MAIN RESULTS ON POTATO SELECTION IN YAKUTIA

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Agroclimatic conditions of the Yakutia and the limiting factors constraining of potato productivity enlargement are considered. Problems and prospects of breeding work on a potato in the Yakutia are shown.

The article summarizes the results of studies assessing potato hybrids economically valuable traits, resistance to most common diseases and the keeping quality according to the accepted scheme of selection in the arid conditions of cry ozone.

As pollinators, 14 varieties of early and middle early groups of ripeness with high economic efficiency were used. Twenty combinations of crossing with 15 maternal forms were carried out.

The most effective pollinators by the results of hybridization were the varieties Latona, Yakutyanka, Breeze, from the mother forms - Rosalind, Adretta, Kamensky and Rosara.

Because of breeding works, new promising hybrids of 232 (Aurora x Bonus), 233 (Slavyanka x Rosalind) were obtained with an average yield of 27.7 t / ha, potential 42.0 t / ha, with excellent taste. Evaluation of these hybrids will continue.

Based on these studies the grade Aldan - 117 - 1 (720.131 x Spring (white)) was suggested, which is transferred to the Russian State Commission for Testing and Protection of New Varieties of Plants from the Yakut State Research Institute of Agriculture named after M.G. Safronov.

The characteristics of potato varieties of local breeding, created in accordance with the priority areas for the region of breeding, included in the State Register of Breeding Achievements of the Russian Federation and protected by patents are also given.

Key words: potato, grade, hybrids, crossbreeding, collection, samples, combinations.

Introduction. In Yakutia, potatoes are one of the leading crop crops cultivated for food and occupy about 8.5 thousand hectares. The short growing season (60-70 days) allows growing only varieties of the early and middle group of ripeness, which most often do not reach the phase of natural dying out of the foliage before harvesting (1-3 September).

Ensuring the sustainability of growth in size and quality of crops in temperate and harsh climates increasingly limits not only and not so much the level of man-made farms, so much unregulated environmental factors (short growing season, low temperatures, soil and air drought,

etc.) which can be avoided only by creating environmentally sustainable varieties and hybrids ("the genotype dominates the environment") [1, 3, 5].

The soil and climatic conditions of the agricultural regions of Yakutia are extreme and are distinguished by the following features: low fertility of frozen soils, which usually have an alkaline reaction, a short growing season (65 - 70 days), a small amount of precipitation over the summer period (106-120 mm), the sum of positive temperatures above 50 C -16740, and the sum of biologically active temperatures above 100 C for the period June-August, on average, 14340; in summer, temperature drops from day to night; late spring (June) and early autumn (August) frosts; dry winds in June-August, a long period (8 - 9 months) storage.

Potato varieties suitable for cultivation in such conditions must meet the following requirements: early ripeness, resistance to drought, frost, daily temperature drops, the most harmful diseases in local conditions, good keeping quality during storage. Taking into account the peculiarities of the soil and climatic conditions, it is possible to grow varieties of the early and mid-early ripeness group using techniques that shorten the growing season as much as possible and promote crop accumulation over a short period [1, 2, 5, 11, 12].

The goal is to create adaptive-type potato varieties that are resistant to abiotic and biotic stresses of the zone most suitable for cultivation in local conditions.

Materials and methods of research.

Studies were conducted on the experimental field of the hospital "Balanty" FGBNU Yakutsk Research Institute of Agriculture. During the growing season, surveys and observations were carried out according to the method of research on potato culture, VNIIKH, 1967 [8]. Selection work on the creation of highly productive potato varieties with economically valuable traits was carried out in accordance with the methodological guidelines of the potato breeding technology, 1994 [10]. Guidelines for the maintenance and study of the world collection of potatoes. - St. Petersburg, 2010 [10], the State Commission for Crop Testing of Crops and VIR them. N.I. Vavilova [6].

The obtained data were subjected to mathematical processing using the methods of field experience B.A. Dospekhova [4], program SNEDECOR, Microsoft Exsel.

Breeding work in Yakutia is mainly based on the use of hybrid material from leading scientific institutions of Russia (VNIIKH, VIR, etc.). Hybridization in local conditions is extremely difficult, due to air drought and dry winds [7, 8].

Research results. Currently, crossing is carried out in gauze houses, on a specially selected collection of parental forms that form berries in local conditions. The most suitable for

hybridization in hot arid conditions of the summer period of Yakutia are the variety samples with abundant and medium (up to 58%) flowering.

The parental forms were potato varieties Breeze, Adretta, Razolind, Yakutyanka, Rosara, Latona, Ladoga, Kamensky, Lyubava, Tabor, Garant, Madam, Kolobok, and Inspiration. All varieties belong to the groups of early and medium early. Possess potential yield up to 40 - 50 t / ha, marketability up to 90 - 96%, high biochemical and taste indicators. Ladoga varieties are resistant to the potato nematode. Many of them are characterized by high keeping quality during the winter storage period (Ladoga, Rosalind, Kamensky, Lyubava, etc.).

The percentage of berry formation in the crossing combinations made was 7.7 - 47.6%. The largest number of berries was obtained when using Latona varieties as pollinators - 35.0%, Yakutyanka - 35.2%, Breeze - 47.6%, and mother forms - Rosalind, Adretta, Kamensky and Rosara. The best combinations in the formation of berries were obtained when crossing varieties: Inspiration x Tabor -90.4%, Gingerbread Man x Adretta - 50.0% and Gingerbread Man x Tabor - 66.0%.

Because of the assessment of more than five thousand hybrid seedlings, 15 hybrids passed the full scheme of breeding tests, distinguished by the presence of the necessary set of economically valuable traits and resistance to the most common diseases in local conditions. Selected hybrids belong to the group of early ripening with a growing season of 55-70 days, with a yield of 20.6-33.0 t / ha, which is higher or at the level of standard varieties.

Of particular importance in the conditions of Yakutia is the ability of potato varieties to accumulate crops in the early stages (by early August), which makes it possible to avoid damage from early autumn frosts. The cultivated varieties Yakutyanka and Severnyi accumulated yields 45 days after germination at the level of 18.0-12.1 t / ha. The variety Yakutyanka surpassed the zoned early ripening variety Tulunsky early by 5.3 t / ha. As of the beginning of August, their marketability varied between 80-92%, and for standard varieties - 51-65%.

When harvesting in late August - early September, the yield of standards averaged over 4 years 16.5-22.2 t / ha, new varieties - 18.7-38.7 t / ha, while the latter reliably surpassed the Varmas standard by 2 , 2-22.2 t / ha, and the Tulunsky early variety - by 5.3 t / ha (117-1) and 16.5 t / ha (Northern), with marketability at the standards of 96%, at the best new hybrids - 97 -98% (tab. 1).

Assessment of hybrids on the susceptibility of the most common diseases in local conditions showed that, against viral diseases, the resistance of new forms was at the level of the Varmas variety and exceeded the Tulunsky early variety. The development of an ordinary mosaic, a mosaic twisting of leaves and a single wrinkled mosaic is noted.

Table 1

Yield and marketability of tubers of potato varieties

(On average for 2015-2018), t / ha

Sort, sample	45 days after germination			Marketability,%	Productivity, t / ha			Marketability,%
	Productivity	off from Varmas	off from Tulunsky early		Productivity	off from Varmas	off from Tulunsky early	
Varmas	7,8	St.	St.	51	16,5	St.	St.	96
Tulunsky early	12,7	«	«	65	22,2	«	«	96
Yakutyanka	18,0	+10,2	+5,3	82	18,7	+2,2	-3,5	98
North	15,2	+7,4	+2,5	80	38,7	+22,2	+16,5	97
117-1	12,1	+4,3	-0,5	92	27,5	+11,0	+5,3	98
NDS	2,0				3,3			

Because of breeding works created:

The variety Yakutyanka (authors YANIIKH, VNIIKH), entered in the State Register of breeding achievements of the Russian Federation in 2007 in the East-Siberian region (Fig. 1). The variety of table appointments, the growing season 58-60 days. The yield under irrigation on August 1-5 averaged 15.5 - 18.3 t / ha, when harvested at the end of August - 31.4 t / ha, the potential yield - 52.1 t / ha with a marketability of 84-95%. It is relatively resistant to drought, suitable for cultivation on a rainfed bed, where the yield is 12-18 t / ha.

Resistant to cancer, rhizoctoniosis, scab, early dry leaf spot, viral diseases, bacteriosis. Tubers are characterized by increased keeping quality, weakly affected by dry rot. At the same time, they have high taste qualities; their biochemical composition significantly exceeds zoned varieties: 21.2% dry matter, 15.2% starch, 10-15 mg% ascorbic acid.

Figure 1. Potato variety Yakutyanka

The variety Northern variety of breeding of the Yakutsk NIISH is zoned in 2012 in Yakutia, in 2014 - in the Tyumen region (Fig. 2). Nematode-resistant and late-ripening late-ripe variety of table purpose. Plant height is average, semi-upright, flowers are white, inflorescence is abundant, leaf size is average, leaf color is green, and leaf pigmentation is absent. The tubers are oval - rounded, the peel is light yellow, smooth, the flesh is light yellow, and the eyes are superficial. The potential yield is 54.0 t / ha, the average yield in recent years is 38.7 t / ha, and the yield in the early harvest period (at the beginning of August) is 12.2-18.5 t / ha.

The quality is good, the starch content is 14.0%, the dry matter content is 21.0%, ascorbic acid is 15.0%, and vitamin C is 16.0 mg /%. The taste is good, marketability is 90-98%, and the growing season is 65-72 days. Resistant to cancer, nematode, rhizoctoniosis, scab, to late blight on leaves 9 points, on tubers -7 points, early dry leaf spot, and viral diseases, moderately resistant to bacteriosis.

Figure 2. Potato variety North

According to the result of many years of testing, the nematode-resistant variety Aldan was transferred to the State variety testing with an average yield of 27 t / ha, a potential yield of 42.7 t / ha (Fig. 3). Resistant to rhizoctoniosis, scab, dry leaf spot, viral diseases, bacteriosis.

Tubers are characterized by high keeping quality, are slightly affected by dry rot, while having high taste qualities. In terms of biochemical composition, it significantly exceeds zoned varieties: 20.0% dry matter, 13.5% starch, 15.0 mg/% ascorbic acid.

Figure 3. Aldan potato variety

Conclusion. Currently, hybrids of 232 (Aurora x Bonus), 233 (Slavyanka x Rosalind) with an average yield of 27.7 t / ha, potential 42.0 t / ha, with excellent taste are of the greatest interest. Evaluation of these hybrids will continue.

In subsequent work, it is necessary to expand the range of research on potatoes, in order to create new varieties of adaptive type with good economically valuable indicators that are resistant to heat and drought.

References:

1. Alsmik, P.I. Selection of potato in Belarus. Minsk, "Uradzhay", 1979 – 127 p.
2. Bukasov, S.M., Cameraz, A.Ya. Basics of potato selection / S.M. Bukasov, A.Ya. Cameras - M .; L .: Selkhozgiz, 1959. - 528 p.
3. Vavilov, N.I. Selection as a science / N.I. Vavilov // Theoretical bases of plant breeding. - M.; L., 1935. - 245 p.
4. Zhuchenko A. A. Adaptive crop production (ecological and genetic bases) theory and practice. Volume II / A. A. Zhuchenko – M.: Publishing house Agrorus, LLC, 2009. - P. 37.
5. Methods of research by the culture of potatoes. – M.: Russian Scientific Research Institute of Potato Breeding, 1967. – P. 262.
6. Methods of state variety testing of agricultural crops. - M., 1985. - Issue 1. - 270 s.
7. Guidelines for potato breeding technology. – M.: RAAS, 1994. – 22 p.
8. Guidelines for the maintenance and study of the world collection of potatoes. - St. Petersburg, 2010 - p. 21-26.
9. Dospekhov, B.A. Methods of field experience. M.: Kolos, 1973. – P. 259-271.
10. Methods of the State Commission on the variety testing of crops at the Ministry of Agriculture of the USSR. M .: Kolos, 1972. - 79 p.
11. Okhlopkova, P.P. Potato in Yakutia [Text]: monograph. RAAS, Siberian branch, Yakut Scientific Research Institute of Agriculture. - Yakutsk: NP State Publishing House of SB RAS, 2004. - 184 p.
12. Okhlopkova P.P., Yakovleva N.S., Efremova S.P. В книге: Emerging Threats for Human Health Impact of Socioeconomic and Climate Change on Zoonotic Diseases Program and Abstract Book. Yakut Sate Agricultural Academy. Institute of Biological Problems of Cryolithozone SB RAN; North-Eastern Federal University in Yakutsk; University of Hohenheim; Yakut Scientific Research Institute of Agriculture; LLC Scientific & production center „Khotu-Bact“. 2018. C. 79.