal, 11.0 and 12.8%, respectively. On the contrary, a greater proportion of seeds is characteristic of the Purple Svecha variety (20.0%), the virgin bird cherry varieties No. 1 and No. 2, respectively, 18.6 and 19.1%, and Siori No. 1 (19.8%).

Variety Pamyati Salamatova had more berries per cluster (13 pcs). By the weight of 100 fruits, varieties of bird cherry virginsky No. 1 and No. 2, respectively 130 and 120 g, stood out.

By the strength of growth, the varieties Alaya Krupnaya and Vefed were identified as more vigorous in red rowan. The varieties Nevezhenskaya and Sorbinka are also characterized by tall growth. Weak growth was found in the varieties Rosina and Granatnaya.

Assessment of the quality of the fruits showed that large-fruited varieties include (with a fruit weight of 1 g or more) Alai Large, Titan, Burka, Sorbinka, Rozina, Pomegranate. The indicator of the proportion of seeds from the mass of berries was directly dependent on the characteristics of the variety. It should be noted that a smaller proportion of seed content (from 2.4 to 3.5%) is typical for varieties Sorbinka, Businka, Burka, and Titan), on the contrary, in varieties, Solnechnaya and Nevezhenskaya, the percentage of seeds content was the highest (21.0-12, 8%), the rest of the varieties occupied an intermediate position.

By the weight of 100 berries, the varieties Alaya Krupnaya, Burka, Sorbinka, Granatnaya (110-250 g) were distinguished. The largest number of berries in the bunch was observed in the varieties Sorbinka and Businka, respectively, 224 and 202 pcs.

According to the complex of economically useful indicators in the experiment, the varieties Burka, Sorbinka, Alaya Krupnaya were distinguished.

The fact that in 2017, as a result of frequent precipitation in the form of rain in June-July, on varieties of common bird cherry, the fruit was affected by a fungal disease - plum pockets (Taphinapruni), the damage was 74 - 80%.

An insignificant lesion of annual growth in varieties of bird cherry by the common bird cherry aphid (Rhopalosiphum padi L.) was noted in 2016 and 2018. within 2-3 points. On the rest of the accessions, no noticeable damage by pests and diseases was observed. On red rowan in the Vefed variety, there is a very weak defeat by the mounred rowan aphid (Yezabura sorbi Kalt. (Syn. Dentatus sorbi Kalt.)) within 1 point.

In general, rowan varieties showed high resistance to pests and diseases, as evidenced by the data of other researchers.

Assessment of winter hardiness of the studied varieties revealed the absence of damage in bird cherry and red rowan. Evaluation of the strength of growth made it possible to identify taller specimens: Virginia No. 2, Colorata, Purple Candle. In the form of the common bird cherry (f. Pleno), the growth rates were low according to the experience. At the same time, a more compact crown is characteristic of the varieties Virginskaya No. 1 and Chemalskaya Luxurious.

Considering the qualitative characteristics of the fruits, it should be noted that they are better in varieties of bird cherry virginskaya No. 1 and No. 2, varieties Pamyati Salamatova in terms of fruit diameter (0.9-1.3 cm) and fruit weight (1.1-1.3 g).

Taking into account productivity indicators made it possible to establish that the Pamyati Salamatova variety had larger clusters and the number of berries per cluster (13 pcs). The minimum proportion of seeds from the mass of pulp is typical for the varieties Granatovaya Grozd and Pamyati Salamatova.

It was revealed that the Schubert variety had the lowest productivity indicators according to the experience. Evaluation of potential productivity revealed the best specimen of virginskaya bird cherry
No. 2 (2376 g / v.). Good performance was observed in the variety Pamyati Salamatova (858 g / v.), Chemalskaya Luxurious (713 g / v.), Purple Svecha (672 g / v.) and Chemal Beauty (648 g / village). Low potential productivity was revealed in the following cultivars: Meteo (72 g / v.), Kolorata (150 g / v.), Siori No. 1 (165 g / v.). In rare cases, the plena form produced single fruits due to the peculiarities of the generative structure of flowers.

Based on the primary research on the introduction of bird cherry trees, the best varieties in terms of some economically useful traits were the varieties of the Virginia bird cherry tree (virginskaya No. 1 and No. 2) and the variety Pamyati Salamatova.

The study of red rowan showed:

- by the strength of growth of grafted varieties for 6 years, the most vigorous varieties were identified Alaya Krupnaya and Vefed, both in terms of crown volume and height. In particular, tallness was noted in the varieties Sorbinka and Nevezhenskaya. The varieties Granatnaya and Rosina turned out to be more restrained in terms of growth;
- of the larger-fruited varieties, it should be noted (with a fruit weight of 1 g or more) Alai Large, Titan, Burk, Sorbinka, Rosina, Pomegranate;
- the greatest number of berries in the bunch was observed in the varieties Sorbinka and Businka, respectively, 224 and 202 pieces;
- by weight of 100 berries, the best indicators were observed in the varieties Alaya Krupnaya, Burk, Sorbinka, Granatnaya;
- the least share of seeds in the mass of pulp was found in varieties Titan, Burk, Businka, Sorbinka (from 2.4 to 3.5%).

Among the varieties of red rowan in terms of potential productivity, the following varieties stand out: Titan (7775 g / v.), Businka (5939 g / v.), Burk (4778 g / v.), Alaya Krupnaya (3562 g / v.), Plokhie in the variety Solnechnaya (24 g / village). This variety is promising as a decorative one in terms of the structure of the leaf blade and the compactness of the crown.

According to the complex of economically useful traits, the best varieties of red-fruited red rowan in the experience were distinguished: Alaya Krupnaya, Sorbinka, Burk.

4. Conclusion
Thus, in the course of evaluating the introduced varieties of bird cherry and red rowan for a complex of economically useful traits in the soil and climatic conditions of the Kirov region, for further stages of selection, the samples of the Virginia bird cherry tree (Virginskaya No. 1 and No. 2) and the variety Pamyati Salamatov stood out among the bird cherry trees. For red rowan, the best indicators were observed in the varieties Burk, Sorbinka, Alaya Krupnaya.

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