

Effect of initial material creation methods on seed potato yield and crop structure

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Abstract. This article presents the results of the research conducted for the purpose of studying the influence of the methods of initial material creation on seed potato productivity and crop structure. Also, the article provides valuable information about the influence of the methods of creating the initial material on the yield indicators of potato varieties. The results obtained in our research show that the methods of selection and initial material creation serve as one of the main factors determining the yield of clones. Based only on the visual method, the highest yield (26.6 t/ha) was obtained in the "Surkhan-1" variety. In the variety "Sante" this indicator was 23.0 t/ha, and in the variety "Umid 2" it was 24.7 t/ha. In the variant carried out with serological analyzes of this method, these indicators were 28.6, 24.6 and 26.3 t/ha, respectively, that is, the difference between the yield of the varieties according to the variants is 1.6-2.0 t per hectare. The highest additional yield was obtained from the variety "Surkhan-1" (2.0 t/ha).

1 Introduction

Viral, viroid and mycoplasma diseases of potatoes are found in almost all lands where this crop is grown. Among these, such diseases are widespread in Uzbekistan. Leaf twisting, color diseases and stolbur of potatoes are common here [1-7].

Viral diseases can reduce the yield by 70% or more, depending on the degree of seed damage, variety characteristics, virus type and soil-climate conditions, and decrease product quality [3, 8].

This situation occurs in connection with various physiological processes of the plant. This effect can be explained by the process of photosynthesis, water balance disturbance, transpiration disturbance in the plant. In addition, there is a change in the amount of dry matter and chlorophyll, a decrease in the intensity of transpiration and respiration in the leaves of the affected plant. Dry matter, starch, and vitamin C decrease in damaged plant nodules, and the nodules are soft and change in shape.

According to the results of the study of the effects of latent viruses on potato productivity, they are not inferior to obvious diseases in terms of the damage they cause. Viruses have been found to reduce potato yield by 4-67%, depending on the type, variety,

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soil, climatic conditions and agrotechnics. Agrotechnical measures and environmental conditions also affect the amount of damage caused by viruses (16–23%).

It should be noted that the ways of transmission of viruses from diseased plants to healthy ones are also diverse, and among them, the transmission characteristics of plant juices of insects are among the factors that determine the spread of infectious diseases. This, in turn, is related to their strong migration ability, rapid reproduction, intensive movement and other biological characteristics. Therefore, information on the distribution of plant saps, species composition and dynamics of flight under certain conditions is one of the important biological data that should be taken into account in the protection of agricultural crops from dangerous viral diseases [1].

2 Materials and Methods

The objects of experiments are the varieties created in the republic included in the State Register, their clones selected on the basis of visual and serological analysis, tubers healthy by the third meristem method, new potato varieties created in the selection process and hybrids, hybrid populations and botanical seeds and tubers of self-pollinated lines created in the direction of quick ripening and virus resistance. In the experiments, agrotechnics generally accepted for the conditions of the Zarafshan oasis were used to grow potatoes. A distinction between some agrotechnical activities was made according to the following options, which are planned to be studied in the research program. In the researches, determination of the length of the growth period of the varieties in the spring and summer periods was carried out according to the method of the State Variety Testing Commission, and biometric measurements were carried out according to the method of the Potato Scientific Research Institute. Visible damage to plants by viral diseases was assessed visually, and the degree of damage by latent viruses X, S, M and U was assessed using serological analyses.

In addition to serological analyzes during the flowering period of plants, immunoenzyme analyzes were carried out on the degree of infection with latent viruses.

Wild and cultivated plants, which can serve as "hotbeds" of potato viruses, were identified by serological analyzes on plants in and around potato fields as reservoirs of potato viruses.

Research aimed at studying the spread of potato viruses, the harmfulness coefficient, the flight time, dynamics, and species composition of winged populations of plant aphids was conducted at the experimental farm of Tashkent State Agrarian University.

In the experiments, the amount of wingless forms of plant aphids was measured by the "100 leaves" method, the time of appearance, amount and flight dynamics of winged forms of insects was studied by the "Yellow Myorike dishes" method, and their species composition was studied based on the tables of G.Kh.Shaposhnikov and F.Muller (1966) developed by A.G.Zykin (1970) using the detector. In studies aimed at determining the effectiveness of agrotechnical measures in seed potatoes grown from tubers grown on a virus-free basis, in the experiments conducted to study the effect of the planting period and scheme on the growth, development and yield of potato varieties and seed quality, planting in the I, II and III decade of March, conducted in options with 90 x 15, 90 x 20, 90 x 25 cm schemes. To investigate the effect of nitrogen fertilizers on seed quality of potato, varieties fed with nitrogen fertilizers at N100, N150, N200 and N250 kilograms per hectare were studied. As a control, potato varieties were fed at the rates of P120, K75 kg. The level of reliability of productivity indicators was analyzed by the dispersion method [2].

3 Results and Discussion

The effectiveness of the selection methods used in primary seed production is determined by the quality of the seed potato from which quality seeds are grown, and this indicator is determined by the yield and product quality.

The results obtained in our research show that the methods of selection and initial material creation serve as one of the main factors determining the yield of clones. Based only on the visual method, the highest yield (26.6 t/ha) was obtained in the "Surkhan-1" variety. In the variety "Sante" this indicator was 23.0 t/ha, and in the variety "Umid 2" it was 24.7 t/ha. In the variant carried out with serological analyzes of this method, these indicators were 28.6, 24.6 and 26.3 t/ha, respectively, that is, the difference between the yield of the varieties according to the variants is 1.6-2.0 t per hectare. The highest additional yield was obtained from the variety "Surkhan-1" (2.0 t/ha).

In the variant carried out by adding serological analysis, the marketability of the harvest obtained from the varieties also increased. For example, in the version where only the visual method was used, 86.2% of the total harvest was in the "Sante" variety, and in the "Umid 2" and "Surkhan-1" varieties, these indicators were 88.3 and 91.0%, respectively and in the variant of the method supplemented by serological analyses, these indicators were 91.0 and 92.6%, respectively (Table 1).

In the triple meristem method, the highest yield was achieved in comparison with other options when healthy buds were used as the starting material. That is, in this option, an average yield of 27.7-32.6 t per hectare was obtained according to varieties. The average of 4.6-5.0 t per hectare compared to the high potential of healthy plants or the control option. a high yield was obtained. The highest (92.4-96.0% by varieties) indicator was also achieved in this option in terms of the yield of marketable tubers from the total yield.

Table 1. The influence of methods of initial material creation on yield indicators of potato varieties

Varieties	Productivity according to repetitions, t/ha			Average yield, t/ha	Quality product	
	2020 year	2021 year	2022 year		t/ha	%
In visually selected clones (control)						
Sante	22,0	23,2	23,8	23,0	19,8	86,0
Umid 2	23,9	24,9	23,5	24,7	21,8	88,3
Surkhan-1	27,0	26,1	26,7	26,6	24,2	91,0
In clones selected by serological analysis by visual method						
Sante	24,6	24,0	25,2	24,6	22,0	89,6
Umid 2	25,7	26,2	27,0	26,3	23,9	91,0
Surkhan-1	27,8	28,4	29,6	28,6	26,5	92,6
In clones grown from healthy tubers by the tip meristem method						
Sante	27,1	27,6	28,4	27,7	25,7	92,7
Umid 2	31,5	31,9	32,0	31,8	30,0	94,3
Surkhan-1	32,9	32,5	32,4	32,6	31,3	96,0

Therefore, the options using healthy tubers using the tip meristem method and adding serological analyzes along with the visual method of seed tubers selection should remain an integral part of the creation of initial material for potato primary seed production, as they provide high yield and marketability compared to the control option.

In the experiments, depending on the methods of creating the initial material, an increase in the yield of large nodules in the total harvest was observed due to a decrease in the amount of small (up to 30 grams) nodules (Table 2).

In the option with visual assessment of healthy plants and serological analysis, the output of large buds was 16.8-20.5%, while in plants grown from healthy buds by the tip meristem method, this indicator was 20.3-24.2%, i.e. compared to the control option. It was found that it can be 5.4-6.2% higher.

Table 2. Effect of methods of creating initial material for seed potatoes on a virus-free basis on yield structure

Varieties	Crop structure, %			
	Until 30 grams	30-50 grams	50-80 grams	Greater than 80 grams
In visually selected clones (control)				
Sante	13,8	18,6	31,1	14,3
Umid 2	11,7	16,0	42,3	16,6
Surkhan-1	9,0	12,4	28,0	18,0
In clones selected by serological analysis by visual method				
Sante	10,4	14,2	32,7	16,8
Umid 2	9,0	13,3	43,1	19,0
Surkhan-1	7,4	9,6	37,3	20,5
In clones grown from healthy tubers by the tip meristem method				
Sante	7,4	11,7	60,6	20,3
Umid 2	5,7	10,2	62,1	22,0
Surkhan-1	4,0	8,0	63,8	24,2

In these options, the output of small (up to 30 grams) tubers was observed to decrease by 5-6% compared to the control option. There was no significant difference between the variants in terms of the yield of tubers in the seed fraction (30-80 grams in weight).

4 Conclusion

In general, the obtained results confirm that the use of healthy tubers by the tip meristem method in virus-free potato seed production as the starting material ensures the development of healthy plants with high biometric indicators, which in turn ensures the production of quality seed material.

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