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Influence of Mineral and Organo-Mineral Fertilizers on the Growth, Development and Yield of Grapes in Foothills

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Abstract: The article studied the influence of mineral and organo-mineral fertilizers on the growth, development and yield of grapes in the foothill areas. The growth of shoots, yield, sugar content and acidity of Oq Kishmish grape variety were determined. When studying the effect of mineral and organo-mineral fertilizers, the growth of shoots was 38.6 and 54.2 cm compared with the control when using nitrogen fertilizers and N120P90K30 on a potassium background. It has been proven that the yield increases by 4.51 t/ha when using mineral fertilizers (N120P90K30) and by 6.35 t/ha when feeding plants against the background of N120P90K30 + 5 t/ha of manure. It has been established that the application of fertilizers together with manure increases the sugar content of grape juice by 1.3% and reduces its acidity by 0.4 g/l.

Keywords: grapes, mineral fertilizers, organic fertilizers, cluster, berry, shoot, yield, sugar content, acidity.

Preface. The theory of plant nutrition is inextricably linked not only with the quantity of the crop, but also with its quality. Changes in plant nutrition lead to a change in the structure of the crop. By applying a certain combination of nutrients and various methods of applying fertilizers, it is possible to induce in the plant such a course of metabolism that leads not only to an increase in yield, but also to a change in its quality.

Of all the fertilizers applied to vineyards, nitrogen fertilizers are of great importance. It is known that nitrogen is the most important nitrogenous substance - an amino acid, primarily chlorophyll, which plays an important role in photosynthesis, is part of the nucleic acids in the substance of cell nuclei. The growth and development of grapes are highly dependent on the nature of nitrogen metabolism.

Phosphorus in plants is mainly part of complex proteins that play an important role in building the cell nucleus and other organic compounds. It accelerates a number of enzymatic processes. The high supply of phosphorus to plants indicates the dependence of the yield coefficient and the rate of accumulation of sugars in bunches, and its deficiency reduces the growth energy of branches and the level of productivity.

Grapes are among the crops that consume a lot of potassium, and suffer greatly from its lack in the soil. It is of great importance in the life of grapes and affects not only the increase in the yield of grapes, but also the improvement of its quality [5]; [6]; [7]. Mineral and organic nutrition in increasing the yield of different grape varieties and the quality of bunches [1]; [3]; [4]; [12]; as well

as the importance of microfertilizers [2]; [10]; effective recommendations for production were studied and given.

Organic fertilizers are the main means of maintaining soil fertility. They enrich it with humus and increase the vital activity of organisms. However, despite the positive qualities of organic fertilizers, it is important to find more reasonable ways to use them due to their large deficit in many farms. One of the ways is the joint use of manure and mineral fertilizers [8]; [9]; [11].

Methods. Based on the above, in 2012-2018, experiments were carried out to study the effect of mineral and organo-mineral fertilizers on the development, yield and quality of grapes in the production conditions of the mountainous zone of the Tashkent region. Fertilizers are applied to a depth of 25-30 cm. The field consists of three lines, the middle of which is the count line.

On each plot were planted 240 plants. The experiments are repeated three times. Fertilizers of all variants were applied once in the second or third decade of November.

Scheme of experiment on the introduction of mineral fertilizers:

1. Fertilizers are not applied - control
2. K_{30} kg/ha
3. $N_{120}K_{30}$ kg/ha
4. $P_{90}K_{30}$ kg/ha
5. $N_{120}P_{90}K_{30}$ kg/ha

Scheme of the experience of combined application of organo-mineral fertilizers:

1. Control – 5 t/ha manure
2. K_{30}+5 t/ha manure
3. $N_{120}K_{30}$ +5 t/ha manure
4. $P_{90}K_{30}$ +5 t/ha manure
5. $N_{120}P_{90}K_{30}$+5 t/ha manure

The issue of the effectiveness of potash fertilizers in vineyards attracts special attention, since many studies show that most soils in Uzbekistan are very rich in gross potassium content, and crops grown in them do not need it in large quantities.

Results. Soil analysis was carried out in the third year of the experiment in order to determine the presence of mobile forms of nitrogen, phosphorus and potassium in the soil after repeated application of one or another type of fertilizer to the vineyards. It follows from them that, depending on the variant of the experiment, the amount of one or another element in the soil increases. At the same time, when combined with other types of fertilizers, more potassium and phosphorus are removed from the soil. Thus, the amount of potassium in the soil when used separately is 108.84 mg, when used together with nitrogen and phosphorus - 96.45 mg, when phosphorus is used separately - 1.80 mg, when used together with potassium and nitrogen - 1.59 mg. All this speaks in favor of the complex use of fertilizers (Table-1).

As a result of monitoring the development of plants during the growing season, the relationship between the applied combinations of mineral and organic fertilizers, the dynamics of their composition in the soil, the development and productivity of plants was determined.

Table-1 **The content of nutrients in the soil for the third year of the study**

Scheme	Total nitrogen, %	P_2O_5, mg in 100 g soil	K_2O, mg in 100 g soil
Fertilizers are not applied - control	0,091	1,20	83,43
N_{120}	0,107	1,20	88,47
P_{90}	0,100	1,80	86,35
K_{30}	0,104	1,46	108,84
$N_{120}P_{90}K_{30}$	0,106	1,59	96,45

Effective seedling growth, as expected, occurred due to the use of nitrogen fertilizers, as well as N120P90K30 against a potassium background. In these variants, compared with control plants, the growth of branches was 38.6 and 54.2 cm. The introduction of only potassium, as well as phosphorus against its background, did not reveal a significant difference in the growth of branches.

The applied mineral fertilizers had a greater impact on the productivity and quality of plants. So, when potassium was introduced into the soil at the rate of 30 kg/ha, an increase in yield was obtained compared to the control (unfertilized background) - 0.73 t/ha, in variants N120 P90 with 30 kg of potassium, the yield is 1.48 and 1, respectively, increased at 79 t/ha. It can be seen here that potassium acts as a catalyst for the absorption of nitrogen and phosphorus from the soil. Even more reliably, our assumption was manifested in the complex application of mineral fertilizers. Here, the yield increase compared to the control was 4.5 t/ha or 61.4%, and against the background of NK and PK - 41.3 and 37.1%, respectively.

Studies on the use of the above mineral fertilizers and their quantities against the background of a small amount of organic fertilizers (5 t/ha of manure) have shown that only 5 t/ha of organic fertilizer is ineffective. Compared to the unfertilized background, productivity increased significantly, but the effect of their use was much higher compared to other mineral fertilizers. So, if the maximum yield increase from the use of mineral fertilizers (NPK) is 4.51 t/ha, then when plants are fed against the background of NPK + 5 t/ha of manure, it is 6.35 t/ha, i.e., an additional increase in yield per due to the use of organic fertilizers 1.56 t/ha (Table-2).

In our opinion, the effectiveness of introducing potassium into the soil together with phosphorus and nitrogen is explained by the fact that potassium is necessary for grapes not only as a nutrient, but also as a means of regulating the supply of nitrogen to the plant.

The use of mineral fertilizers with manure provides different absorption of nutrients. In addition, the complex application of fertilizers allows you to properly nourish the plants for a long time. In this case, first of all, plants use batteries from fast-acting mineral fertilizers, which corresponds to the period of the plant's greatest need for nutrients.

The application of fertilizers along with manure increased the sugar content of grape juice by 1.3% with an increase in yield. No significant changes were observed in the composition of titratable acids, except for a slight decrease in their amount with the introduction of potash fertilizers and, conversely, a tendency to increase with the introduction of nitrogen fertilizers.

Table-2 the influence of mineral and organo-mineral nutrition on the development and yield of Oq Kishmis grapes

Variants	Growth, sm	Yield, t/ha	Growth of yield, t/ha	Sugar content, %	Acidity, g/l
Fertilizers are not applied - control	69,7	7,34	-	24,2	5,8
K_{30} kg/ha	73,0	8,07	0,73	24,5	5,6
N_{120} K_{30} kg/ha	108,3	8,82	1,48	24,8	5,7
P_{90} K_{30} kg/ha	77,1	9,13	1,79	25,2	5,5
N_{120} P_{90} K_{30} kg/ha - control	123,9	11,85	4,51	25,5	5,5
Manure 5 t/ha	80,2	7,90	-	24,9	5,6
K_{30}+5 t/ha manure	84,4	9,57	1,67	25,4	5,6
N_{120} K_{30}+5 t/ha manure	99,3	10,93	3,03	25,3	5,7
P_{90} K_{30}+5 t/ha manure	88,7	11,58	3,68	25,5	5,5
N_{120} P_{90} K_{30}+5 t/ha manure	142,9	14,25	6,91	25,5	5,4
$HCP_{0,5}$, t/ha		0,082			

Conclusion. When studying the effect of mineral and organo-mineral fertilizers on the growth, productivity, sugar content and acidity of the Izyum Bely grape variety, the growth of branches was 38.6 and 54.2 cm compared with the control when nitrogen fertilizers and N120P90K30 were applied. used on a potassium background. With the use of mineral fertilizers (N120P90K30 kg/ha),

an increase in yield by 4.51 t/ha was established, and when plants were fed against the background of N120P90K30 + 5 t/ha of manure - 6.35 t/ha. The application of fertilizers together with manure led to an increase in the sugar content of grape juice by 1.3% and a decrease in acidity by 0.4 g/l.

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