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STUDENTS MASTERING THE TECHNOLOGY OF ACCELERATED GRAPE GROWING BY THE IN VITRO METHOD

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Abstract

The article deals with the development by schoolchildren of the technology of accelerated grape growing by the in vitro method to achieve a certain experience and increase interest in science, demonstrating innovative methods to students in practice.

Also in the course of the study, the task of instilling in schoolchildren the skills of operational solution of various tasks with the help of logical tasks for the formation of knowledge about the in vitro method was achieved.

Keywords: in vitro, experimentation, critical thinking, competence, modeling

Grapes are one of the most common agricultural crops, playing a significant role in the global economy.

As world experience shows, the main thesis of scientific and technological progress is that only the solution of issues of great scientific importance ultimately leads to a great economic effect. In this aspect, the most promising are the ways and methods of BIOTECHNOLOGY, a science that arises at the junction of several biological disciplines: genetics, virology, microbiology and crop production.

Increasing the production of grapes requires not only the expansion of areas, but also the development and improvement of technologies that ensure accelerated reproduction of promising varieties, increasing the yield of grape plantations.

In many countries of the world, great importance is currently attached to the introduction into production of intensive methods for the production of high-quality planting material of grapes and the development of new highly effective ways of laying vineyards.

The growth and yield of grapes, the period of entry into fruiting largely depend on the quality of the planting material.

Currently, biotechnology is rapidly moving to the forefront of scientific and technological progress. Two circumstances contribute to this. On the one hand, the rapid development of modern molecular biology and genetics, based on the achievements of chemistry, physics, which made it possible to use the potential of living organisms in the interests of human

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economic activity. On the other hand, there is an urgent practical need for new technologies designed to eliminate the shortage of food, energy, and mineral resources.

As a science, biotechnology is young, its development is rapid. The flow of information is sometimes contradictory or accessible only to narrow specialists.

Over the past twenty years, research on the problem of tissue culture of many agricultural plants, including grapes, has significantly expanded and deepened. Their orientation pursues different goals: revealing the potential features of certain tissues for regeneration; searching for ways to induce morpho- and organogenesis in the callus; an attempt to obtain haploid plants from the meristemic apex or the tops of shoots after phytosanitary thermotherapy; microcloning (micro-propagation) as a method of exceptionally fast and very effective vegetative reproduction under aseptic conditions. In the latter case, micro-multiplication serves to reduce the duration of the breeding process and accelerate the introduction of new varieties into production.

Due to the insufficient productivity of existing methods of propagation of planting material, the promotion of new varieties into production is delayed for decades. With this in mind, there is a need to develop and implement new methods of propagation of grape varieties. One of the effective ways to solve the problem is the technology of clonal micro-propagation of grapes.

An urgent problem of the present time is the reduction or cessation of the use of chemicals in the fight against diseases, pests and weeds in order to protect the environment from pollution through the use of biological and agrotechnical methods of control, the introduction of varieties resistant to diseases and pests that do not require chemical means of control. Therefore, of particular interest are the varieties of technical and table direction, characterized by increased resistance to diseases (mildew, oidium, gray rot, anthroknosis, etc.) and frosts. And this is understandable. After all, the cultivation of grapes of complex-resistant varieties is beneficial both economically (less labor and money) and environmentally (products without pesticides).

However, the lack of planting material leaves its mark on the global solution of the above problematic issues, that is, the usual technology of grape propagation does not meet the requirements of the time, cannot provide viticultural farms with complex-stable and economically valuable grape varieties in a short time.

One of the existing obstacles to the introduction of a new variety into practice is the impossibility of obtaining a large amount of planting material for vegetative reproduction during one season. This obstacle can be eliminated by using the achievements of biotechnology, which offers breeders an effective and fast method of micro-propagation of plants. It is also very important that the seedling material obtained in this way is genetically identical to the parent plant that gave it origin.

In viticulture, clonal reproduction - obtaining a number of successive generations of genetically homogeneous organisms as a result of vegetative reproduction from one common maternal organism - is traditional. With clonal micro-reproduction, this tradition is preserved, but the coefficient of vegetative reproduction per unit of time increases significantly, while reducing the occupied area of nurseries.

Clonal micropropagation has a number of other advantages and features, namely: it is carried out in laboratory conditions, which excludes the influence of various environmental factors;

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has a high reproduction coefficient; allows you to produce planting material that is cured of viruses and bacterial cancer; allows you to reproduce plants year-round and on the stream; it becomes possible to propagate varieties that are poorly rooted in the usual way method; to obtain the maximum number of plants per unit area; during reproduction, the possibility of over-infection of plants is excluded; during the introduction of plants, the probability of importation and distribution of quarantine objects is eliminated; allows long-term storage of plants in test tubes under appropriate conditions; allows breeders to preserve the required gene pool; to rapidly propagate new varieties and clones for their transfer to the GSU and to create intensive-type micromachines in farms; has great environmental and resource-saving importance.

Relevance of research. The production of certified planting material of grapes is one of the most important problems of viticulture today, the problem of obtaining plants free from viral, mycoplasma diseases and bacterial cancer is successfully solved worldwide with the help of biotechnological methods of Adaptation - the final and responsible stage of obtaining healthy plants. During this period, a gradual decrease in air humidity is necessary, which helps plants to rebuild the transpiration system and adapt to non-sterile conditions, growth regulators contribute to the optimization of the adaptation stage. Recently, new drugs have appeared that stimulate not only the growth and development of plants, but also increase their immunity.

The grape plants obtained as a result of rehabilitation and adapted to environmental conditions are pre-phase planting material of class A, intended for laying super-elite queen cells, which are the basis for the production of certified planting material, However, the issues of adaptation of healthy plants, both to non-sterile conditions and to open ground conditions of sandy soils, have not been studied enough and are currently relevant

The purpose of the study: to develop methods of adaptation of plants in vitro to non-sterile conditions and conditions of the open ground of sandy soils, aimed at increasing survival, obtaining full-fledged uterine plants and creating a basic uterine

To achieve this goal, the following tasks were identified: to improve the stage of adaptation of plants to non-sterile environmental conditions by using new generation preparations of potassium lignohumate, Extra-sol-55, emistim, zircon,

- to develop a substrate with the introduction of the natural mineral glauconite into its composition,

- to improve the methods of reproduction of healthy plants with single-eye cuttings,

- to establish the optimal timing and methods of planting when adapting plants to open ground conditions,

- to study near-planting fertilization and foliar fertilizing when adapting healthy plants to the conditions of sandy soils,

- to improve the method of testing on herbaceous indicators for the implementation of phytosanitary control on queen cells

The object of the study: the stage of adaptation of test tube plants to non-sterile environmental conditions and to open ground conditions of sandy soils

Subject of research: grape plants of the following varieties. Northern Cabernet, Platovsky, Early Purple, Tsimlyansky black, Chardonnay, Berlandieri x Riparia Cober 5 BB, Riparia x Rupestris 101-14

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Viticulture industries based on innovative scientific developments that are of crucial importance for the sustainable development of viticulture and improving its efficiency in market conditions. In this regard, the optimization of the assortment and the formation of the gene pool of grape varieties with high quality potential and low cost remains relevant. The use of breeding methods in production does not fully meet the demand for planting material. In addition, widely used methods do not allow to obtain high-quality (healthy) planting material. In order to update trees with new promising varieties and increase the area, it is necessary to improve existing ones and develop new approaches to the effective and operational management of high-quality planting material of grapes.

One of the most effective ways to obtain the daughter material of unhealed grapes is a method based on the introduction of meristems with a high tip into a sterile culture in vitro, providing a high reproduction coefficient followed by microclonal reproduction [1]. The analysis of literature sources shows that the use of the technology of microclonal propagation of grape mericlones allows to reduce the time of introduction of new varieties into production compared with traditional methods and accelerate the transition of plants from the juvenile to the clearly productive phase of development. This technology allows year-round work and reduces the breeding time of new varieties by 4-5 times compared to traditional methods. In addition, using this method allows you to propagate plants that can be propagated in the traditional way. The construction of industrial vineyards with health-improving material will prolong the productive use of plantings and increase yields by 30-40%.

The aim of the study is to develop and improve modern methods and methods of growing grape varieties and clones that have been cured by meristemic culture in vitro.

Material and methods of research. For eight years, studies have been conducted on the improvement of grapes using In vitro culture, improving approaches to rooting and adaptation, since 2010, the influence of various nutrient media and their individual components on the growth and development of apical meristems has been studied. More than 120 table, technical and native varieties were included in the culture In vitro. A laboratory collection of grape varieties in vitro has been created. The effective use of young green shoots from clone bushes during the period of active growth (May) has been established as a starting material for the successful production and isolation of grape clones for reproduction [2].

The control showed that at the first stage of cultivation (2 weeks), part of the meristems (40-60%, depending on the variety) began to necrotize. The remaining meristems developed in microregions 2-2.5 mm in size a month after planting. A transplant was performed. Into biological test tubes. The degree of survival of apical meristems in the group of ac varieties (Augustine, Fly Agaric, Italian Muscat, early Magaracha) during the introduction into culture In vitro is on average 50%, and in technical varieties (Magaracha, Viorica, Rakatsiteli) - 40-45%. The death of apical meristems during reproduction occurs due to damage to apical structures during division. Apical meristems are planted in a nutrient medium a month after planting with the same components. The transplant was carried out in biological tubes measuring 40x120 mm, regenerators measuring 6-10 cm appeared in 45-55 days.

During the transplant period, the cluster shoots are very high, which vary depending on the variety, their survival rate: 75% of the deviations of the Rkatsiteli variety and more than 90% are varieties of Moldova and varieties of Italian Muscat. A very low percentage of infected shoots. Apparently, there was a factor of sterilization of apical meristems when introduced into culture in vitro, as well as a factor of transplanting plants in sterile conditions (laminar

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boxes). In 55-60 days , regenerants of plants with a size of 6-10 cm appeared . Regenerant plants are cut into fragments, adding nodes with leaves and buds (the lower part of the internode is 1-2 cm longer than the upper one). The resulting micro-gears are planted in biological tubes (40x120 mm) in such a way that the lower part of the internode on the agar falls into the center of the agar. Glass tubes are covered with foil and placed in a growing room according to appropriate methods.

Summarizing the results obtained, it should be noted that 40% of apical meristems allow them to be grown and propagated in the future, while it is possible to obtain planting material without viruses. We conducted further studies using single-eye explants from isolated apical meristems. One of the most important and integral components of the nutrient medium are growth regulators [3]. Their careful selection and determination of the optimal concentration make it possible to increase the effectiveness of the method of clonal microdermination of grapes.

Experiments have shown that regeneration of shoots from isolated peaks, except for a mixture of the drug in the amount of 5.0 mg / l, occurs immediately when the ends begin to darken and die. Micro-shoots grown in an environment with a concentration of 0.1 mg/l of art. 6 developed very slowly. It is possible that the low concentration of this drug poorly stimulates the processes of plant organogenesis [2, p. 78].

Methods

In order to improve the technology of accelerated distribution of grapes in vitro in the Botanical Garden and introduction into the educational process, I chose the topic of growing grapes in vitro in the school laboratory on the topic of an additional PBL lesson of the boarding school of the children's Lyceum No. 3.A questionnaire question was received from 17 students of the 10th grade. After receiving the questionnaire, it was found that out of 17 students, 6 students have knowledge of how to grow plants in test tubes. 7 children were selected for an additional PBL lesson and studies were conducted together with them. For growing grapes in vitro, grape varieties growing in the south of the Republic, Hungarian muscat, White Kebab were selected [3, p. 102]. Together with the students, 5 pieces of buds from each grape variety were selected.The resulting buds were washed with distilled water for 10 minutes. Grape buds washed with water were washed again with distilled water after sterilization with diacite for 10-15 minutes to get rid of the fungus with the help of pathogenic viruses. We rinsed the Shish Kebab variety with chlorine-containing whiteness. We place the buds of two grape varieties in a separate nutrient medium. The laboratory was cleaned daily with chlorine to prevent the virus from entering the nutrient medium by bacteria.Thiamine, pyrodoxine, ascorbic acid - 1 mg/l, mesoinosite – 100 mg/l, sucrose - 20 g/l, agar - 7 g/l were placed in the nutrient medium.

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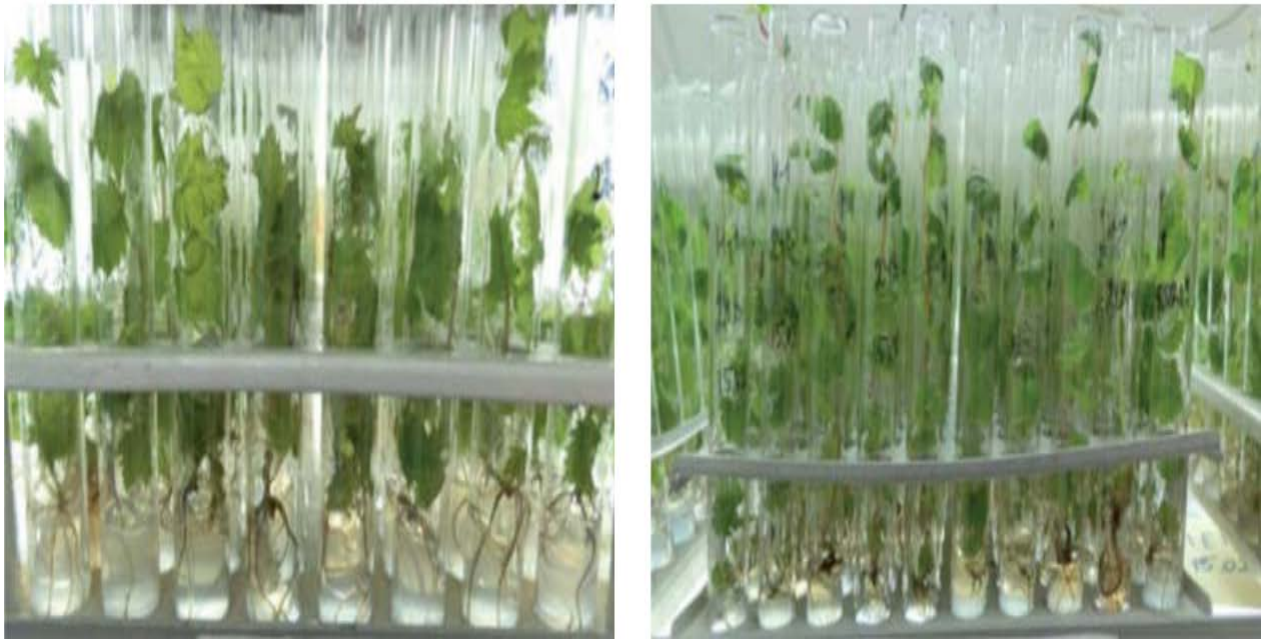

Fig. 5. Grape roots grown in a special container

The temperature of the laboratory was not lowered below 24C degrees. The laboratory was cleaned daily with chlorine to prevent the virus from entering the nutrient medium by bacteria. The development of grape explants was monitored every day.

The study showed that leopard explants have delayed root development.Phytohormones were added to develop the roots. Completely in 2 months, the implants had roots.The problem after the roots appeared was to plant grapes in the soil for seedlings.Grape seedlings are transplanted into a good fertile soil.After transplanting into the soil, rooting of plants in the soil was observed.

The result obtained by growing grapes

Grape Horses	Number of received explants	The number of those that did not grow to the soil	The number of those that have grown well-established in the soil
Hungarian muscat	5	3	2
Shasla is White	5	2	2

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Results and Conclusion

A nutrient medium with preparations for growing grapes in vitro was selected, which they created during an additional lesson with students. During the study, students learned how to create an artificial nutrient medium and grow explants and received a lot of information. PBL with the consent of the Lyceum administration

On one topic of the application (Project based on learning), the topic of growing grapes by in vitro method was selected. In the laboratory of the lyceum, White and Hungarian Muscat grape varieties have been successfully bred. It was found that when growing explants of grapes, it is important to monitor the development of explant roots and monitor their movement into the soil.

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