The results of interspecific potato hybrids evaluation using marker-assisted, laboratory and field methods

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Abstract. The evaluation of interspecific potato hybrids was carried out in 2018–2019 in Moscow region and Krasnoyarsk region. Using the methods of traditional and marker-assisted selection the interspecific hybrids created at the Scientific and Practical Center for Potato and Horticulture in Belarus were screened. According to the results of molecular genetic analysis, forms with complex resistance to a potato cyst nematode, Y, X viruses were identified: 110xy 0911-19, 89y 06-2a, 38dy-39d, 71-10-10, 212-216-9, KC 211xy 04 -10, 18-06-2, 54-10-3. As sources of economic characteristics, interest in practical selection is represented by samples with a high starch content in different ecological zones: 201.161-11, 213.24-31, 60-10-6, 53-10-5, 2011 14-8; pollen fertility: 201.206-48 , 201.13-11, 001125-43; resistance to Phytophthora infestans : 89y 06-2a, 18-06-2, 106y 07-22, 209-3-1, 201.13-11, 60-10-6, 54-10-3 etc.; high marketable yield, mass of grocery-ware tuber: 106y07-22, 201.13-11, 110xy 0911-19, 89y 06-2a, 38dy-39d; favorable chemical composition for processing on potato products, chips, fries: 213.24-31, 213.11-32, 201.13-11, 89y 06-2a, 18ay 10-2.

1. Introduction
The current stage of potato growing development is characterized by a significant increase in the number of characters in the direction of which the selection process is being carried out. The main tasks of selection are determined by the requirements of agricultural producers, the consumer market, environmental safety and natural conditions of the regions. The increase in the number of characters combined in one variety, especially in the direction of combining resistance to biotic and abiotic factors with a complex of economically valuable and consumer qualities, significantly complicated the implementation of selection programs. In this regard, the role of prebreeding selection whose task is to identify new sources and donors, to create and genetic assessment of the source material for more important breeding directions has increased [1].
The use of interspecific hybridization and molecular markers (or marker-assisted selection methods) at the prebreeding stage helps to expand the genetic diversity of the source material. Methods of marker-assisted selection allow more efficient selection and systematization of the source material, control the transfer of target characters in the process of hybridization, and selection of promising hybrid clones.

To expand the genetic base of potato selection, the All-Russian Research Institute of Potato Economy (VNIIKH) and the Krasnoyarsk State Agrarian University (Krasnoyarsk SAU) are constantly searching and evaluating new source material in collaboration with various scientific institutions. In 2018–2019 VNIIKH together with the Krasnoyarsk SAU conducted a comprehensive evaluation of a new group of source material created at the Research and Production Centre of the National Academy of Sciences of Belarus for potato growing and horticulture (SPC NAS of Belarus for potato growing and horticulture).

The aim of this work is a comprehensive evaluation of interspecific potato hybrids using traditional laboratory field and modern biotechnological methods.

2. Materials and methods

2.1. Plant material
In the study, 37 interspecific hybrids of potato of the Belarusian selection, created with the participation of 2-6 species of Solanum, have been studied. Wild and cultivated species of Solanum, on the basis of which hybrids were obtained, are shown in Table 1. The studies were performed in the experimental potato gene pool department of the molecular genome analysis laboratory of the All-Russian Scientific Research Institute of Agricultural Research (Moscow Region), and the selection laboratory of the Krasnoyarsk State Agrarian University (Krasnoyarsk Territory).

2.2. Laboratory Field Evaluation
Intraspecific hybrids were studied in laboratory and in field conditions on the basis of the All-Russian Research Institute of Agricultural Sciences and the Krasnoyarsk State Agrarian University according to the main economically valuable characters in accordance with the Methodological Recommendations [2]. Hybrids were evaluated according to the morphological characteristics of tops and tubers, crop structure, chemical composition of tubers, fertility, taking into account the intensity of flowering and natural berry formation, resistance to viral diseases (visually and by enzyme-linked immunosorbent assay (ELISA)) using diagnostic kits of unit “Biotechnology” (VNIIKH), resistance to late blight (against a natural infectious background and by the method of artificial infection of leaves and tubers with the highly virulent race Phytophthora infestans) on a 9-point scale. Hybridization was performed with mandatory castration of maternal flowers.

2.3. Molecular genetic analysis
Potato interspecific hybrids were screened for the presence of pathogen resistance gene markers on the basis of the laboratory of molecular methods for analyzing the VNIIKH genome using an instrumentation line for polymerase chain reaction (PCR) analysis.

Genomic DNA was highlighted according to the protocol based on the STAB method with changes [3]. Light shoots of tubers of interspecific hybrids (200–250 mg) were homogenized with 1 ml of 2 × STAB buffer containing 2% (v / v) 2-mercaptoethanol [4]. For molecular screening of interspecific hybrids, DNA markers were used: resistance to Y potato virus — STS marker YES3-3A closely linked to the Rysto gene [4], SCAR marker RYSC3 of the Radad gene [5], SCAR markers M6 and M45 of the Radad gene [6], as well as the STS marker Ry186 of the Ryhc gene [7]; resistance to the golden potato nematode Globodera rostochiensis (Woll.) Behrens - SCAR markers of the H1 gene - TG 689 [8], 57 R [9], N 146 and N 195 [7]; STS marker Gro1-4-1 of the Gro1-4 gene [10]; resistance to the pale potato nematode Globodera pallida (Stone) Behrens - STS marker Gpa2-2 of the Gpa2 gene [10]; resistance to potato virus X is the STS marker of the PVX Rx1 gene [7] and the SCAR marker 5Rx1
of the Rx1 gene [11]. DNA amplification was performed in a PTC-100 thermal cycler (MJ Research, USA).

Table 1. Wild and cultivated species of Solanum, participating in the origin of interspecific hybrids (according to data from VA Kozlov).

| Hybrid   | Wild and cultural species from which hybrids were obtained |
|----------|----------------------------------------------------------|
| 18ay10-2 | chc, mcd, sto                                          |
| 10y04-1  | adg, sto                                                |
| 38dy-39d | hou, dms                                               |
| 59y-01-3 | chc                                                     |
| 89y06-2a | sto, acl                                                |
| 92xy00-2 | sto                                                     |
| 106y07-22| chc, adg                                                |
| 110 xy 0911-19 | sto, acl                  |
| Kc 211xy 04-10 | chc, adg                       |
| 213.30a-22 | chc, ryb, ber, adg, stn                                  |
| 213.38a-2 | adg, vrn, phu, ber                                     |
| 238y07-5 | bre, chc, brg                                          |
| 18-06-2  | dms, adg                                                |
| 35-06-14 | vrn, plt                                                |
| 37-05-12 | blb, dms, adg, phu, acl                                 |
| 50-09-5  | vrn, plt, ryb, adg                                      |
| 52-06-4  | blb, dms, acl, phu, ryb, grl                            |
| 53-10-5  | blb, dms, acl, phu                                      |
| 53-10-11 | blb, dms, acl, phu                                      |
| 54-10-3  | vrn, plt                                                |
| 60-10-6  | dms, spl, adg                                           |
| 71-10-10 | blb, dms, adg                                           |
| 201.161-11 | ryb, vrn, ber                                  |
| 205-150-92 | adg, vrn, phu                               |
| 213.11-32 | ryb, mcd, adg, chc                                     |
| 213. 24-31 | acl, cmm, blb, ryb, adg       |
| 001125-43 | blb, pld                                              |
| 201114-8 | blb                                                     |
| 201116-2 | blb                                                     |

The nucleotide sequences of the primers and the conditions of individual PCR are taken from literature. A 25 μl reaction mixture contained 2.5 μl 2.5 mM deoxynucleoside triphosphate mixture (Helikon, Russia), 2.5 μl 25 mM aqueous chloride solution of magnesium chloride (Thermo Fisher Scientific, Lithuania), 0.1-0.5 μl of 100 μM of each primer (Synthol, Russia), 0.2 μl of thermostable DNA polymerase (Syntol, Russia) 5 ea / μl, 2.5 μl 10X reaction buffer for thermostable DNA
polymerase (Synthol, Russia), 5 μl cDNA sample and 10-14 μl milli-Q water. Specific amplification products were separated by electrophoresis on a 1.5% agarose gel stained with ethidium bromide.

3. Results and discussion

3.1. Fertility evaluation taking into account flowering intensity and natural berry formation

Meteorological conditions of vegetation periods in 2018 and 2019 in the Moscow region were very different. Hot and arid weather in July 2018 negatively affected the flowering of the studied samples and hybridization. On the contrary, in July 2019, heavy rainfall and moderate air temperatures contributed to the intensive flowering of hybrids and their involvement in crosses. Abundant flowering at the level of 7–9 points was observed in hybrids 10y04-1, 92xy00-2, 106y 07-22, 211xy04-10, 209.79-4, 213.11-32, 001124-24. Self-pollination berry production was low in all samples except for the 92xy00-2 hybrid (intensity 5 points).

With the participation of the studied interspecific hybrids, 31 crossbreeds were completed, 780 flowers were pollinated, and 68,250 hybrid seeds were obtained. Most interspecific hybrids belong to the middle late and late ripeness groups and are involved in hybridization as maternal forms. As pollinators commercial varieties of early and medium ripening were used. They are characterized, along with high pollen fertility by, a complex of economically valuable traits: Bellarosa, Gala, Labadia, Innovator, Kenzi, Kiwi, Fritella, Krepysh. In 2019, based on hybrids of interspecific origin of the Belarusian selection, 7 hybrid populations were created and evaluated in the seedling nursery according to the generally accepted methodology: 110xy 0911-19 × Gala, 110xy 0911-19 × Kiwi, 205.150-92 × Bellarosa, 001124-24 × Kenza, 10y04 -1 × Kenza, 209.79-4 × Kenza, 211xy04-10 × Innovator. For further selection testing, 1173 promising (single-layer) hybrids were selected from these populations.

In the Krasnoyarsk Territory, the vegetation period in 2018 was also arid, in July only 47% of the average annual precipitation fell. In 2019, the summer months were characterized by an excess of heat and rainfall, the distribution of which was extremely uneven. Arid conditions arose in July, and the hydrothermic coefficient amounted to 0.75. The bulk of the studied interspecific hybrids in these years had a duration and flowering intensity significantly greater (on an average 30 days) than the standard varieties Krasnoyarskiy early (27 days) and Tuleevsky (24 days). Some hybrids (201.206-48, 201.13-11, 001125-43) had also a high ability to form berries from self-pollination, which is especially important in connection with the problem of finding effective pollinators in the conditions of the Krasnoyarsk Territory, due to the fact that flowering occurs during the period with the maximum average daily temperature, and the growth of berries occurs in conditions with lower average daily temperatures, which at night often fall below 10 °C. Sample 001125-43, included in the hybridization, formed a stable number of berries.

3.2. Evaluation of resistance to viral diseases and late blight

According to the results of a visual evaluation of resistance to viral diseases, the majority of Belarusian hybrids were characterized by high field resistance (7–9 points) (table 2). Only 7 of the 37 samples received were excluded from the test with symptoms of mosaic twisting. According to ELISA data, almost all hybrids contain viruses M and S in their latent state. The most harmful Y virus was detected in 3 hybrids (213.30a-22, 37-05-12, 60-10-6).

During artificial infection with late blight by inoculation of the separated leaves, most of the samples were characterized by average laboratory resistance, and when infected with tubers- by high (7–9 points). Two hybrids with high resistance of tops and tubers were selected - 89y06-2a (7.0 and 9.0 points) and 18-06-2 (7.6 and 9.0 points, respectively) (table 2).

Favorable conditions for the development of late blight have arisen in the Krasnoyarsk forest-steppe in August 2019. High resistance to disease (8 points) was found in 33% of samples, among which were isolated in laboratory conditions, 42% of the samples were characterized as stable (7 points) with an indicator of the susceptible standard Krasnoyarsk early 3 points.
Table 2. Characteristics of interspecific hybrids by fertility and a complex of economically valuable characters (Moscow region, average for 2018–2019).

| Hybrid       | Starchness, % | Field resistance to viruses | ELISA/presence of viruses | Resistance to late blight (artificial infection, score) | Resistance to late blight (artificial infection, score) | Crossings | options | carried out | Hybrid seeds | obtained, pcs. |
|--------------|---------------|-----------------------------|---------------------------|--------------------------------------------------------|--------------------------------------------------------|-----------|---------|-------------|--------------|----------------|
| 18ay10-2     | 15.8          | 7.9                         | S'M²                       | 5.9, 7, 4                                               | 4, 1, 1                                                | 1.06      | 1, 1   | 1           | 1355         |
| 10y04-1      | 18.3          | 7                           | M                          | 5, 6, 5                                                 | 1, 1, 1                                                | 1.30      | 1, 1   |             |              |
| 38ad-39d     | 16.7          | 7.9                         | SM                         | 5.9, 7, 4                                               | 3, 1                                                   | 1.25      | 1, 1   |             |              |
| 59y-01-3     | 13.8          | 7                           | M                          | 5.3, 5, 4                                               | 1, no                                                  |           |        |             |              |
| 89y06-2a     | 18.1          | 7.9                         | M                          | 7, 9, 5                                                 | no, 2                                                  |           |        |             |              |
| 92xy00-2     | 16.8          | 7                           | SM                         | 5.8, 7, 4                                               | 7, 5, 3                                                | 1.06      | 1, 1   |             | 18930        |
| 106y07-22    | 18.1          | 7.9                         | SM                         | 5.7, 4, 7                                               | 7, 5, 3                                                | 1.11      | 1, 1   | 2           | 5950         |
| 110xy0911-19 | 16.8          | 7.9                         | SM                         | 4.7, 9, 5                                               | 3, 2, 2                                                | 1.04      | 1, 1   | 2           | 2405         |
| 211xy04-10   | 19.9          | 7.9                         | M                          | 6, 7, 4                                                 | 7, 3, 2                                                |           |        |             | 4322         |
| 213.30a-22   | 13.7          | 7                           | SMY³                        | 3.7, 6, 4                                               | 3, 1                                                   | 1.13      | 1, 1   |             | 1602         |
| 213.38a-2    | 16.7          | 7.9                         | SM                         | 3, 7, 8                                                 | 3, 1, 1                                                | 1.36      | 1, 1   |             |              |
| 238xy07-5    | 20.4          | 7.9                         | M                          | 6, 9, 1                                                 | no                                                     |           |        |             |              |
| 18-06-2      | 14.9          | 9                           | M                          | 7.6, 9, 5                                               | 5, 1                                                   | 1.10      | 1, 1   |             |              |
| 35-06-14     | 16.4          | 7.9                         | SM                         | 4.9, 6, 4                                               | 1, no                                                  | 1.11      | 1, 1   |             |              |
| 37-05-12     | 18.3          | 7.9                         | SY                         | 3.2, 5, 6                                               | 3, 3, 3                                                |           |        |             |              |
| 50-09-5      | 22.8          | 7.9                         | SM                         | 4.8, 4, 3                                               | 3, 1, 1                                                | 1.04      | 1, 1   |             | 4060         |
| 53-10-5      | 20.8          | 7                           | SM                         | 5.6, 9, 3                                               | 3, 1                                                   | 1.06      | 1, 1   |             |              |
| 54-10-03     | 8.5           | 7                           | SM                         | 4.8, 6, 3                                               | 3, 1, 1                                                | 1.08      | 1, 1   |             | 870          |
| 60-10-6      | 22.9          | 7                           | SMY³                        | 3.5, 6, 6                                               | 3, no                                                  |           |        |             |              |
| 201.161-11   | 21.4          | 7.9                         | SM                         | 6, 9, 3-5                                               | 3, 1, 1                                                | 1.10      | 1, 1   |             | 1182         |
| 205-150-92   | 21.5          | 7                           | SM                         | 4.6, 6, 5                                               | 5-7, 1                                                | 1.06      | 1, 1   |             | 2069         |
| 209.74-4     | 23.1          | 7                           | S                          | 4.4, 5, 4                                               | 5-7, 1                                                | 1.06      | 1, 1   |             | 371          |
| 213.11-32    | 19.5          | 7                           | SM                         | 3.7, 9, 5                                               | 5, no                                                  | 1.06      | 1, 1   |             |              |
| 213.24-31    | 21.8          | 7                           | SM                         | 5.7, 9, 3-5                                             | 1, 1, 1                                                | 1.10      | 1, 1   |             | 1177         |
| 001124-24    | 17.3          | 7                           | SM                         | 6, 8, 5                                                 | 5, 1, 1                                                | 1.06      | 1, 1   |             | 2710         |
| 001125-43    | 21.4          | 7                           | -                          | 5.4, 9, 1                                               | no                                                     |           |        |             |              |
| 20113-11     | 16.8          | 7-9                         | X³SM                       | 4.6, 6, 8                                               | 3, no                                                  |           |        |             | 2           |
| 201114-8     | 23.6          | 7                           | M                          | 6.8, 6, 3                                               | 1, no no                                               |           |        |             |              |
| 201116-2     | 21.5          | 7-9                         | M                          | 5.4, 7, 4                                               | 3, 1, 1                                                | 1.06      | 1, 1   |             | 370          |

³ S potato virus   ² Y potato tato virus.   ¹ X potato virus

3.3. Molecular genetic analysis

Using molecular analysis, 12 lines were identified among interspecific hybrids with the presence of H1 gene markers, which provides resistance to patotypes Ro1 and Ro3 G.rostochiensis; 8 hybrids with the presence of a marker of the Gpa2 gene, which provides partial resistance to patotypes Pa2 and Pa3 G. pallid (table 3).

Table 3. Molecular markers in interspecific hybrids.

| Hybrid | TG 689 | 57R | N 195/N 346 | Gro1-4 | Gpa 2-2 | YES3-3A | RYSC3 | M6 | M45 | Ry 186 | PVX | SR1 | Total number of markers |
|--------|--------|-----|-------------|--------|---------|---------|-------|----|-----|--------|-----|-----|------------------------|
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |
|        |        |     |             |        |         |         |       |    |     |        |     |     |                       |

Resistance to KCN¹ resistance to YBK² and XBK²
Hybrid 110hu 0911-9 contains markers of two genes H1 and Gpa2 and is a donor of resistance to the pathotypes of both species of potato cyst-forming nematodes. Hybrid 213.300-2 lacks TG 689, and hybrid 209.79-4 revealed only TG 689 of four H1 gene markers. As previously reported, TG 689 is characterized by “false negative” (lack of marker in resistant genotypes) and “false positive” (presence of marker in susceptible genotypes) cases that require an additional laboratory field test. Possibly, such cases are associated with recombination and incomplete linkage between the molecular marker locus and the H1 gene [9, 12].

The marker of the Gro1-4 gene, which, in comparison with the H1 gene, has the highest selection value, since it controls resistance to all G. rostochiensis patotypes, was found in 110xy 0911-9 hybrid. Among interspecific hybrids of the Belarusian selection, the following samples should be highlighted: 212-216-9 KC 211xy 04-10, 92xy 00-2, 110xy 0911-19, 89y 06-2a, 38dy-39d, 39d, 10y04-1 - obtained on the basis of S. stoloniferum in which markers of the Ry_{adg} gene were detected. The gene Ry_{adg} comes from the Andigena group [6]. The presence of RYSC3, M6, and M45 in hybrids from S. stoloniferum confirms the assumption that these markers are not species-specific with respect to the Andigena group. Since the Ry_{suo} gene marker is associated with cytoplasmic male sterility (CMS) [4], hybrids 54-10-3 and 10y04-1, which contain YES3-3A, can only be used as maternal parent forms for hybridization. It is possible that S. stoloniferum may be the source of several Ry genes, one of which is linked to CMS In addition hybrid 10y04-1, in the origin of which species S. stoloniferum and S. andigenum participate, has a unique combination of markers of two genes Ry_{adg} and Ry_{suo}.
absent (figure 1 (a, b)). The PVX marker of the Rx1 gene among interspecific hybrids is more common than the 5Rx1 marker (figure 1 (c, d)).

As a result of molecular genetic analysis among interspecific hybrids, forms with a combination of several R genes were highlighted: 212-216-9, KS 211hu 04-10, 18-06-2, 54-10-3, 110hu 0911-19, 89y 06-2a, 38dy-39d, 71-10-10, which are donors of group and complex resistance to the potato cyst nematode, Y and X potato viruses and are of interest for targeted selection of potato varieties with long-term protection against pathogens.

![PCR analysis](image)

**Figure 1.** PCR analysis for the presence of markers a) M6, RYSC3, M45; b) RYSC3; c) PVX, d) 5Rx1. Tracks: a and b - 1 - form 128/6 (as k+), 2 - variety Blueness (as k+), 3 - hybrid 2373 FY (as k+), 4 - hybrid 213.11-32, 5 - hybrid 213.38a-2 6 - hybrid 212-216-9, 7 - hybrid 52-06-4, 8 - hybrid KC 211xy 04-10, 9 - hybrid 92xy 00-2, 10 - hybrid 18-06-2, 11 - hybrid 110xy 0911-19, 12 - hybrid 89y 06-2a, 13 - hybrid 38ad-39d, 14 - hybrid 10y04-1, M — molecular weight marker; c and d - negative control, M - molecular weight marker.

3.4. Evaluation of crop structure and chemical composition of tubers

Increased starchiness (above 18%) in the Moscow region was observed in 17 hybrids (table 2). The yield analysis (table 4) of the studied hybrids was carried out in the Krasnoyarsk Territory, where the limiting factor is the number of marketable tubers - 10–12 on an average in a bush.

| Hybrid                           | Number of tubers, pieces / bush | Mass of tubers, g/bush | Average weight of grocery-ware tuber, g |
|----------------------------------|---------------------------------|------------------------|----------------------------------------|
|                                  | grocery ware | non ware | grocery ware | non ware | grocery ware |
| st Krasnoyarsk early             | 7             | 3        | 926          | 68       | 132          |
| st Tuleevsky                     | 6             | 3        | 938          | 88       | 156          |
| 18ay 10-2                        | 9             | 4        | 847          | 147      | 94           |
| 10 y 04-1                        | 9             | 2        | 1201         | 39       | 133          |
| 38dy-39d                        | 12            | 4        | 1343         | 108      | 112          |
| 59y 01-3                        | 8             | 2        | 688          | 74       | 86           |
| 89y 06-2a                       | 13            | 4        | 1397         | 118      | 107          |
| 92xy 00-2                       | 6             | 2        | 1042         | 49       | 174          |
| 106y 07-22                      | 8             | 3        | 1517         | 99       | 190          |
| 110xy0911-19                   | 12            | 4        | 1305         | 109      | 132          |
| KC 211xy 04-10                  | 8             | 3        | 711          | 70       | 89           |
| 213.30a-2                       | 13            | 10       | 1190         | 324      | 92           |
In conditions of a significant deficit of moisture in 2018, interspecific hybrids were highlighted according to this indicator, with 14–17 tubers per bush compared to the standards of Krasnoyarsk Early (6 tubers) and Tuleevsky (5 tubers): 35-06-14, KS211hu04-10 110kh0911-19, 38dy-39d, 213.30a-2, 238y07-5, 18-06-2, 89y06-2a. By the mass of grocery-ware tubers, samples 92x00-2, 201.13-11-1 and 106y07-22 significantly exceeded the standards.

The weather conditions for potato vegetation in 2019 were unfavorable for the formation of a large number of grocery-ware tubers. The increased content of grocery-ware tubers was confirmed in two samples: 110x0911-19 (10 pcs / bush) and 89y06-2a (11 pcs / bush) with an average value in the experiment of 5.5 pcs. in the bush. In terms of commodity productivity of more than 1000 g / bush from a bush, 19 samples stood out, including both standards.

When analyzing the yield structure of the studied samples on an average for 2 years (2018-2019), according to one of the most important indicators - the number of grocery-ware tubers - 4 hybrids were selected: 110x0911-19 (12 pcs./shrub), 38dy-39d (12 pcs. / bush), 18-06-12 (13 pcs. / bush), 89u06-2a (13 pcs. / bush), according to high marketable productivity (1000-1500 g / bush) - 12 hybrids.

According to two indicators - the number of grocery-ware tubers and commodity productivity - a significant excess compared with standard varieties showed samples 110kh0911-19, 38dy-39d, 18-06-2, 89u06-2a, the average weight of the grocery-tubers - 106y07-22, 201.13-11, 92hu00-2.

When evaluating the suitability for processing, along with the appearance, strict requirements are established for the chemical composition of tubers. Samples 53-10-11, 212.216-9, 53-10-5 were highlighted by starch content of above 21%. The average experimental value of the indicator was 17.6%, which is slightly lower than the accumulation of starch in the Moscow region (18.5%). A low content of reducing sugars (up to 0.2%) was found in 19 lines, 14 of which have too high (more than 25%) dry matter content. The optimal chemical composition of tubers for processing into fries, chips and crisps was in samples 213.24-31, 213.11-32, 201.13-11, 89y06-2a, 18ay10-2.

| Sample          | Bush  | 10 | 400 | 191 | 67 |
|-----------------|-------|----|-----|-----|----|
| 213.38a-2       | 6     | 10 | 400 | 191 | 67 |
| 238y07-5        | 13    | 4  | 1321| 124 | 102|
| 4-07-2          | 6     | 4  | 654 | 107 | 109|
| 18-06-2         | 13    | 3  | 1378| 94  | 106|
| 35-06-14        | 9     | 11 | 720 | 269 | 80 |
| 37-05-12        | 7     | 4  | 619 | 136 | 88 |
| 50-09-5         | 9     | 4  | 1125| 127 | 125|
| 52-06-4         | 6     | 1  | 749 | 45  | 125|
| 53-10-5         | 8     | 5  | 758 | 148 | 95 |
| 53-10-11        | 6     | 2  | 592 | 74  | 99 |
| 54-10-3         | 9     | 6  | 810 | 209 | 90 |
| 60-10-6         | 7     | 1  | 744 | 61  | 106|
| 71-10-10        | 7     | 7  | 581 | 193 | 83 |
| 201.13-11       | 7     | 2  | 1233| 69  | 176|
| 201.161-11      | 8     | 2  | 944 | 77  | 118|
| 201.206-48      | 7     | 1  | 719 | 28  | 103|
| 205.150-92      | 8     | 7  | 588 | 106 | 74 |
| 209.3-1         | 6     | 3  | 681 | 87  | 114|
| 209.79-4        | 8     | 1  | 808 | 50  | 101|
| 212.216-9       | 6     | 8  | 408 | 282 | 68 |
| 213.11-32       | 4     | 4  | 421 | 172 | 105|
| 213.24-31       | 6     | 5  | 523 | 173 | 87 |
| 001124-24       | 7     | 3  | 730 | 76  | 104|
| 001125-43       | 8     | 4  | 1042| 105 | 130|
| 201114-8        | 4     | 7  | 347 | 215 | 87 |
| 201116-2        | 5     | 2  | 460 | 49  | 92 |
| 815-99          | 9     | 6  | 847 | 156 | 94 |
4. Conclusion

The evaluation of the source material of potatoes obtained from the Research and Production Centre of the National Academy of Sciences of Belarus for potato growing and horticulture has been conducted in the conditions of the Moscow region and the Krasnoyarsk Territory and has shown that hybrids of interspecific origin are quite well selected for economically valuable characters, many of them differ in the abundant flowering necessary for cross-breeding.

Most hybrids are resistance donors to various pathogens and are characterized by increased starchiness, some have an optimal chemical composition ratio and are therefore of interest as a starting material for selection for resistance to viral diseases, nematodes, late blight, and also for suitability for processing to potato products.

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