Evaluation of potato varieties as a source material for selection

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Abstract. The article presents the results of research on creating a source material for breeding new high-yielding potato varieties adapted to the conditions of the southern part of the Volga-Vyatka region. The research was carried out in the Department of selection and seed production of the Chuvash research Institute. The soil of the experimental site is gray forest, heavy loam, of medium fertility. Field and laboratory studies were conducted using generally accepted methods. More than 150 varieties have been studied in the collection nursery. The selected samples are valuable material for further selection and are identified on the basis of productivity. As a result of studying potato varieties of different groups of ripeness, highly productive varieties were selected for using the source material: 3 varieties were selected for each group of ripeness after the yield of marketable potatoes; 4 varieties with an increased number of tubers were selected.

1. Introduction

The creation of new varieties provides real progress in the development of the potato industry by increasing yields, improving product quality and reducing energy costs for its production [1]. The main directions and tasks of potato selection are determined by the requests of producers, the intended use of the crop, the traditions of the population, and the requirements of the external and internal market [2]. The gene pool is the basis of selection: the richer and more diverse the collection material, the more opportunities breeders have for breeding new varieties with better properties [3].

The study of a collection of potato varieties and hybrids as a source material for productivity allows us to conduct purposeful selection work and bring out new varieties with the desired characteristics [4]. To create new varieties, the world's genetic resources play a primary role. The success of selection depends on the correct selection of the source material [5].

You can confidently predict the selection value of collection samples when their potential capabilities are known. In this regard, for the implementation of selection programs and research on environmental adaptation and economic suitability of samples, it is necessary to expand and in-depth study of the collection material, on the basis of which to identify sources of valuable features for further use in the selection process [6, 7, 8].

The aim of the research is to study the selection material of potatoes in the Chuvash region and identify highly productive ones adapted to the soil and climate conditions of the Volga-Vyatka region of Russia.
2. Materials and methods

The object of research carried out in the Chuvash research Institute is the varieties of domestic selection and potato hybrids received from the Department of experimental gene pool of VIHK. A. G. Lorkha.

Field experience was conducted in the fields of the Chuvash research Institute in the primary crop rotation in 2017-2018. The soil of the experimental site is dark-gray forest, with a heavy loam in its granulometric composition. The content of humus in the arable layer is 6.2 %, the availability of mobile forms of phosphorus P2O5-238 mg/kg, potassium K2O-132 mg/kg, the soil reaction is close to a neutral pH of 5.5.

The Zhukovskij rannij, Nevskij and Chaika varieties were used as standards. The size of the accounting plot is 20 m2, the repetition is four-fold, the planting scheme is 90×30 cm, the location of the plots is systematic [9]. The work is carried out according to generally accepted methods [10, 11, 12]. Varietals were evaluated by productivity and its components.

The predecessor is spring wheat. The main soil treatment was carried out in the autumn with a revolving plow to a depth of 25-27 cm. in the spring, the moisture was closed with tooth harrows. To give a shallow structure of the soil, milling was carried out to a depth of 14-16 cm. potatoes were planted manually.

In 2016, the lowest amount of precipitation was observed in the first two months of the growing season: in May – 17%, in June – 45% of the long-term monthly norm. In the next two months of vegetation, the lack of precipitation continued. In July, they fell 88%, in August 80% of the multi-year amounts. Productive moisture reserves in the soil continued to be low. During the period of active vegetation of plants (May-August), the average air temperature was 19.6°, exceeding the long-term temperature by 3.2. Precipitation fell 134.3 mm, 54% of the long-term norm.

In 2017, the growth and development of agricultural crops came in conditions of excess moisture against the background of a cold temperature regime at the beginning of the growing season (May-June) and close to the average annual norm. During the period of active vegetation of plants (May-August), the average air temperature was 15.7°C, lower than the long-term one by 0.7°C. Precipitation fell 285.9 mm, 139% of the long-term norm.

In 2018, less precipitation was observed during the entire growing season. Good rains occurred only in the first decade of July, when 35.4 mm fell, or 148% of the long-term ten-year norm. Productive moisture reserves in the soil continued to be low. During the period of active vegetation of plants (May-August), the average air temperature was 18.7°C, exceeding the long-term by 5.0°C. Precipitation fell 155.3 mm, 72% of the long-term norm.

3. Results

More than 150 varieties of potatoes of various ecological and geographical origin were studied in the Chuvash research Institute: 64.7% of varieties of domestic selection. According to the results of long-term studies, the average yield of varieties at the time of trial digging (on the 55th day from planting) varied from 244 to 706 g / bush (table 1). The maximum accumulation of the harvest from the early term studies, the average yield of varieties at the time of trial digging (on the 55th day from planting) varied from 244 to 706 g / bush (table 1). The maximum accumulation of the harvest from the early

| Variety               | 55 days | 65 days | Increase |
|-----------------------|---------|---------|----------|
|                       | pieces  | pieces  | pieces   | gram    |
| Zhukovskij rannij (st)| 9.2     | 10.6    | 1.4      | 142     |
| Sandrin               | 10.1    | 14.5    | 4.4      | 336     |
| Reggi                 | 8.0     | 8.1     | 0.1      | 24      |
| Utenok                | 9.1     | 9.4     | 0.3      | 148     |
| Vzryvnoj              | 11.6    | 12.1    | 0.5      | 23      |
Gala 15.0 690 16.3 816 1.3 126
Nevskij (st) 9.9 482 10.7 626 0.8 144
Gornyak 9.1 330 11.2 621 2.1 291
Ryabinushka 9.1 472 9.8 507 0.7 35
Avan 9.8 534 11.0 660 1.2 126
Matushka 10.1 618 11.6 756 0.5 138
Domaris 10.1 505 11.8 572 1.7 67
Chaika (st) 8.8 244 9.9 429 1.1 185
Golubizna 9.9 479 11.1 651 1.2 172
Fidelia 10.1 543 13.7 661 3.6 118
Batya 11.6 418 12.8 615 1.2 197
Sapria 8.3 402 10.9 554 2.6 152
Vimpel 13.8 510 16.1 597 2.3 87

Of the average early varieties, on the 55th day after germination, such varieties as Domaris 23g, Avan 52g, Matushka 136g exceeded the standard Nevskij by weight, and Matushka and Domaris varieties by 2% by the number of tubers from the bush. By the second accounting, the excess of the accumulated harvest relative to the Nevskij standard variety was noted in the Avan 34g, Matushka 130g, and in the number of Avan, Gornyak, Matushka, Domaris from 3.7 to 11.2%.

Of the mid-ripening varieties, by the first count, all varieties exceeded the Chaika standard by weight by 158-299g, and by quantity 1.1-5.0 pcs. Only one potato variety in this group was inferior to the standard by 5.7% (Sapria). By the second count, all samples exceeded the standard Chaika grade in weight and quantity. The excess was 29-54% by weight and 10-63% by quantity.

According to the results of accumulation dynamics in the period from 55 days to 65 days after planting, there was a more intensive formation of yield relative to standard varieties: by weight in Sandrin varieties by 2.4 times, Gornyak by 2 times, Batya by 6%.

In the ecological nursery from the early group of ripeness, the maximum productivity – 909g. was noted in the Gala variety, in the middle-early Avan variety – 963g., in the middle-ripe Vimpel variety – 896g.

The highest marketability relative to the standards were all varieties (table 2). The marketability of the studied varieties averaged 93.98% over the years of study.

**Table 2. Potato varieties that exceeded the grade-standard in terms of marketability for 2016-2018.**

| Variety                        | Large, kg | Seeds, kg | Small, kg | Marketability, % |
|-------------------------------|-----------|-----------|-----------|------------------|
| Zhukovskij rannij (st)        | 13.7      | 12.5      | 2.1       | 92               |
| Sandrin                       | 24.3      | 14.2      | 2.8       | 93               |
| Reggi                         | 23.9      | 11.0      | 1.3       | 96               |
| Utenok                        | 16.2      | 10.6      | 1.7       | 94               |
| Vzryvnoj                      | 15.4      | 13.4      | 1.8       | 94               |
| Gala                          | 20.5      | 17.2      | 1.3       | 97               |
| Nevsky (st)                   | 14.0      | 14.2      | 2.7       | 91               |
| Gornyak                       | 20.2      | 13.7      | 2.3       | 94               |
| Ryabinushka                   | 20.9      | 12.7      | 2.0       | 94               |
| Avan                          | 31.4      | 11.5      | 1.7       | 96               |
| Matushka                      | 22.3      | 11.2      | 2.4       | 93               |
| Domaris                       | 23.2      | 14.7      | 2.3       | 95               |
| Chaika (st)                   | 10.3      | 14.8      | 2.0       | 93               |
| Golubizna                     | 16.5      | 16.6      | 2.1       | 94               |
| Fidelia                       | 16.0      | 13.1      | 0.8       | 98               |
The highest marketability was observed in Fidelia varieties – 98%, Gala, Sapria – 97%, Reggi, Avan – 96%. In most varieties, high marketability is achieved by a large yield of a large fraction: Sandrin 59%, Ryabinushka 59%, Reggi 66%, Matushka 62%, Avan 70%, Sapria 72%. The highest yield of the seed fraction was observed in varieties: Batya 59 %, Vympel 54%. The yield of the small fraction of the studied varieties was within 2-7%.

4. Conclusions

Thus, as a result of studying potato varieties of different groups of ripeness, highly productive varieties were selected for using the source material: early-maturing varieties of Gala, Utenok, and Vzryvnoj are available for sale. Middle-aged Avan, Domaris, Matushka. Middle-aged Vympel, Fidelia, Batya; having an increased number of tubers Sandrin, Gornyak, Fidelia, Sapria.

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