THE EFFECT OF BIOPREPARATIONS ON ACCELERATED PRODUCTION GRAPE SEEDLINGS

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Abstract. Methods for accelerated production of grape seedlings using new-generation preparations that promote the process of rhizogenesis have been developed. The effect of Agrofloin, Ekorost, Fitop 8.67, Alginamin, and Humica Plus fertilizers on the rooting of shortened grape cuttings has been studied, and the best ones have been identified. The effectiveness of promising rhizogenesis preparations in the cultivation of grape seedlings from shortened cuttings has been established. The use of the above fertilizers will reduce the growth time of shoots and enhance the growth of grape seeds. Among the fertilizers used, the best in all respects is the humic organic fertilizer Ekorost, which has a germination rate of 99.2%. Although the next biological preparation is inferior to Agroflo-R fertilizer in terms of effectiveness (86.8%), it is not inferior in terms of the measured indicator and the indicator of photosynthetic productivity of the foliage and root system. At the same time, the biological multifunctional preparation Fitop 8.67 stood out, with a germination rate of 98.3%. The organic fertilizers Alginamin and Humica Plus showed average results in the development of the whole plant with a high survival rate of 80.2% and 90.1%.

Introduction.

Research methodology. The study was conducted in accordance with generally accepted methods [8]. Statistical processing of experimental data was performed using the method of variance analysis [9]. Healthy, fruitful bushes of the Muscat Ottonel variety were selected for cutting. The vines from which the shoots were selected were of a uniform dark straw color with no signs of pest or disease damage. The diameter was 5-8 mm. Thin and thick shoots are not recommended for harvesting, so preference was given to branches that were not old but well matured. The maturity of the cuttings was checked using iodine. The cut was dipped in a 1% solution and the color change was observed. Unripe specimens remained light green, while suitable ones acquired a purple-black tint. The middle part of the branch is selected for the cutting, as the top is too young and underdeveloped. Cuttings were made from the 4th bud, as strong and fruitful shoots grow from such blanks. For storage, a long branch with 6-8 buds was cut, from which pruning for sprouting is done in the spring.

The preparatory process involves saturating the cuttings with moisture so that they do not dry out during the winter. To do this, the cut shoots were immersed in a container of water and kept there for a day. After that, the planting material was disinfected in a solution of potassium permanganate for 30 minutes. The cuttings treated in this way were laid out on paper to dry. Proper preparation increases the chances of preserving the planting material. The blanks were stored in tightly wrapped film in a cool place.

In the spring, the shoots were taken out and cut into cuttings so that each cutting had 2 upper buds, then placed in water with fertilizers at the recommended rate for 24- hours. The following fertilizers were used: the enzyme preparation Agrofloin (Agrokhim, Kazakhstan); biological multifunctional preparation Fitop 8.67 (NPF Research Center LLC, Russia); Alginamin (SwissGrow, Kazakhstan). Water was used as a control. The experiment was repeated three times, with 20 cuttings in each repetition.

Agroflorin (Agrokhim, Kazakhstan) – This biological product restores the natural purity of the soil, forms and protects the fertile (mulching) layer of the soil from destruction, cleans the soil, and restores the natural balance of the soil microflora after treatment with chemicals, pesticides, and herbicides.

The Agrofloin biological product contains a unique natural set of biologically active compounds, phytohormones, macro- and microelements.

The preparation contains: all essential amino acids; a large amount of organic acids (10.9 g/l) – fumaric (0.3 g/l), succinic (0.5 g/l), oxalic (0.3 g/l), acetic (0.5 g/l) and natural nitrogen-containing compounds; all B vitamins, folic acid, and nicotinic acid; 26 macro- and microelements that are vital for plants.

Safe for plants, humans, and animals.

Phytop 8.67 is a modern biological multifunctional preparation. It has a complex effect on cultivated plants, harmful organisms, and soil.

The product is developed and manufactured by the research and production company Research Center (Russia, Novosibirsk Region, Koltsovo Science City).

The preparation contains three strains of saprotrophic bacteria in equal proportions: Bacillus subtilis VKPM B 10641, B. amyloliquifaciens VKPM B 10642, B. amyloliquifaciens VKPM B 10643 from the collection of OOO NPF "Research Center", isolated in ecologically clean areas of Siberia and selected by the authors-developers.

The Phytop 8.67 preparation has the following properties: stimulates the growth of the root system, above-ground parts, and total biomass in plants; suppresses plant pathogens; increases the activity of soil microflora, cleanses the soil of pathogenic microbes, and increases its fertility; increases the stress resistance of plants – winter hardiness, drought resistance; as a result, increases yield – up to 20-30%.

When the bacteria contained in Fitop 8.67 are applied to the surface of plants or to the soil, they become part of the rhizosphere or epiphytic microflora of plants, causing certain modifications to the environment that are beneficial to the health of plants, animals, and humans who consume plant-based foods.

Purpose of Phytop 8.67: The product is primarily intended for use in crop production in the early stages of technological cycles and serves as a means of nurturing young plants, both through the direct effect of bacteria on the plant organism and by changing the environment surrounding it due to the antagonistic effect on phytopathogens, stabilizing the soil microbial community and increasing soil suppressiveness.

The main methods of application of Fitop 8.67: pre-sowing treatment of seeds; pre-planting treatment of cuttings; watering the soil with a solution of the preparation before sowing, or after sowing, or after emergence; treatment of the root system of seedlings by soaking it in a solution of the preparation; treatment of the root system of young plants planted in a permanent place of growth with a solution of the preparation using a drip irrigation system or furrow irrigation; treating the above-ground system of vegetative plants as an anti-stress agent (to relieve depression after herbicide treatments) and to protect against infectious diseases, thanks to the antagonistic properties of bacteria towards phytopathogens.

Alginamin (SwissGrow, Kazakhstan) – Pure nitrogen suspension from seaweed extracts (Macroscystis, Ascophyllum, and Sargassum), peptides, and low molecular weight plant amino acids. Contains only pure components. Improves the processes of metabolism in crops, especially vitamin synthesis, accelerates the development and growth of plant organs. The fertilizer stimulates the production and development of the root system. It preserves tissue vitality and prolongs the growth period, stimulates root mass increase, and improves their absorption capacity. It increases fruit size and average weight. It accelerates the flowering of flower crops. It improves quality and increases yield. It can be used in organic farming.

Seaweed in Alginamin contains the hormone cytokinin (zeatin), which accelerates cell reproduction, regulates nucleic acids, and promotes branching. Cytokinins preserve plant vitality by slowing down leaf and fruit fall.

Alginamin also contains auxins, which support cell growth and cell proliferation. In addition, it increases enzymatic activity and water absorption capacity during fruit formation. Auxins also promote tissue elongation, as do cytokinins.

Methods of application and doses:

Alginamin can be used to develop the root system of seedlings: Foliar feeding before planting seedlings in nurseries at a dosage of 30-50 ml per 100 l of water; Drip irrigation during planting of seedlings or 24 hours later at a dosage of 1.5-2.5 l/ha, repeated second application at an interval of 7-10 days.

Results. Obtaining high-quality rootstock planting material from shortened grape cuttings tolerant to phylloxera varieties with limited feeding area is possible with the use of various fertilizers and preparations [10-14]. The effect of promising antitranspirants on the rooting of shortened grape cuttings was studied (Table 1).

Table 1 – Planting phenology

Variants		Planting date	Start of bud swelling	Bud sprouting	Shoot emergence	Shoot growth	End of shoot growth
I	Agroflorin	March 10	March 17	March 21	March 28	April 7	August 3
II	Phytop 8.67	March 10	March 18	March 23	April 1	April 10	March 10
III	Alginamin	March 10	March 20	March 23	April 6	April 14	March 20
IV	Control (water)	March 10	March 28	April 2	April 18	April 18	September 4

Analysis of planting phenology showed that the best options for all indicators I and II were those using Agrofloin and Fitop 8.67 fertilizers. Variants III with the use of Alginamin fertilizers showed average results, but significantly better than the control (variant IV). While in variant I, bud swelling and bud emergence began 11 days earlier than in the control, the difference in the number of days until the end of shoot growth increased to one month.

After a week or two, depending on the variants, shoots began to emerge from the buds, and after another ten days, their development began.

The early emergence of young shoots from the buds of unchipped cuttings leads to the depletion of the main supply of nutrients in the cuttings even before the formation of roots. As a result of such premature bud development, the root system develops slowly and poorly, and often a significant number of shoots with sprouted buds die.

Bud break can also be delayed by 4-5 days by coating the upper ends of the cuttings (together with the buds) with lime milk. The upper ends of the cuttings are dipped into a lime solution so that three or four buds are covered. The cuttings are planted after the lime has dried.

The delaying effect of liming is explained by the fact that cuttings covered with lime are less heated due to their reflection of sunlight. On the other hand, the lime film that forms on the surface of the buds obviously has a mechanical and chemical effect on bud break.

However, we believe that it is better to use techniques aimed at accelerating root formation than techniques that delay bud break. Techniques that accelerate root formation also promote more vigorous seedling development, while techniques that delay bud break do not promote this and require considerable labor for hilling and unhilling the cuttings.

One of the main factors determining the condition of planting material is the size and photosynthetic productivity of the foliage (Table 2).

Table 2 – Development of the foliage

Variants		Number of leaves, pcs.	Average internode length, cm	Average leaf area, cm^2	Average area per plant, cm^2
I	Agroflorin	8.1	7.5	32.5	263.3
II	Phytop 8.67	7.5	7.0	30.4	228.0
III	Alginamine	6.2	6.7	28.6	177.3
IV	Control (water)	4.3	5.8	25.0	107.5

The smallest leaf surface area was formed in the control group and averaged 25.0 cm². With the use of Agrofloin fertilizer the average leaf surface area was 32.5 cm² ([2), and the variant with the use of Fitop 8.67 fertilizer showed almost the same result (30.4 cm² ([2)). With the use of Alginamin fertilizer, the average leaf surface area was 28.6 cm² ([2).

The most vulnerable part of grape cultivation is the root system. It freezes at relatively low soil temperatures, cannot tolerate very high soil temperatures, does not tolerate excess moisture, and does not tolerate very rich soil. These are the reasons that lead to the death of grapevines. The main method of reducing these negative factors is the use of fertilizers as root formation stimulants. With their help, it is possible to significantly facilitate plant care and increase the survival rate of grape cuttings and seedlings. It has now been established that the regeneration processes in grape cuttings, as well as the energy of root growth, are largely determined by soil fertility and the content of the necessary nutrients in it. Consequently, improving plant nutrition will promote more vigorous root system development in grape seedlings with numerous branches and an abundance of fibrous roots. The effect of fertilizers on root system development is shown in Table 3.

Table 3 – Root system development

Variants		Total length of primary skeletal roots, mm	Root zone width, mm	Root zone length, mm	Root rot, points	Fresh weight, g		Dry weight, g	
						whole plant	Roots	whole plant	roots
I	Agroflorin	83.0	30.1	131	8	17.04	8.50	7.84	3.94
II	Phytop 8.67	52.6	28.4	130	5	10.43	5.21	5.11	2.56
III	Alginamin	79.6	27.9	109	5	6.94	3.27	3.68	1.75
IV	Control (water)	38.0	15.4	73	3	7.30	4.30	2.92	1.32

Since the power of the root system of grape seedlings is determined by the degree of development of active thin roots that make up the main part of the absorbing surface of the root system, which absorbs water with dissolved minerals, we conducted research on the degree of root development in grape seedlings depending on the use of various fertilizers. The root formation stimulator had a greater effect on the biometric indicators of plants than on rooting growth. The greatest stimulation effect was observed in variant I (Agroflorin) compared to untreated cuttings. They had an increased dry root mass and a much better developed above-ground part. The use of Fitop 8.67 fertilizer (variant II) had a positive effect.

Conclusions. In accordance with the goals and objectives, methods were developed for the accelerated production of grape planting material using new-generation preparations that promote the

process of rhizogenesis. The use of the above fertilizers made it possible to reduce the growth period of shoots and increase the survival rate of grape cuttings. Among the fertilizers used, the best in all respects is the humic organic fertilizer Agrofloin. The next most effective fertilizer is Fitop 8.67, which is not inferior in terms of the size and photosynthetic productivity of the foliage and the condition of the root system. Alginamin organic fertilizers, with a high survival rate of 80.2% [15], showed average results in the development of the whole plant. Increasing the application rate also has a positive effect on the growth and development of seedlings. With a further increase in fertilizer doses, the increase in yield does not offset the costs of their application. Experience shows that it is more profitable to apply smaller doses of fertilizers over a larger area and obtain a higher gross yield than to use high doses of fertilizers over a smaller area. The results obtained can be used in the technology of propagating grape varieties with woody cuttings.

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