

INFLUENCE OF SOME FOLIAR FERTILIZERS ON THE DEVELOPMENT OF PRISTA GRAPEVINE VARIETY

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Abstract

The study was conducted during the period 2022–2024 in the experimental vineyard of the Institute of Agriculture and Seed Science “Obraztsov Chiflik” Ruse, part of Agricultural Academy – Sofia. The experiment included vines of the dessert variety Prista. It belongs to the group of early varieties. The variants are: first, which was treated with foliar fertilizers according to the following scheme: with sufficiently developed leaf mass – with the foliar fertilizer Yara Vita Flutrel – 300 ml/da; in the tassel phenophase – with Yara Vita Bortrac – 150 ml/da; phenophase of grain growth with Flutrel – 300ml/da; beginning of ripening – Stopit – 500 ml/da, and second, untreated with foliar fertilizers.

The aim is to establish the influence of foliar fertilizers on the development of grapevines of Prista variety. The following indicators were determined: Grape yield (kg), sugar content (%), titratable acids (g/l), resistance to detachment (g), resistance to pressure (g). Foliar fertilization according to the indicated scheme has a positive effect on the development of Prista grapevines, with a proven effect expressed in the following: The average results from the experiment show that the treated variant of Prista grapevines is characterized by an average yield of grapes from one vine of 8.78 kg, and the untreated one with a yield of 8.29 kg of grapes. The excess is 0.480 kg compared to the control. In terms of the number of clusters, the treated variant is characterized by 18.6 pieces compared to 9.7 pieces in the control. The same trend is observed in the average mass of the cluster: It is 364 g in the treated vines and 294 g

in the control. In terms of the average mass of the grain, the differences are insignificant. In terms of sugar content 20.8 in the treated vines compared to 18.6 in the control. No significant difference was observed in titratable acids. In terms of cluster length, the results were 23.05 cm in the treated vines and 22.64 cm in the control. The cluster width was greater in the vines with foliar fertilization – 11.13 cm and in the control with a value of 11.38 cm. In terms of resistance to pressure and tearing, the values are higher in the variant without foliar fertilization according to the above scheme. The established correlation dependencies $r = 0.7$ prove that.

Key words: foliar fertilization, grapevine, Prista

Introduction. Organic farming is a good agronomic practice, but a serious obstacle to its implementation is the imbalance of micronutrients – nitrogen, phosphorus and potassium [1]. The development of new criteria for ecological assessment of the productivity of agricultural crops in order to preserve the ecological balance in agroecosystems, as well as the introduction of some innovative changes in agrotechnologies related to the protection of environmental components are the subject of scientific studies of various content [2–5]. In recent years, agricultural science has viewed fertilizers not only as a means of increasing yields, but also as a source for producing crops with high nutritional value [6]. True management of growth, development and yield of agricultural crops can be based on a complete knowledge of the needs of plants for the main nutritional elements (N, P, K, Ca, and Mg). For this purpose, it is necessary to study in more detail their absorption and export by plants and their individual organs depending on fertilization rates and environmental conditions [7].

The strength of vines represents their potential for growth and fruiting, which can be objectively determined by the degree of development of the root system, shoots, old wood, and also by the reserve nutrients [8,9].

In the highly productive varieties used in modern agriculture, the export of nutrients from the soil is high [10].

The use of liquid fertilizers for foliar feeding has recently increased not only because of the large assortment of such fertilizers, but also because of their direct absorption by the leaf surface of plants, which increases efficiency, does not burden the soil unnecessarily, and contributes to preserving the quality of the ecological environment and resources [11].

Foliar feeding is an effective method for supplying plants with nutrients [12–14], it has been the subject of numerous field studies, and has been adopted as standard practice in many countries for many crops. Theoretically, it is more environmentally friendly, as nutrients can be delivered directly to plant tissues during critical stages of plant growth and development [15].

It is an alternative for providing macro and micronutrients in a timely manner to maintain high photosynthetic activity [16,17], and high yields.

The aim of the present study is to establish the influence of foliar fertilizers on the development of grapevines of Prista variety. The following indicators were determined: Grape yield (kg), fertility, according to the generally accepted in scientific research practice methods [18, 19], sugar content (%), titratable acids (g/l), resistance to tearing (g), resistance to pressure (g).

Materials and methods. The study was conducted during the period 2022–2024 in the experimental vineyard of the Institute of Agriculture and Seed Science “Obraztsov Chiflik” Ruse, part of Agricultural Academy – Sofia. The experiment included vines of the dessert variety Prista (Fig. 1). It belongs to the group of early varieties.



Fig. 1. Dessert variety Prista

The experiment variants are: first variant, which was treated with foliar fertilizers according to the following scheme: with sufficiently developed leaf mass – with the foliar fertilizer Yara Vita Flutrel – 300 ml/da; in the tassel phenophase – with Yara Vita Bortrac – 150 ml/da; phenophase grain growth with Yara Vita Flutrel – 300 ml/da; beginning of ripening – Stopit – 500 ml/da, and a second option, untreated with foliar fertilizers (control). The following indicators were determined: Grape yield (kg), fertility, according to the generally accepted methods in scientific research practice [18, 19], sugar content (%), titratable acids (g/l), resistance to detachment (g), resistance to pressure (g).

Results and discussion. The results for Prista variety in 2022 presented in Table 1, show that in terms of grape yield from the vine, number of bunches, average weight of bunches, number of mature shoots, in the variant with foliar treatment, a positive change was observed compared to the values ??of the untreated control. The obtained grape yield from the vine in the treated variant exceeded the control by 1.253 kg.

T a b l e 1

Results of dessert variety Prista after treatment with foliar mineral fertilizers and an untreated control variant in 2022

Indicators	Treated variety Prista	Untreated variety Control
Harvesting grapes from a vine, kg	12	7.4
Number of grapes per vine	11	11
Grape, medium mass, g	358	150
Grain: average weight 100 grains, g	460	463.33
Sugar content, %	20	18.5
Titrateable acids, g/l	3.9	3.5
Bunch length, cm	22.00	22.18
Bunch width, cm	10.0	9.72
Tear resistance, g	590	580
Pressure resistance, g	1386	1200
Number shoots	33	20

The average weight of the bunches is 50 g. The difference between the treated and untreated varieties is 0.07 cm. The length of the bunches in the treated variety is 0.07 cm compared to the untreated variety. The sugar content is 3.4% higher in the treated variety. The resistance to breakage is 220 g higher in the treated variety.

The pressure resistance of the treated variety is 593 g higher in the treated variant compared to the control. The content of titrateable acids is maintained in both variants with a value of 4.47–4.8 g/l. A difference in the number of mature shoots between the two variants was also established: 34 in the treated variant and 19 in the control.

Table 2 shows the results obtained in 2023. In terms of grape yield from vine, number of bunches, average weight of bunch, number of mature shoots, a positive change was observed in the variant with foliar treatment compared to the values of the untreated control. The obtained grape yield from vine in the treated variant exceeds the control by 4.6 kg. The average weight of the bunches is 3.33 g. The length of the bunches in the treated variety is 0.18 cm higher than in the untreated variety. The sugar content and resistance to breakage in the treated variety are also increased. The resistance to pressure in the treated variety and the control is the same. The content of titrateable acids in both variants is close. A difference in the number of shoots was found between the two variants: 33 in the treated variant and 20 in the control.

The results obtained for Prista variety in 2024 are reflected in Table 3. They show that the treated variant exceeds the untreated control in terms of grape yield by 4.4 kg. In terms of the number of grapes per vine, an excess of 7.6 pcs. is observed in favour of the untreated variant.

T a b l e 2

Results of dessert variety Prista after treatment with foliar mineral fertilizers and an untreated control variant in 2023

Indicators	Treated variety Prista	Untreated variety Control
Harvesting grapes from a vine, kg	5.533	4.280
Number of grapes per vine	15.2	14.4
Grape, medium mass, g	347	297
Grain: average weight 100 grains, g	577	520
Sugar content, %	21.9	18.5
Titrateable acids, g/l	4.47	4.8
Bunch length, cm	22.67	22.60
Bunch width, cm	11.82	12.00
Tear resistance, g	740.00	520.00
Pressure resistance, g	1773	1180
Number shoots	34	19

T a b l e 3

Results of dessert variety Prista after treatment with foliar mineral fertilizers and untreated control variant 2024

Indicators	Treated variety Prista	Untreated variety Control
Harvesting grapes from a vine, kg	8.82	13.22
Number of grapes per vine	22.8	30.4
Grape, medium mass, g	386.8	434.8
Grain: average weight 100 grains, g	582.66	620
Sugar content, %	20.53	18.6
Titrateable acids, g/l	4.28	4.28
Bunch length, cm	24.5	23.14
Bunch width, cm	11.57	12.43
Tear resistance	606.66	580
Pressure resistance, g	1386.66	1280
Number shoots	18	13

The sugar content in the treated variant exceeds that in the control by 1.9%. There is no difference between the titrateable acids. In terms of the number of mature shoots, the treated variant exceeds the untreated one by 13. In terms of pressure resistance, the variant treated with foliar fertilizers is characterized by a value of 1386.66 g, and the control by 1280 g.

The results obtained on average for the period 2022–2024 are reflected in Table 4. From the summarized results, on average for the period 2022–2024 it is observed that the treated variant yielded 8.78 kg of grapes per vine, and the

T a b l e 4

Average results for the three-year period 2022–2024 for the dessert grape variety Prista after treatment with foliar mineral fertilizers and an untreated control variant

Indicators 2022–2024	Treated variety Prista	Untreated variety Control
Harvesting grapes from a vine, kg	8.78	8.29
Number of grapes per vine	18.6	9.7
Grape, medium mass, g	364	294
Grain: average weight 100 grains, g	540	534
Sugar content, %	20.81	18.6
Titrateable acids, g/l	4.21	4.19
Bunch length, cm	23.05	22.64
Bunch width, cm	11.13	11.38
Tear resistance	645	560
Pressure resistance, g	1386.66	1280
Number shoots	25	20

control variant 8.29 – 0.49 kilograms less. The treated variant yielded 8.9 more grapes per vine. The average mass of grapes in the variant with applied foliar fertilizers is by 70 more than in the control. The average mass of 100 grains in the treated variant is by 6 higher. The sugar content is also higher in the treated variant by 2.21. The content of titrateable acids is lower in the untreated variant by 4.19, and in the treated variant by 4.21, respectively. In terms of cluster length, it is a higher value in the treated variant by 0.41. The width of the bunch is by 0.25 cm in favour of the treated variant. The excess in the number of shoots is 5 in favour of the vines treated with foliar fertilizers.

Positive correlations have been established for the period 2022–2024 between the indicators: Grape yield per vine, kg, Number of bunches per vine, Bunch, average weight, g and average weight of 100 grains, g. The correlation coefficient shows the direction and intensity of the relationship between the studied traits [20].

Conclusions. The studies conducted during the period 2022–2024 on the treatment with the indicated foliar complex mineral fertilizers show that they are a factor influencing the growth vigour and fertility of dessert varieties and a factor determining the economic qualities and biology of the vine. They positively affect the obtained yields of dessert grapes of Prista variety. The established correlation dependencies $r = 0.7$ are proof of this. The results of the experiment prove the positive impact of the tested foliar fertilizers on the development of the vine and the obtained yield. This is due to the complex content of several micro and macro elements in them. Foliar application has a different effect on the studied morphological traits and a positive effect on productivity.

This is an incentive and gives reason to use them by farmers as a corrective component in vineyard growing technology.

REFERENCES

- [1] KATSAROVA A. (2023) Assessment of zeolite and diatomite for optimizing nutrient regime in two types of soils, *Bulg. J. Soil Sci. Agrochem. Ecol.*, **57**(4), 41–48, (in Bulgarian with English abstract).
- [2] GERGANOV G., M. NIKOLOVA, V. BLOZEVA, D. GROZEVA (2009) Practical and economic problems in the realization of agro-ecological activities in plant growing, *Dialogue*, **5**, 108–124, (in Bulgarian).
- [3] MITOVA I., N. DINEV (2017) Development of Agriculture: Conventional and/or Biological? Sustainable, East-West Publishing House, Sofia, ISBN 978-619-01-0075-1, 167 pp, (in Bulgarian).
- [4] VELIKOV Y. (2015) Sustainable Development. Road to Better Public Health and Economic Prosperity, Zelenika Foundation, 66 pp, (in Bulgarian).
- [5] YANCHEVA H., I. MANOLOV (Eds) (2003) Basics of Organic Agriculture, Plovdiv, FIBL, Switzerland, 480 pp, (in Bulgarian).
- [6] KOSTADINOVA P., V. POPOV (2012) Basic principles and methods of organic farming, *New Knowledge*, **1**(3), 55–63, (in Bulgarian).
- [7] DINEV N., I. MITOVA (2018) Biometric and physiological indicators of feed peas designed for “green manure”, *Bulg. J. Soil Sci. Agrochem. Ecol.*, **52**(3), 26–33, (in Bulgarian with English abstract).
- [8] BELBEROVA Y., E. TSVETANOV (2025) Influence of green pruning operations on the degree of shoot maturation and growth vigor in the Storgozia grapevine variety, *Bulg. J. Crop Sci.*, **62**(3) 102–112, (in Bulgarian with English abstract).
- [9] NEGRUL A. (1959) Viticulture with Basic Ampelographies and Selections, Moscow, Gosud. Ed., 20–22, (in Russian).
- [10] PACHEV I. (2013) Survey of the influence of leaf-nutrition preparation “Foliarel-proti – Bor” in spring forage peas, *Bulg. J. Soil Sci. Agrochem. Ecol.*, **47**(2), 44–47, (in Bulgarian).
- [11] PETKOVA Z., M. NAZARKOV, I. GERASIMOVA, M. NENOV (2025) Testing the effectiveness of new liquid organic and mineral fertilizers in a field experiment with wheat, *Bulg. J. Crop Sci.*, **62**(2) 3–15, (in Bulgarian with English abstract).
- [12] ABO-AHMEDEH H., A. MHASNEH, H. RAWASHDEH (2020) Using soil and foliar applications of some fertilizers to improve the yield and quality parameters of table grapes (*Vitis vinifera* L.), *Bulletin UASVM Agriculture*, **77**(1), <https://doi.org/10.15835/buasvmcn-agr:2019.0016>.
- [13] SALA F., A. DOBREI (2015) Managing the yield and quality of grapes by calcium supplementing on foliar way, *Bulletin USAMV Horticulture*, **72**(2), 403–410, <https://doi.org/10.15835/buasvmcn-hort:11362>.
- [14] SOURI M. K., M. HATAMIAN (2019) Aminochelates in plant nutrition; a review, *J. Plant Nutr.*, **42**(1), 67–78.
- [15] YOUNUS WANI M., M. R. MIR, M. F. BAQUAL et al. (2017) Role of foliar sprays in sericulture industry, *J. Pharmacogn. Phytochem.*, **6**(4), 1803–1806.
- [16] COLAPIETRA M., A. ALEXANDER (2006) Effect of foliar fertilization on yield and quality of table grapes, *Acta Hortic.*, **721**, 213–218, <https://doi.org/10.17660/ActaHortic.2006.721.28>.
- [17] LEGHARI S. J., N. A. WAHOCHO, G. M. LAGHARI et al. (2016) Role of nitrogen for plant growth and development: a review, *Adv. Environ. Biol.*, **10**(9), 209–218.

- [18] KATEROV K., A. DONCHEV, M. KONDAREV et al. (1990) Methodology for the study and description of grapevine varieties and rootstocks, Bulgarian Ampelography, vol. 1, Bulgarian Academy of Sciences, 280 pp, (in Bulgarian).
- [19] LAZAREVSKIY M. (1959) Grapes varieties. In: State Publ. House Agricultural Literature, 420 pp, 35–39, (in Russian).
- [20] MIHAYLOVA P., F. STRAKHA, P. APOSTOLOV (1982) Plant Protection Forecast and Signalling, Sofia, Zemizdat, 214–215, (in Bulgarian).

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