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Use of Electrophysical Methods to Accelerate Root Growth in Grapes

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ABSTRACT: The article discusses the possibilities of electrophysical methods to increase the efficiency of growing grape seedlings in black currant cuttings, processed for 15 hours at an electric field of 71 V / m, and to accelerate the process of root formation and improve viability and quality. growth and permeability of rooted seedlings. Experimental results aimed at increasing up to 20% and methods of electroprotection of grape cuttings are presented.

KEYWORDS: specific resistance, grape seedling, cuttings, vegetative propagation, electrodes, electric current, electric field strength, electrostimulation, resistance, voltage, electromagnetic field energy, current strength, rod, roots and frequency.

I. INTRODUCTION

In the future of yield vineyards, the quality of the harvest often depends on the quality of the seedlings planted. Although a number of biological and agro-technical measures are being taken to increase the yield of various fruit trees and vines, today some farms have low resistance to seedlings, which hinders the establishment of vineyards.

The process of root formation in grape cuttings is a complex biological process that depends on internal and external factors, and the successful cultivation of seedlings largely depends on the regenerative ability of cuttings. The higher the activity of regeneration processes in grape cuttings, the better the permeability and quality of seedlings. Vegetatively propagated flow has regenerative properties. The recovery of the present organs is not the same. For example, part of the root, leaf band, flowering band can take root. But because of the lack of buds, the branches do not develop. The process of renewal depends on factors such as the biological characteristics of the vine variety, the age of the branch, the amount of nutrients in it, soil moisture and fertility. When propagated from current cuttings, future organs form a polarity, i.e., branches are formed at the top of the cuttings (from the top pole) and roots from the bottom (from the bottom pole). Regeneration in cuttings taken from the middle part of a well-ripened annual branch occurs overnight.

Especially the cuttings are treated before transplanting for better retention and development. The main purpose is to accelerate the formation of roots in the cuttings planted. Some of the cuttings planted without any treatment may not hold, and another part may dry out after first removing the leaves and twigs. This is mainly due to the fact that the root is not yet well formed. The initial growth of cuttings will be due to the nutrients and moisture accumulated in them last year. If the balance between root formation and the growth of new branches is disturbed, i.e. the root is formed later, the cuttings will dry out. In practical viticulture, a number of methods are used to accelerate root formation in cuttings. These methods can be divided into five.

The mechanical method is to cut the ends of the cuttings into the ground with a knife or other device 3-4 times along the length, or remove all the remaining buds except the two upper buds on the cuttings with a sharp knife and mechanically search the place where the cuttings take root. This method is not without its drawbacks: mechanically damaged areas rot quickly and do not hold grape cuttings.

The physiological method is to soak the grape cuttings in watery containers, soaking for an average of 6-12 hours.

Chemical method is which method uses growth substances to accelerate the formation of roots in cuttings. In this case, the part of the cuttings planted in the soil is placed in a solution of geteroaux 0.15-0.20% for 1-2 days. Processed grape cuttings require rapid planting.

The natural physical method is the cutting of cuttings and the use of natural methods that accelerate root formation in cuttings used by a number of other farmers. During welding, yellowish-white convex (pack) calluses are

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formed at the lower incision of the cuttings. This process takes two weeks. If the cuttings stand longer than this, the emerging roots may die. Shredded cuttings should be transplanted immediately to the place where the seedlings are grown. Simple methods are also used to prepare cuttings for planting. These methods also accelerate root formation in cuttings [3,4,6].

However, under production conditions, these methods do not always provide the expected efficiency. In addition, growth regulators are usually expensive and have a certain toxicity, and can be harmful to human health if safety rules are not followed when processing cuttings.

The current state of science has shown that various stimulants aimed at accelerating root formation in grape cuttings, including various forms of electromagnetic field energy (electric field, electric current, magnetic field, electric discharges, electromagnetic waves, electromagnetic waves, etc.) control and activation of plant life through application. pulsed electromagnetic field) indicates that it can be directed in the right direction through noise[1,2,3,4,5,6].

II. ANALYTICAL INDICATORS

Various experiments and theoretical knowledge on the study of different effects of electromagnetic field energy on grape cuttings and seedlings and their use in the cultivation of grape seedlings were analyzed using internet materials, literature and patent data.

Studies by local and foreign scientists, including V.I Michurina, A.M Basov, I.I Gunara, V.V Pilyuginoy, P.P Radchevskiy, A.G Kudryakov, B.R Lazarinko and I.F Borodin, have shown that exposure to biological objects, including materials belonging to the plant kingdom, electrophysical methods in some cases give not only quantitative but also qualitatively positive results that can be achieved by other methods[1-8].

A.G Kudryakov found that the process of rooting grape seedlings by processing grape seedlings using electricity can achieve good results when exposed to an electric field of 14 V / m and 24 hours. It is recommended to use an alternating current of 50 Gts industrial frequency in the implementation of root formation processes in grape cuttings using electrophysical methods, and its transmission to the seedlings through the liquid was found to give high results[3].

P.P.Radchevsky conducted two experiments in the spring. In the experiment, one control and one 0.01% heteroaxin solution were placed, and four variants of one- and two-eyed grape cuttings were processed in a pulsed electromagnetic field. He found that under the influence of a pulsed electromagnetic field for 5-10 minutes, the rooting process in grape cuttings is accelerated and good results can be achieved as a result of effective use of these technologies. It should be noted that the process of root formation in grape cuttings treated in a pulsed electromagnetic field was 97.5-100. In grape cuttings treated with pulsed electromagnetic field for 5 minutes (IEMM-5 minutes), the process of root formation was observed to be 7.5-15% faster than the control[4].

Experiments and theoretical knowledge conducted by the analyzed scientists have shown that the rooting of vine cuttings may depend on a certain amount of harman active eyes, and research is needed in this regard[1,3,4,6].

III. RESULTS AND ANALYSIS

A small experiment was conducted taking into account the theoretical knowledge studied. The research was conducted at the Department of Electrotechnology and Use of Electrical Equipment of TIIAME in the form of vegetation experiments on two-eyed cuttings of black currant variety of grapes. The experiment was performed in a common heated room.

For the experiment, the cuttings were prepared from black currant varieties of grapes before the onset of water flow in the branches in the spring, and the cuttings were prepared from 20 cm in length and stored in special packages until April 9.

A total of 390 grape pens were used in the experiment. The number of grape cuttings processed using electricity was reduced to 375 and 15 for control. In the experiment, an alternating current of industrial frequency (50 Gts) was used. In the experiment, the electric field strength was processed at 14, 37, 71, 94, 103 V / m. Processing times for cutting were 4, 8, 12, 15.24 hours.

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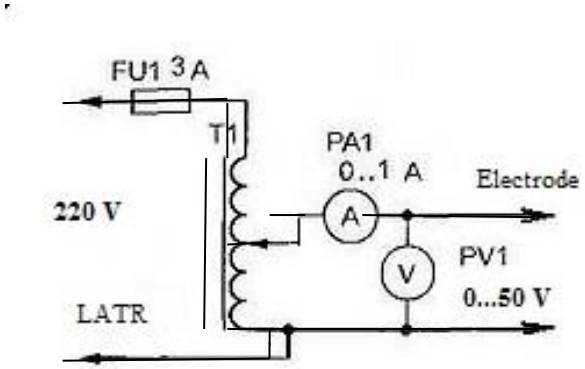

Figure 1. Schematic diagram of the equipment used in the electrical processing of grape cuttings.

Processed grape cuttings (375 cuttings) were planted on April 10 in 300-gram containers. It should be noted that all cuttings are made from ripe annual varieties of one grape. 3.8-liter plastic containers were used to electrically process the cuttings. The electrodes in the electrical processing unit are made of stainless steel, the electrodes are 7 cm wide, 16 cm long and spaced 25 cm apart.

Figure 2. Planting processed grape cuttings in 300 gram pots.

Small experiments and analyzes have shown that grape seedlings do not react to the active state of harmanol under the influence of electricity, and that plant tissues have active conductivity only at low levels of electric field strength[4,5,6].

Electrical treatment before planting grape cuttings significantly increases the process of root formation in cuttings and increases the permeability of cuttings, which significantly increases the level of seedling development.

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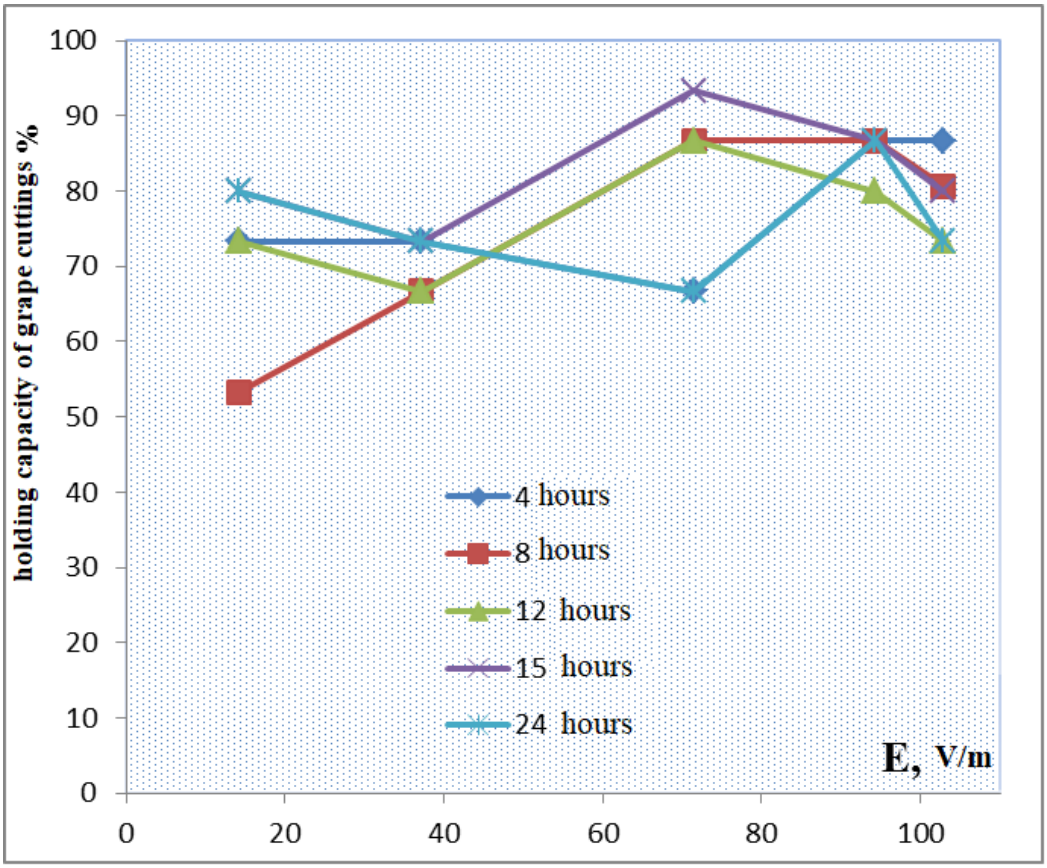

Figure 3. The degree of adhesion of grape cuttings depends on the strength of the electric field and the processing time.

Rooting processes using grape cuttings using electric current showed the highest results at 71 V / m electric field strength and 15 h exposure, and rooting process on cuttings was 93.33%.

The holding time of grape cuttings increased by 73.33% in 14.37 V / m electric field, 66.66% in 71 V / m electric field, 94 and 103 V / m electric field with 4 hours of processing time. Was equal to 86.66%. The mean retention at 4-hour processing was 77.33%, which was 2.67% lower than the control option.

The holding time of grape cuttings increased by 53.33% when the second processing time was 8 hours at 14 V / m electric field strength, by 66.66% at 37 V / m electric field strength, and by 86, 71 and 94 V / m electric, increased field strength, 66% and 80.66% at 103 V / m electric field strength. The mean retention at 8-hour processing was 74.79% (5.21% lower than the control option).

The holding time of grape cuttings increased by 73.33% in 14 V / m electric field, 66.66% in 37 V / m electric field and 86.66 in 71 V / m electric field during 12 hours of the third processing time. %, 80% at 94 V / m electric field strength, 73.33% at 103 V / m electric field strength. The mean retention at 12-hour processing was 75.99% (4.01% lower than the control option).

The holding time of grape cuttings is 80% at 14 V / m electric field, 15 hours during processing, 73.33% at 37 V / m electric field and 93.33% at 71 V / m electric field. It was 86.66% at 94 V / m electric field strength and 80% at 103 V / m electric field strength. The mean retention was 82.66% at 15 hours of processing. Compared to the control option, the cuttings increased by 2.66%.

The shelf life of grape cuttings is 80% with a 24-hour processing time at 14 V / m electric field, 73.33% at 37 V / m electric field and 66.66% at 71 V / m electric field. It was 86.66% at 94 V / m electric field strength and 73.33% at

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103 V / m electric field strength. The average storage at 24-hour processing was 75.99%. Compared to the control option, the cuttings decreased by 4.01%.

In the control variant, the hardness of grape cuttings was 80%, while in comparison with the control, the hardness of grape cuttings processed for 15 hours (average hardness 82.66%) in an electric field of 71 V/m increased by 20%. power. Thus, the results of the experiment showed that the processing of grape cuttings before planting allows to increase the yield of seedlings by 2.66 times. Therefore, high economic efficiency (average 125 thousand pens per hectare) can be achieved by designing a device for electroplating before planting grape cuttings, thereby increasing the yield of seedlings per hectare.

Despite the great prospects for the application of electrotechnological methods of controlling the vital processes of plant organisms belonging to the plant world today, the application of these methods in the cultivation of seedlings from grape cuttings has not yet been studied. One of the most pressing issues in agriculture today is the substantiation of healthy growing technologies (electrophysical factors and energy parameters) for one- and two-year-old grape seedlings using electrotechnical methods without any damage to the organism, navigation and roots.

IV. CONCLUSION

1. Experimental trials have shown that treatment of grape cuttings using electrophysical effects significantly accelerates the process of root formation in cuttings and increases the permeability of seedlings.

2. It is recommended to use an industrial frequency of 50 Gts alternating current in the process of rooting of grape cuttings by electrotechnological methods, and one of the most effective technologies is its liquid transfer to grape cuttings.

3. Electro-processing of black currant grape cuttings showed an electric field strength of 71 V / m and a 15-hour exposure of the cuttings to 93.33%, an increase of 2.66% over the control option.

4. Compared to the control, the process of rooting in grape cuttings treated with electricity was accelerated by 15-18%.

5. Studies have shown that electrophysical treatment before planting of agricultural products, i.e. grape cuttings belonging to the plant world from various forms of electromagnetic field energy, can give a positive result and increase the size of cuttings (up to 17-20%) .

6. Biological products (fruit trees and grapes, apples, pomegranates) that can be used to increase the energy efficiency of agricultural production to study the effect of electromagnetic field energy on conductive dielectric and insulating materials in liquid, solid and gaseous state may come.

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