# Influence of Agrochemical Products on the Development of Seedlings in School

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**Abstract**. Production of planting material through the use of physiologically active substances - Urea (standard), Cannabiogen Delta, PLAGRON Power Roots, Canna BioGen Delta Nueve, Slavol, to increase the yield of seedlings from shkolki. When using new generation fertilizers, the realization of the genetic potential of plants is ensured, making them strong and hardy, these additives stimulate protein production and increase the activity of the enzyme responsible for the biosynthesis of other substances necessary for plant growth and development. These fertilizers are without chemical additives, which have a positive effect on plants, soil and the environment. As a result of the research, it was found: the average yield of seedlings with foliar fertilization in shkolka according to the options. It is argued that new generation fertilizers are a strong plant growth stimulator, actively influencing the development of the root system.

## 1 Introduction

The foundation for the stable development of the viticulture industry is nursery farming. The development of the industry depends on the development of the nursery base - the life of vine plantations, their potential and actual productivity, resistance to biotic and abiotic factors, and the economic efficiency of production as a whole [2].

One of the intensive methods for the production of grape planting material is the cultivation of vegetative seedlings, which is widely used in Russia, the USA, France, Czechoslovakia, Germany and other countries [6]. To grow own-rooted planting material, first, mother plantations of grapes are created and cuttings are harvested from them, from which grape seedlings are then grown. The mother liquors are planted with elite planting material, purified from varietal impurities by approbation, mass and clone phytosanitary selection from unwanted bushes - clones, chronic viral diseases and bacterial cancer [10].

Long-term studies of many scientists were aimed at optimizing the technology of growing planting material using foliar application of nutrients. Much attention is paid to the study of the effect of new microfertilizers, represented by chelate compounds and containing PAS [3, 5, 8-9, 12].

A.V. Olefir, as a result of the research, found that the use of foliar feeding in shkolka can significantly improve the biometric parameters of grafted grape seedlings. Comparing the compositions of Reakom and Foliker, the author notes that, in addition to the necessary set of microelements in the chelated form (boron, iron, copper, manganese, molybdenum, and zinc), Foliker contains macroelements and has an acidic pH of a 1% solution [11].

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Despite numerous works devoted to the study of the effect of physiologically active substances, there are no recommendations for nursery breeding on the complex use of preparations containing physiologically active substances. In this regard, the need arose for a detailed study of the effect of PAS on the plant in order to develop rational and effective methods in the technology of production of planting material.

## 2 Research Methodology

Observations and studies were carried out according to the methods developed by L.M. Maltabar and A.G. Zhdamarova [7]. The moisture content of the cuttings was determined with an AHD AL 50 moisture analyzer. The safety of the eyes was determined by transverse section of the eye. Accounting for the survival rate of vaccinations in shkolka was carried out 1-2 months after planting. The determination of the yield of grape seedlings and their quality was calculated from the number of planted plants. To identify the effect of plant growth stimulants on the processes of growth and development of seedlings, the leaf surface area was measured by linear measurement of 30 control plants. To determine the power of development of seedlings, growth was measured in 30 seedlings for each variant of the experiment, taking into account: total and mature growth for each shoot; increment thickness between the 2nd and 3rd nodes using a caliper or a special template. The measurement of the leaf surface area is carried out simultaneously with the growth measurement. After digging seedlings in 25 plants, for each variant, the total number of roots developed on the heel was counted, dividing them by thickness into 3 fractions: up to 1 mm, 1-3 mm and more than 3 mm. The root thickness was first measured on several plants with a caliper, then it was done visually [1]. The quality of seedlings was established in accordance with the requirements of the interstate standard (GOST - 31783-2012) [4]. The determination of the water content of the tissues of the shoots of seedlings was carried out according to the method of M.V. Chernomorets [13]. An AHD AL 50 moisture analyzer was used for the analysis.

## 3 Results and Discussions

A significant factor influencing the growth and development of seedlings in shkolka is the level of nutrient supply to plants. The research program included an experiment aimed at identifying the effectiveness of foliar dressings on shkolka using the latest fertilizers Cannabiogen Delta, PLAGRON Power Roots, Canna BioGen Delta Nueve, Slavol and Urea (standard), recommended in the generally accepted seedling production technology. Control - no processing.

Consideration of average data on the survival rate of seedlings in shkolka for the period from 2020 to 2022. showed that the treatment of grafts with Cannabiogen Delta, PLAGRON Power Roots, Canna BioGen Delta Nueve, Slavol contributed to the active rooting of plants in shkolka. The survival rate in these variants was respectively - (58.9%); (60.7%); (62.4%); (63.0%) in the control - 48.6% (Table 1). With foliar application of Urea, the survival rate of grafts was 52.1%, which is 3.5% higher than the control.

An analysis of biometric indicators characterizing the development of seedlings in a school indicates a positive effect of foliar fertilization at an early stage of graft development. In the variant with the use of Urea, the average length of seedling shoots was within 98.8 cm and exceeded the control values by 9.4 cm. The best result was obtained when seedlings were treated with the PLAGRON Power Roots bioregulator - 151.4 cm. 1 to 63.4%, in control - 37.8%.

**Table 1.** The impact of foliar dressings on the survival rate and development of seedlings in shkolka, Levokumsky variety (Agrofirma Ashkhab LLC, Shelkovsky district, Chechen Republic), average 2020-2022

| Experience Variant | Control | Cannabiogen Delta | PLAGRON Power Roots | Canna BioGen Delta Nueve | Slavol | Urea (reference) |
|---|---|---|---|---|---|---|
| Survival, % | 48,6 | 60,7 | 63,0 | 58,9 | 62,4 | 52,1 |
| Shoot length, cm | 89,4 | 120,7 | 151,4 | 112,3 | 126,5 | 98,8 |
| Shoot ripening, % | 37,8 | 52,5 | 63,4 | 47,1 | 56,3 | 44,8 |
| Diameter | 4,7 | 5,0 | 5,5 | 5,1 | 5,4 | 5,0 |
| escape, mm | 968,1 | 1819,5 | 2033,2 | 1605,5 | 1999,7 | 1361,6 |
| Leaf surface area, cm2 | 38,7 | 71,6 | 76,4 | 69,8 | 75,4 | 50,7 |

The activation of growth processes was observed after the application of PLAGRON Power Roots fertilizer, the length of the shoot increased by 62 cm, the maturation of the vine was 25.6%, respectively.

It is well known that an increase in the productivity of photosynthesis is associated with an increase in the area of the leaf apparatus. The data shown in Table 1 shows the responsiveness of plants to foliar fertilization. The leaf surface area in the experimental variants was in the range of 1605.5-2033.2 cm2, in the control - 968.1 cm2.

Seedlings treated with fertilizers Urea (reference), Cannabiogen Delta, PLAGRON Power Roots, Canna BioGen Delta Nueve, Slavol, were characterized by higher leaf surface area (1361.6-2033.2 cm2), an increase in the area by variants from 393.5 up to 1065.1 cm2. The diameter of the shoots was in the range of 5.0-5.5 mm, in the control - 4.7 mm.

The main indicator of the effectiveness of the work carried out is the increase in the yield of standard grape seedlings. Data analysis shows that the use of PLAGRON Power Roots fertilizer, containing a more complete complex of NPK and microelements, activated the growth and development of seedlings in shkolka. Fluctuations in the yield of seedlings in this variant of the experiment was the highest and varied on average 76.4%, in the control variant - 38.7%.

It has been established that foliar treatment of grafts increases the yield of grafted seedlings: Cannabiogen Delta by 32.9%, Canna BioGen Delta Nueve - 31.1%, Slavol - 36.7%. Urea - 12.0% relative to control.

Examination of the root system of seedlings that received additional nutrition showed a positive reaction of vaccinations to foliar feeding carried out in the initial period of their development. All seedlings in the experimental variants had a well-developed root system. The best results were obtained in the variants with the treatment with fertilizers Cannabiogen Delta, PLAGRON Power Roots, Canna BioGen Delta Nueve, Slavol, Urea (reference) (Table 2).

**Table 2.** The effect of foliar dressings on the development of the root system of grafted seedlings of the Levokumsky variety (Agrofirma Ashkhab LLC, Shelkovsky district, Chechen Republic), average 2020-2022

| Experience Variant | Number of calcaneal roots by fractions, pcs. | | | Number of calcaneal roots by fractions, pcs. |
|---|---|---|---|---|
| | up to 1 mm | 1-3 mm | more than 3 mm | |
| Control | 3,7 | 4,2 | 0,8 | 9,4 |
| Cannabiogen Delta | 6,2 | 7,4 | 1,2 | 16,6 |
| PLAGRON Power Roots | 9,3 | 7,1 | 2,1 | 17,4 |
| Canna BioGen Delta Nueve | 5,4 | 6,6 | 1,4 | 13,9 |
| Slavol | 8,7 | 7,8 | 1,7 | 14,5 |
| Urea (reference) | 4,5 | 5,2 | 1,0 | 11,9 |

In the course of the research, it was noticed that the development of the root system of seedlings in shkolka is closely related to the growth force of the graft variety. In the control variant, the Levokumsky variety, which did not differ in strength of growth, had a relatively weak development of the root system. The average number of roots per seedling is 9.4 pcs. The average number of roots is 11.9 pcs. when treating plants with urea (reference). Vigorous, the average number of roots per plant ranged from 13.9 to 17.4 pcs.

A certain varietal responsiveness of plants to foliar feeding has been established. The elements contained in the PLAGRON Power Roots fertilizer stimulated the development of the root system of seedlings, the number of roots increased by 10% relative to the control, respectively.

Assessing the effect of foliar feeding on the development of the root system, it is necessary to note the formation of a powerful root system with a predominance of roots with a diameter of 1-3 mm in all variants. Fertilizers Cannabiogen Delta, PLAGRON Power Roots, Canna BioGen Delta Nueve, Slavol, Urea (reference) stimulated the formation of roots with a diameter of more than 3 mm in most of the plants under observation.

Observations of the development of plants in dynamics (2022) showed that foliar treatment of plants with PLAGRON Power Roots promotes the activation of growth processes throughout the entire growing season. The average shoot length in the variant with PLAGRON Power Roots was 102.0 cm (Table 3).

**Table 3.** The influence of foliar dressings on the growth dynamics of grape seedlings, Levokumsky variety, (Agrofirma Ashkhab LLC, Shelkovsky district, Chechen Republic), 2022

| Experience Variant | Date of measurements | | | | | | |
|---|---|---|---|---|---|---|---|
| | 03.07 | 13.07 | 24.07 | 04.08 | 15.08 | 25.08 | 11.09 |
| Control | 23,9 | 36,5 | 53,6 | 62,4 | 80,7 | 87,1 | 89,6 |
| Cannabiogen Delta | 31,4 | 43,6 | 59,9 | 78,4 | 89,3 | 93,8 | 90,8 |
| PLAGRON Power Roots | 33,7 | 46,0 | 61,4 | 84,7 | 99,8 | 101,8 | 102,0 |
| Canna BioGen Delta Nueve | 30,9 | 42,4 | 58,6 | 77,6 | 88,8 | 96,4 | 99,8 |
| Slavol | 33,9 | 44,0 | 60,7 | 79,0 | 92,8 | 99,1 | 100,4 |
| Urea (reference) | 29,6 | 40,6 | 56,4 | 73,4 | 82,9 | 88,2 | 90,3 |

To determine the readiness of seedlings for digging, in 2022, the degree of watering was determined, i.e. water content in the tissues of the vine seedlings. Studies have shown that by November 8, the water content of the tissues reached a constant value and varied according to the variants of the experiment from 44.5 to 49.9%, which indicates the end of the process of maturation of the vine in the school (Table 4).

**Table 4.** Indicators of watering of grape seedlings, Levokumsky variety (Agrofirma Ashkhab LLC, Shelkovsky district, Chechen Republic), 2022

| Experience Variant | Date of analysis | |
|---|---|---|
| | October 15 | October 25 |
| Control | 44,5 | 44,5 |
| Cannabiogen Delta | 46,3 | 46,2 |
| PLAGRON Power Roots | 49,8 | 49,9 |
| Canna BioGen Delta Nueve | 46,4 | 46,3 |
| Slavol | 46,6 | 46,8 |
| Urea (reference) | 45,8 | 44,9 |

A slight difference in the water content in the tissues, between the variants of the experiment with foliar treatment, indicates the absence of the effect of fertilizers on the processes of ripening of the vine at this stage of the plant's life.

## 4 Conclusions

As a result of the research aimed at improving the technology for the production of grafted planting material, the following conclusions were drawn: three-year data on the use of a new generation of fertilizers Cannabiogen Delta, PLAGRON Power Roots, Canna BioGen Delta Nueve, Slavol, Urea (standard) proved their promise in foliar feeding, the yield of seedlings increased from 12.0 and 36.7% relative to the control, as well as physiological processes associated with growth, maturation of the vine and the area of the leaf apparatus, stimulating the process of root formation.

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