



**JOURNAL OF ADVANCED  
SCIENTIFIC RESEARCH**

**ISSN: 0976-9595**

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## **PRODUCTIVITY AND QUALITY OF VEGETABLE CROPS DEPENDING ON THE APPLICATION OF MINERAL NUTRITION IN GREENHOUSES OF UZBEKISTAN**

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**Abstract:** The article describes data from many years of research in which it was established that with the correct organization of mineral nutrition in protected soil on cucumber and tomato crops, the content of nitrate nitrogen in fruits in glass and film greenhouses does not exceed the permissible concentration. The limit of permissible concentration of nitrates in cucumbers in protected soil is 300 mg/kg, for tomatoes 150 mg/kg of fresh produce in Uzbekistan.

**Keywords:** protected soil, greenhouses, cucumbers, tomatoes, mineral nutrition, nitrates, harvest, and quality.

### **Introduction**

Specific features of protected soil are low illumination in the autumn-winter months, high relative air humidity, overheating of plants in spring-summer, rapid development and accumulation of pests and diseases. Even during one rotation, plants experience such fluctuations in external conditions during the growing season that varieties that are not adapted to this lose a significant part of their generative organs. Therefore, the selection of varieties and hybrids for certain periods of cultivation in protected soil is extremely important and further determines the features of technology and the size of the harvest. Tomato varieties for greenhouse production must be high-yielding, have high taste and marketable qualities of the fruit, be able to set fruit well in low light conditions, and be resistant to diseases and pests [2, 6, 8].

One of the main problems in protected soil is the excessive accumulation of nitrates due to the introduction of high doses of mineral fertilizers to obtain high yields of vegetables. The toxicity of nitrates and nitrites is due to the fact that carcinogens accumulate in them. When consuming large quantities of vegetable and

melon products containing nitrates, poisoning of the body occurs, leading in some cases to death [3, 4, 5].

In greenhouse vegetables, the accumulation of nitrates is observed much more often than in open ground vegetables, since high yields lead to a significant removal of nutrients, which in turn necessitates the application of high doses of organo-mineral fertilizers [1, 4].

### **Research methodology**

The research was carried out at the Research Institute of Vegetables, Melons and Potatoes. Our research has established that with proper nutrition, the content of nitrate nitrogen in the fruits of cucumbers and tomatoes in glass and film greenhouses does not exceed the permissible concentration.

As is known, the limit of permissible concentration of nitrates in cucumbers in protected soil in Uzbekistan is 300 mg/kg, for tomatoes 150 mg/kg of fresh produce [7].

### **Research results**

Research conducted by the Laboratory of Vegetable Growing of Protected Soil of the Scientific Research Institute of Vegetables, Melons and Potatoes in 2014-2019. It has been established that the nitrate content in vegetable products of protected soil largely depends on the varietal characteristics of cucumber and tomato and the time of determination of this indicator. In winter and early spring, the accumulation of nitrates in tomatoes and cucumbers is much higher than in spring and summer. The nitrate content in cucumbers and tomatoes grown in winter-spring rotation is given in Table 1.

As can be seen from these data, the nitrate content in tomatoes and cucumbers does not exceed the maximum permissible concentration. It should be noted that vegetable samples were taken from areas where the technology for growing greenhouse vegetables was not violated.

The lower nitrate content in April, May and June is explained by the fact that high air temperatures in greenhouses during this period contribute to a more rapid

reduction of nitrates to ammonia, which, in turn, interacts with other organic compounds, forming amino acids and amides.

**Table 1.**

**Yield and quality of tomato and cucumber fruits when grown in unheated greenhouses in the Tashkent region**

| Variety name             | Marketable harvest, kg/m <sup>2</sup> | Average fetal weight, g. | Dry soluble substance, % | Total Sugars, % | Ascorbic acid | Nitrate nitrogen mg/kg | Tasting mark, score |
|--------------------------|---------------------------------------|--------------------------|--------------------------|-----------------|---------------|------------------------|---------------------|
| <b>Cucumber</b>          |                                       |                          |                          |                 |               |                        |                     |
| F <sub>1</sub> Ekspoza   | 12,6                                  | 156                      | 5,81                     | 1,84            | 7,84          | 139                    | 4,0                 |
| F <sub>1</sub> Artist    | 12,2                                  | 128                      | 4,93                     | 1,92            | 8,73          | 140                    | 4,0                 |
| F <sub>1</sub> Orzu      | 11,5                                  | 110                      | 4,30                     | 2,03            | 11,20         | 136                    | 5,0                 |
| F <sub>1</sub> Multistar | 18,5                                  | 280                      | 4,27                     | 2,38            | 10,30         | 145                    | 5,0                 |
| <b>Tomatoes</b>          |                                       |                          |                          |                 |               |                        |                     |
| F <sub>1</sub> Bella     | 12,2                                  | 145                      | 5,8                      | 4,4             | 22,2          | 80                     | 4,0                 |
| F <sub>1</sub> Saixun    | 12,7                                  | 130                      | 5,0                      | 5,6             | 23,0          | 74                     | 4,5                 |
| Gulkand                  | 8,1                                   | 180                      | 5,0                      | 5,6             | 24,1          | 74                     | 5,0                 |
| AVE-Mariya               | 10,0                                  | 110                      | 5,2                      | 5,1             | 23,4          | 76                     | 4,8                 |
| Marvarid cherry          | 9,2                                   | 22                       | 7,2                      | 5,0             | 24,0          | 72                     | 5,0                 |

We have established that with a two-rotation culture, the nutritional system of cucumbers and tomatoes should be based on the content of organic matter in the soil and the actual content of nutrients, established by agrochemical analysis of the water extract in a ratio of 1:5 (1 part soil, 5 parts water) [4].

When growing greenhouse cucumbers in soil, the organic content was at the level of 25 - 30%, when growing greenhouse tomatoes - at least 15 - 20%, the content of available phosphorus when growing tomatoes in the autumn - winter rotation was maintained at the level of 6 - 8 mg / 100 g. , in winter – spring 8 – 10 mg/100 g.

It should be noted that the content of total potassium was quite high, however, the content of water-soluble potassium, especially in the autumn-winter turnover, was relatively small, no more than 50 - 70 mg/100 g of soil, which necessitated the addition of potassium sulfate. The content of mobile (water-soluble potassium)

during cucumber cultivation in autumn-winter rotation was at least 90-100 mg/100 g of soil, in winter-spring rotation it was no less than 80.

The most difficult was to maintain the optimal level of nitrogen nutrition, we found that the nitrogen content (nitrate + ammic) when growing cucumbers in the autumn-winter rotation should not exceed the optimal level by more than 1/3, which at a 30% level of organic matter in the soil is 33 - 35 mg/100 g, with a higher nitrogen content the content of nitrate nitrogen in greens increases significantly to 180 - 200 mg/kg of wet weight of fruits.

When growing tomatoes, the nitrate nitrogen content may increase slightly, especially in the winter-spring rotation, since tomatoes accumulate a small amount of nitrates. For example, in the autumn-winter rotation, we observed an increase in nitrate nitrogen in tomato fruits only at the content of 100 mg/100 g of soil, and in the winter-spring with a content of 150 mg/100 g of nitrate nitrogen, while the nitrate content in the fruits did not exceed the permissible limit and amounted to 120 mg/1 kg of wet weight (MPC 150 mg/kg). At the same time, the calcium content in the soils was maintained at the level of 90 – 100 mg/100 g, and the magnesium content did not increase beyond 30 mg/100 g of the soil.

However, when applying manure of at least 300 t/ha to soils, it is not necessary to introduce trace elements, they should be used for foliar feeding when growing seedlings and plants (tomatoes at least 3-4 times, cucumbers at least 3-5 times), and, finally, during the growing season, it is necessary to monitor the content of water-soluble salts in the soil. If their content is above the permissible limit, then during the growing season, the plant needs to be watered frequently, but at small rates, and after the end of the crop, carry out high-quality washing according to the results of the analysis with good drainage [1].

Therefore, the correct use of mineral fertilizers in our conditions allows us to obtain a stable yield of cucumber in the autumn-winter turnover up to 10 kg/m<sup>2</sup>, tomato up to 7-8 kg/m<sup>2</sup>; in winter-spring turnover, respectively, 12 – 15 and 10 – 12 kg/m<sup>2</sup> and with a low content of nitrate nitrogen for cucumbers, depending on the

variety, maximum 136 – 145 mg% (MPC) 300 mg%) and tomatoes 72-80 mg% (MPC – 150 mg% [5, 7].

A convincing example of this is the greenhouse complexes "Limonchilik" of the Kibray district and "Bio Zerno" of the Zangiota district, which use the levels of mineral nutrition recommended by us.

### **Conclusion**

Our research has established that with the proper organization of mineral nutrition of cucumbers and tomatoes, the content of nitrate nitrogen in fruits in glazed and film greenhouses does not exceed the permissible concentration, the limit of the permissible concentration of nitrates in protected ground in cucumbers is 300 mg/kg, for tomatoes 150 mg/kg of fresh products in Uzbekistan.

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