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INVESTIGATION OF THE EFFECT OF INDOLYL ACETIC ACID AND NAPHTHENIC ACID ON THE ROOT DEVELOPMENT OF OLIVE CUTTINGS

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ИССЛЕДОВАНИЕ ВЛИЯНИЯ ИНДОЛИЛУКСУСНОЙ И НАФТЕНОВОЙ КИСЛОТ НА РАЗВИТИЕ КОРНЕЙ ЧЕРЕНКОВ ОЛИВЫ

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Abstract. The influence of growth factors on the development of callus and roots in the biennial cuttings of the olive plants were investigated in a comparative manner. The experiments were conducted in the greenhouse of the Absheron Experimental Station. One-year and two-year cuttings of the olive plant were taken as the object of the study. Growth agents (indolyl acetic acid and Na^+-salt of naphthenic acid) were used to influence the rapid rooting of shoots. During the conducted experiments, different results were obtained in different options. In comparison with the control variant, the positive effect of indolyl acetic acid and Na^+-salt of naphthenic acid on olive cuttings were observed. According to the conducted studies, it was found that the rooting of the cuttings was accelerated as a result of the effect of growth substances. The number of rooting and callus was higher in two-year cuttings than in one-year cuttings. Thus, 49 out of 60 (81%) two-year cuttings were rooted by using of indolyl acetic acid, and 50 were rooted (83%) when callus was exposed to the Na^+-salt of naphthenic acid, in 9 were observed having callus, only in 1 wasn't observed development. The Na^+-salt of Naphthenic acid had a better effect on rooting and the number of calluses among growth substances. As a result, it was determined that for the rapid development of the olive plant, cuttings should be taken from healthy and well-nourished trees and Naphthenic acid Na^+-salt should be kept for a specified time (12 hours) and concentration (0.005%).

Аннотация. Сравнительным методом исследовано влияние факторов роста на развитие каллуса и корней у двулетних черенков масличных растений. Эксперименты проводились в оранжерее Абшеронской опытной станции. В качестве объекта исследования были взяты однолетние и двухлетние черенки растения оливы. Для воздействия на быстрое укоренение побегов использовали стимуляторы роста (индолилуксусная кислота и Na^+-соль нафтеновой кислоты). В ходе проведенных экспериментов в разных вариантах были получены разные результаты. По сравнению с контрольным вариантом отмечено положительное влияние индолилуксусной кислоты и Na^+-соли нафтеновых кислот на черенки оливы. По данным проведенных исследований установлено, что укоренение черенков ускоряется в результате воздействия ростовых веществ. Количество укоренений и каллусов у двухлетних черенков было выше, чем у однолетних. Так, из 60 (81%) двухлетних черенков укоренились с помощью индолилуксусной кислоты, а при воздействии на каллус Na^+-соли нафтеновых кислот — 50 (83%), у 9 наблюдались каллусы, только у 1 развития не наблюдалось. Натриевая соль нафтеновой кислоты лучше влияла на укоренение и количество каллуса среди ростовых веществ. В результате установлено, что для быстрого развития оливковых

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растений необходимо брать черенки со здоровых и хорошо упитанных деревьев и выдерживать Na^+-соль нафтеновой кислоты в течение определенного времени (12 часов) и концентрации (0,005%).

Keywords: olive cuttings, indolyl acetic acid, Na^+-salt of naphthenic acid.

Ключевые слова: черенки оливы, индолилуксусная кислота, Na^+-соль нафтеновой кислоты.

Azerbaijan is included in the group of countries with great potential for the development of the olive plant. The natural climatic conditions of the Absheron peninsula are very favorable for the development of this plant. Olive propagation can be done in several convenient ways. Olive is propagated by seeds, cuttings, shoots. Among these methods, the most effective method is propagation through cuttings. When J. Sh. Mammadov carried out reproduction experiments with cuttings, it became clear that this method is a more efficient method of propagation [1, 3].

Acceleration of rooting in plants that propagate well with cutting has always been relevant and important. It has been determined from the research that some growth substances have a positive effect on the development of roots during cutting propagation. These substances are called growth enhancers or auxins. Auxins, which are cyclopentene oxide acids, are found in newly sprouting parts of plants and cause their growth to accelerate. The effect of growth substances on the olive plant has been studied by some world scientists. The Italian researcher Morettini confirmed that the fruit loss in olives in July and September, reaching 70-75%, is caused by deficiencies related to nutrition [12].

In his research in this field, Bouat investigated the changes of N, P, K and Ca in flowers and fruits along with leaves throughout the year, as well as in leaves, he observed that these elements, which were high at the beginning of the vegetation period in flowers and fruits, decreased until the hardening of the seed and then remained at the same level [7-9].

In a similar study, González explained that the accumulation of K in the fruit in the olive leads to the reduction of the yield in the next year because of the amount of K in the leaf and the balance between N/K and Ca/K in the branches [10].

Gonzalez observed that the reduction of potassium and calcium in the olive plant was slower between March and October [11].

According to the research conducted by J. Mammadov, the amount of oil in olive fruits increased by 3.0-4.8% compared to the control during the research years under the influence of fertilizers. Fruits in triple-fed variants were distinguished by higher oil content, which was on average 0.1-1.1% higher than the indicators of other nitrogen-fed variants. Thus, when there is a severe shortage of nitrogen in the soils of the Absheron Peninsula, the application of nitrogen fertilizers on a phosphorus-potassium background leads to a high yield every year, which is considered one of the necessary requirements of high cultivation [4-6].

In Azerbaijan, although the effect of growth substances on the development of some fruit plants has been studied, the effect on the development of the olive plant has not been investigated [1].

The olive plant is a medicinal, food and industrially valuable plant. On the other hand, the cultivation of this plant is a very profitable plant for the producer, and the cultivation of one hectare of it allows to take approximately 15-20 thousand Azerbaijani manat profits every year. Unlike other fruit plants, each olive seedling planted can produce a good harvest starting from its third year and reach its full production period in the fifth and sixth years of cultivation. As the demand for

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olive oil increases in the world, the issue of increasing the area of olive groves also arises. Thus, the demand for olive seedlings and the finding of ways of its mass and rapid reproduction are still relevant today. From this point of view, we aimed to study the effect of growth substances on olive cutting propagation. The purpose of the research work is to determine the effect of the application of growth substances in different doses that affect the rapid rooting of one-year and two-year shoots of the olive plant.

Object and Methodology of the Research

The experiments were carried out in the Greenhouse of the Absheron Experimental Station. The cuttings were planted in a rooting medium in a 1:1 ratio of peat perlite. The temperature in the greenhouse varies from 15 to 25°C, and the humidity varies from 67 to 86%.

One-year and two-year cuttings obtained from healthy and productive olive trees were taken as the object of the study. Growth substances (IAA and Na+ salt of naphthenic acids) were used to influence the rapid rooting of varieties. The research is conducted on the basis of the adopted methodology of the Russian Scientific-Research Institute of Horticulture and Viticulture named after I. V. Michurin. That is, here humus was determined by Y. V. Tyurin, CO_2-calcimetric method, water-soluble ammonia nitrogen-Nesler reagent, and pH was determined by potentiometric method in water [2].

Analysis and discussions

The most convenient way of propagating Olives is through cuttings. At this time, the olive retains the characteristics of the parent tree, and it becomes possible to bear fruit in a shorter period of time. One of the important conditions is the correct selection of the trees from which the cutting material will be obtained during cutting propagation. Thus, it is advisable to choose cuttings from trees that are provided with good nutrients, watered on time and free from parasites, diseases and pests. More rooting was observed in the cutting material obtained from young trees compared to the cuttings obtained from old trees. One and two-year semi-wooden cuttings of Olive are available in three forms. The saplings from the base of the tree are the cuttings obtained in the middle part of the tree and the cuttings obtained in the tip of the tree. Which part of the tree the cuttings come from ultimately produces different results. For cuttings obtained in the spring, it is advisable to get more from the middle part of the tree. For cuttings obtained in summer and autumn, the sprouts coming from the bottom of the tree are considered suitable. The cuttings obtained in spring must be from the trees of the previous year, and the cuttings in summer and autumn must be from the flowers of the same year. It is best to get spring cuttings in March-April, and autumn cuttings in August-September. Experiments were carried out on different olive varieties in the greenhouse complex of the Absheron Experimental Station in 3 variants. I variant — Control; II variant — Indolyl Acetic Acid (IAA); III variant — Na^+ salt of Naphten Acid (NA).

The cutting supply from perennial branches is carried out once in 2-3 years. This event should be implemented from February 15 to the end of March. In frost-free years, the supply of cuttings can be started from December. Straight, greenish, smooth-barked branches with a diameter of 1.0-2.0 cm are used for cuttings, and they are made with a length of 25-30 cm. In the period before planting, they are immersed in river or sea sand, provided that they are open from the top to 5 cm, and they are protected in greenhouse conditions for 50-60 days. When the cutting is planted, the part remaining above the ground surface should be more than 5 cm. Olive cuttings were transferred to the experimental area after being stored in different variants and different solutions. During the experiment, 60 wooded one and two-year olive cuttings were used in each variant. As a result, different results were observed in different options.

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The cuttings were prepared for planting in the first ten days of September. The cuttings were placed in water in pots, then in the shade side they were cleaned from extra leaves and the tip was sealed with paraffin tape to prevent water loss in the cuttings. In the control variant, the cuttings were taken from ordinary water and planted on the substrates we prepared in advance. A drainage layer of 3 cm thick coal particles was created in the pots where the cuttings will be planted. A mixture of peat-perlite in the ratio of 1:1 was added to it. The cuttings are planted here with one joint outside (Figure).

Figure. The study of the effect of growth substances on olive cuttings

In the version where indolyl-acetic acid is applied, 1 g of indolyl-acetic acid was first dissolved in 100 ml of ethyl alcohol and then diluted with 125 ml of distilled water. We keep the cuttings we prepared at the beginning in this solution for 5-10 seconds and then put them aside for a few minutes. This process is important for the alcohol to move away from the cutting. Later, these cuttings are also planted in pots with peat-perlite mixture. The cuttings we kept for 12 hours in a 0.005% solution of sodium salt of NA were planted in a peat-perlite mixture substrate. The result in one-year-old cuttings was much lower than in two-year-old ones. Thus, 60 cuttings were taken in all three variants of one-year cuttings, as a result, rooting was observed in 12 cuttings in the control version, 19 in the version with IAA applied, and 22 cuttings in the version affected by the NA (Table 1).

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Table 1

THE EFFECT OF IAA AND NA OF NAPHTHENIC ACID OF DIFFERENT GROWTH SUBSTANCES ON THE DEVELOPMENT AND ROOTING OF ONE-YEAR CALLUS OF OLIVE PLANT

Variants	*The number of cuttings*	*The number of rooted cuttings*	*The number of cuttings in which callus was observed*	*Undeveloped cuttings*
Control	60	12	3	45
IAA	60	19	7	34
NA	60	22	8	30

In two-year cuttings, 60 samples were taken in all three options, as a result, rooting was observed in 45 (75%) cuttings in the control version, 49 (81%) in the version applied IAA, and 50 (83%) in the version affected by the NA. The number of callus was higher in both one-year and two-year samples in NA-treated variant (Table 2).

Table 2

EFFECTS OF DIFFERENT GROWTH SUBSTANCES IAA AND NA ON CALLUS DEVELOPMENT AND ROOTING IN TWO-YEAR-OLD CUTTINGS OF OLIVE PLANTS

Variants	*The number of cuttings*	*The number of rooted cuttings*	*The number of cuttings in which callus was observed*	*Undeveloped cuttings*	*The number of rooted cuttings in %*
Control	60	45	5	10	75
IAA	60	49	8	2	81
NA	60	50	9	1	83

Conclusion:

According to the conducted studies, it was found that the rooting of the cuttings was accelerated as a result of the effect of growth substances. The number of rooting and callus was higher in two-year samples compared to one-year ones. So, out of 60 biennial samples, 49 out of 60 were rooted (81), under the influence of IAA, 50 were rooted (83%), when the callus was treated with NA, callus was formed in 9, only 1 not developed. Among the growth substances, the NA had a better effect on rooting and the number of callus. As a result, it was determined that for the rapid development of the olive plant cuttings they should be taken from healthy and well-nourished trees, and they should be kept in NA for a specified time (12 hours) and concentration (0.005%). When the specified amount is exceeded, the development of the growth and roots in the olive plant is weakened.

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