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EFFECTS OF MINERAL AND BIOHUMUS FERTILIZERS ON TOMATOES GROWN IN GREENHOUSES ON TYPICAL GRAY SOILS

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Abstract
Among the crops of our republic, tomatoes hold an important place, and they are widely grown in our country. Therefore, to meet the demand of the population for fresh fruits and the canning industry, it is necessary to increase the volume of tomato production. This can be achieved not only by creating new high-yielding varieties but also by improving the productivity through modern technologies of tomato cultivation.

Keywords: Rich in minerals, tomato cultivation in warm areas, improved quality of production.

Introduction

Due to its valuable and dietary properties, tomatoes are considered one of the most widely cultivated vegetable crops worldwide. Today, there are more than a thousand varieties of tomatoes, and they are grown in open and protected fields (such as heated greenhouses). Currently, approximately 4.4 million hectares produce a total of 153 million tons globally. The main tomato-producing countries are China (45.4 million tons), the United States (14.14 million tons), India (11.15 million tons), Turkey (10.7 million tons), and Egypt (10.0 million tons). In Uzbekistan, tomatoes are one of the primary vegetable crops, accounting for 40-45% of the total vegetable cultivation area. In 2010, tomatoes were grown on 75,000 hectares of land in Uzbekistan. About 70% of the total production is processed, 10-15% is sold in the local market, and 15-20% is exported.

In Uzbekistan, the cultivation of tomatoes is carried out according to the following plan: Shafaq and Sevara for early ripening; Peremoga-165, Vostok-36, Progressivniy for mid-season; Volgogradskiy 5/95, TMK-22, Novinka Pridnestrovya, Bahodir, O‘zbekiston-178,

Surxon-142, as well as Namuna varieties, Sulton F1, Soprano F1, and Superstreyn for mid-late season; and Oktabr 60, Yusupovskiy, and Doni-2000 for late-season planting.

The selection of suitable land involves well-fertilized soil with a balanced mechanical composition, and it is favorable for tomato cultivation in loamy, loamy-sandy, and typical sandy soils. Specifically, tomatoes thrive in fertile soils, including organic (peat, compost, manure, coconut coir, etc.) and inorganic (perlite, vermiculite, mineral wool, etc.) environments. In greenhouses, tomatoes are mainly grown in soil or in organic and inorganic substrates. In greenhouses, the first-generation hybrid varieties of tomatoes are primarily cultivated.

In Uzbekistan, tomatoes are grown in heated greenhouses throughout the year to provide the population with fresh produce during the late autumn, winter, and early spring seasons. When grown in open fields, tomatoes can yield up to 100-150 tons per hectare, while in modern greenhouses, this figure can reach 600 tons per hectare. In greenhouses, tomatoes are grown primarily in soil or in organic and inorganic substrates (peat, compost, manure, coconut coir, perlite, vermiculite, mineral wool, etc.). In greenhouses, first-generation hybrid tomato varieties are primarily cultivated. In Uzbekistan, tomatoes are grown in heated greenhouses for three seasons to ensure year-round supply of fresh fruits: late autumn-winter (from August to January), winter-spring (from January to July), and long-term (starting in August and continuing until the next July).

In this way, taking into account the factors mentioned above, mineral fertilizers, and other factors affecting the growth, development, and productivity of tomatoes, experimental results have been analyzed. In the Republic and in the regions of our country, there are a total of 3,157 farmer horticultural enterprises and 6,297 hectares of greenhouse horticulture. Thus, 3,000 farmer horticultural enterprises and agricultural enterprises operate in 5,229 hectares of greenhouses.

During the months of January to December in 2022, a total of 301,000 tons of agricultural products were produced in greenhouses. Among them, 211,000 tons of tomatoes were harvested. The products grown in the greenhouses were mainly exported to Russia and neighboring countries.

Research Methods:

Tomato cultivation, which requires a high demand for phosphorus, necessitates the application of 150-170 kg of potassium, 200-250 kg of nitrogen, and 250 kg of phosphorus per hectare to obtain a yield of 301,000-302,000 tons from 1 hectare of land. The application of potassium improves the hydrophilic properties of the soil and enhances its water retention capacity. The deficiency of potassium leads to the breakdown of the balance between nitrogen, phosphorus, and carbohydrates in tomatoes.

The accumulation of a large amount of carbohydrates in the fruits and stems leads to their softening and deterioration during storage. The decrease in potassium availability in the soil year by year has resulted in a decrease in its content in tomato plants.

Results of the research and their discussion: The provision of crops with essential nutrients plays a vital role in their growth and development during the vegetative phase. Proper nutrition with macro and microelements not only ensures the normal development of vegetative organs of crops but also enhances their yield.

Based on the research results from all experimental variants, no significant differences were observed in the growth and development phenophases of crops during the transition periods. Differences in the growth and development of crops during the phenophase were identified in the course of a 3-year study.

The identified differences during the growth phenophase of crops can be explained by the various sowing dates and the microclimatic conditions of the greenhouse in different years when the research was conducted.

After obtaining the first harvest, the initial root length directly measured showed its dependence on mineral-organic nutrition (3.4 For example, during 3 years of observation, the average root length in plots using only NPK fertilizer was 121+4.39 cm, significantly lower compared to other variants with additional compost or biogas. Adding compost at a rate of 15t/ha once (N180:P225:K135+BG15) was statistically less effective than the higher additions. However, the supplementary application of biogas led to an increase in the primary root length, reaching 133.4+6.18 cm (N250:P250:K150+BG30) and 138.8+4.08 cm (N250:P250:K150+BG45).

It can be seen from this that a one-time application of 45t/ha of biogas compared to 15t/ha resulted in a greater increase in the primary root length and the growth of lateral roots.

The scientific research on the nutrition of plants with microelements through nitrogen and the provision of green crops with N, P, and K fertilizers by Kirilov and Sengak (143,114) from foreign and republic competitions revealed issues related to nutrient supply. It was found that the deficiency of minerals in the soil leads to a decrease in the yield of green crops. In their study aimed at improving the effectiveness of introducing fertilizers into green crop cultivation, Asadov and Gadjiev (13) recommended periodic application of mineral fertilizers throughout the vegetation period to provide plants with essential elements for their nutrition. According to the authors, the calculation of the application rate depends on the utilization coefficient, with phosphorus being applied at 60% when plowing, 30% nitrogen and potassium before sowing, 20% phosphorus, potassium, and nitrogen for top dressing, and 10% phosphorus and up to 25% nitrogen and potassium in subsequent fertilization before flowering. Nuriddinov and Berejnov (63) determined the quality of manure and found that it contains a total nitrogen content of 0.37% and N-NO3 at a concentration of 31/35 mg/kg. Papova and Gerosimov (69) demonstrated the possibility of adding mineral fertilizers in the form of urea solution to supplement the necessary nutrients for plants. In this case, the nitrate content in nitrogen applied to the greenhouse soil is relatively reduced.

Conclusion

Under the conditions of chemically fertilized soil, the use of biogas as a source of nutrients for tomato cultivation is possible. Applying 45-60 t/ha of biogas at a ratio of N250-260: P250: K150 provides optimal conditions for plant nutrition. When mineral fertilizers are applied together with biogas, there is an increase in the elements that contribute to plant nutrition. The optimal content of nitrogen, phosphorus, and potassium taken in an NPK ratio of 45-60 t/ha of biogas is observed.

The application of biogas three or four times at a rate of 15 t/ha on an NPK basis compared to the variant with 75 t/ha of manure increases the yield, mass, and market value of the fruits.

The introduction of 45 and 60 t/ha of biogas at a rate of 15 t/ha on an NPK basis resulted in an average of 16.8 and 17.4 kg/m2 over three years.

With the application of 45 t/ha of biogas at an N250-260: P250: K150 ratio, the yield was achieved.

References

1. In a study aimed at improving the effectiveness of introducing fertilizers into Asadov and Gadjiev's (13) vegetable crops, it is recommended to apply mineral fertilizers periodically throughout the entire vegetation period to provide the plant with essential nutrients for growth.
2. Nuriddinov and Berejnov (63) identified the composition of humus, noting that it contains 0.37% total nitrogen, with N-NO3 at a concentration of 31/35 mg/kg. As a nitrogen source, humus can contribute to the nutritional needs of vegetable crops in the

soil. For instance, if there is 2% organic matter in a 30 cm soil layer, it can provide 400 kg/ha of organic nitrogen.

3. Papov and Gerosimov (69) demonstrated the possibility of supplementing the complete nutrition of plants with the necessary mineral fertilizers by adding urea solution at a concentration of 0.2-0.5% as an additional source of nitrogen. In this way, the nitrate content in the soil would be reduced compared to adding nitrogen to the hotbed soil.