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Study Of The Influence Of Dry Forms Of Complex Mineral And Biomineral Fertilizers On The Microbial Community Of Soil Under Vegetable Crops

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Abstract

The article presents the results of studies on the influence of dry forms of complex mineral and biomaterial fertilizers on the number of different physiological groups of soil microorganisms under vegetable crops (tomatoes, bell peppers, eggplants). It has been established that complex biomineral fertilizers of the FAN-AGRO BIO series create favorable conditions for the reproduction of beneficial soil micro flora in the arable soil layer and balance it in favor of agronomic ally beneficial microorganisms.

Keywords: complex mineral and biomineral fertilizers, physiological group of microorganisms, microbial community, soil, vegetable crops.

Introduction.

The soil is a favorable environment for the habitation and reproduction of many microorganisms, the content of which depends on the type of soil and its condition.

In world agriculture, a wide range of different types and forms of fertilizers are used. By the nature of the effect on the soil and plant growth, fertilizers are divided into direct and indirect. The introduction of direct fertilizers improves plant nutrition concerning

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nitrogen, phosphorus, potassium, and other elements (respectively, nitrogen, phosphorus, potassium, and other fertilizers). Indirect sources include lime, gypsum, and other fertilizers, which improve, first of all, the structure and other physical characteristics of

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soils [1].

Constant application of various fertilizers over a long period allows stabilizing the microbial community of agrocenoses. Long-term use of high doses of mineral fertilizers reduces the stability of soil microbial cenosis, which significantly increases the range of fluctuations in the number of microorganisms. The influence of agricultural technologies on the microbiota when growing crops is very significant. This circumstance makes it necessary to develop scientific foundations for obtaining agricultural products and reproducing soil fertility, considering the state of microbial soil cenosis [2].

Fertilization, in turn, causes changes in the structure and functions of microbial communities. Under the influence of various fertilization systems, biological processes are activated in it. The application of fertilizers enhances the vital activity of physiological microorganisms and increases their number [3]. The species composition of agrocenosis plants can affect the processes associated with the activity of microorganisms in the soil not only qualitatively, but also quantitatively. Microbiological processes are the basis of the circulation of substances and energy in nature, as a result of which the soil itself and its fertility are born [4].

Currently, the issue of preserving the fertility of arable soils is very important and urgent.Mineral fertilizers are applied to the soil in a scattered form and quickly, within a few days, especially phosphorus and potash fertilizers, are fixed in the soil and turn into forms inaccessible to plants. Therefore, in order to increase the utilization rate of mineral fertilizers, we have previously created new biomineral fertilizers by biological modification of granules of complex mineral fertilizers of the FAN-AGRO series [5], created on the basis of local raw materials and produced by FAN-DON LLC, the bacterial fertilizer Fosstim-3 [6].

The aim of the study was to study the effect of dry forms of complex mineral and biomineral fertilizers on the number of different physiological groups of soil microorganisms under vegetable crops.

Research Methods

The objects of research were complex mineral fertilizers of the FAN-AGRO series and biomineral fertilizers of the FAN-AGRO BIO series, sierozem soils of the Research Institute of Vegetable and Melon Crops and Potatoes, seedlings of tomatoes, bell peppers, eggplant.

To determine the number and composition of microorganisms, the method of soil dilutions was used with sowing on several solid and liquid nutrient media in three replicates on the day of sampling. The experiment took into account the number of several physiological groups of microorganisms: ammonifying bacteria - on meat-peptone agar (MPA); phosphate-mobilizing bacteria - on Pikovskaya's medium; oligonitrophilic microorganisms - on Ashby's medium; actinomycetes and micromycetes - on Czapek's medium; cellulose-decomposing aerobic microorganisms - on Hutchinson's medium; cellulose-decomposing anaerobic microorganisms - on Omelyanskaya environment; butyric acid bacteria, phase I and II nitrifiers - on Vinogradsky medium [7]. For preliminary desorption of microorganisms, the soil suspension was shaken for 5 min. Seeding was carried out from dilutions 10^3-10^6.

Statistical processing of the data obtained was carried out using generally accepted

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statistical criteria [8].

Results and its discussion.

Field trials of new dry forms of complex biomineral fertilizers FAN-AGRO BIO series 03, 04 and 09 were carried out on vegetable crops (tomatoes, bell peppers, eggplant) at the Research Institute of Vegetable, Melons and Potatoes.

We have studied the effect of dry forms of complex mineral and biomineral fertilizers on the number of soil microbial communities in the arable layer of soils under various vegetable crops at the end of the growing season**.** The number of ammonifiers in soils, in variants with biomineral fertilizers of the FAN-AGRO BIO series under all studied vegetable crops, was 1 order of magnitude lower than in variants with mineral fertilizers of the FAN-AGRO series, which indicates a better assimilation of organic nitrogen from the soil by plants. The number of phosphate-mobilizing bacteria in variants with biomineral fertilizers of the FAN-AGRO BIO series under all studied vegetable crops ranged from $6.5x10^4$ to $7.5x10^5$ CFU / g soil, in variants with mineral fertilizers of the FAN-AGRO series they were not found, which indicates the survival rate and reproduction in the soil in the root zone of vegetable crops immobilized on mineral fertilizers phosphorus-mobilizing bacteria and the better assimilation of phosphorus by plants. The number of oligonitrophilic bacteria in the soil in the variants with biomineral fertilizers of the FAN-AGRO BIO series was on the same order of magnitude with the variants with mineral fertilizers of the FAN-AGRO series under the crops of tomatoes and bell pepper, and under the culture of eggplant - by 1 order of magnitude higher than in the variant with mineral fertilizers of the FAN-AGRO series, which indicates better assimilation of humic substances from the soil.

The number of actinomycetes in the soil in the variants with biomineral fertilizers of the FAN-AGRO BIO series was on the same order of magnitude with the variants with mineral fertilizers of the FAN-AGRO series under the crops of tomatoes and bell pepper, and under the culture of eggplant - by 1 order of magnitude higher compared to the variant with mineral fertilizers of the FAN-AGRO series.

The number of micromycetes in soils in variants with biomineral fertilizers of the FAN-AGRO BIO series under all studied vegetable crops was 2 orders of magnitude lower compared to variants with mineral fertilizers of the FAN-AGRO series, which is a good indicator for soils, since it does not cause an imbalance in soil microbial community (Fig. 1.).

The cellulose-decomposing capacity of the soil is one of the indicators of biological activity, which can vary depending on the type of fertilizer applied. The rate of cellulose decomposition can quite fully reflect the general direction of microbiological processes in the soil [4].

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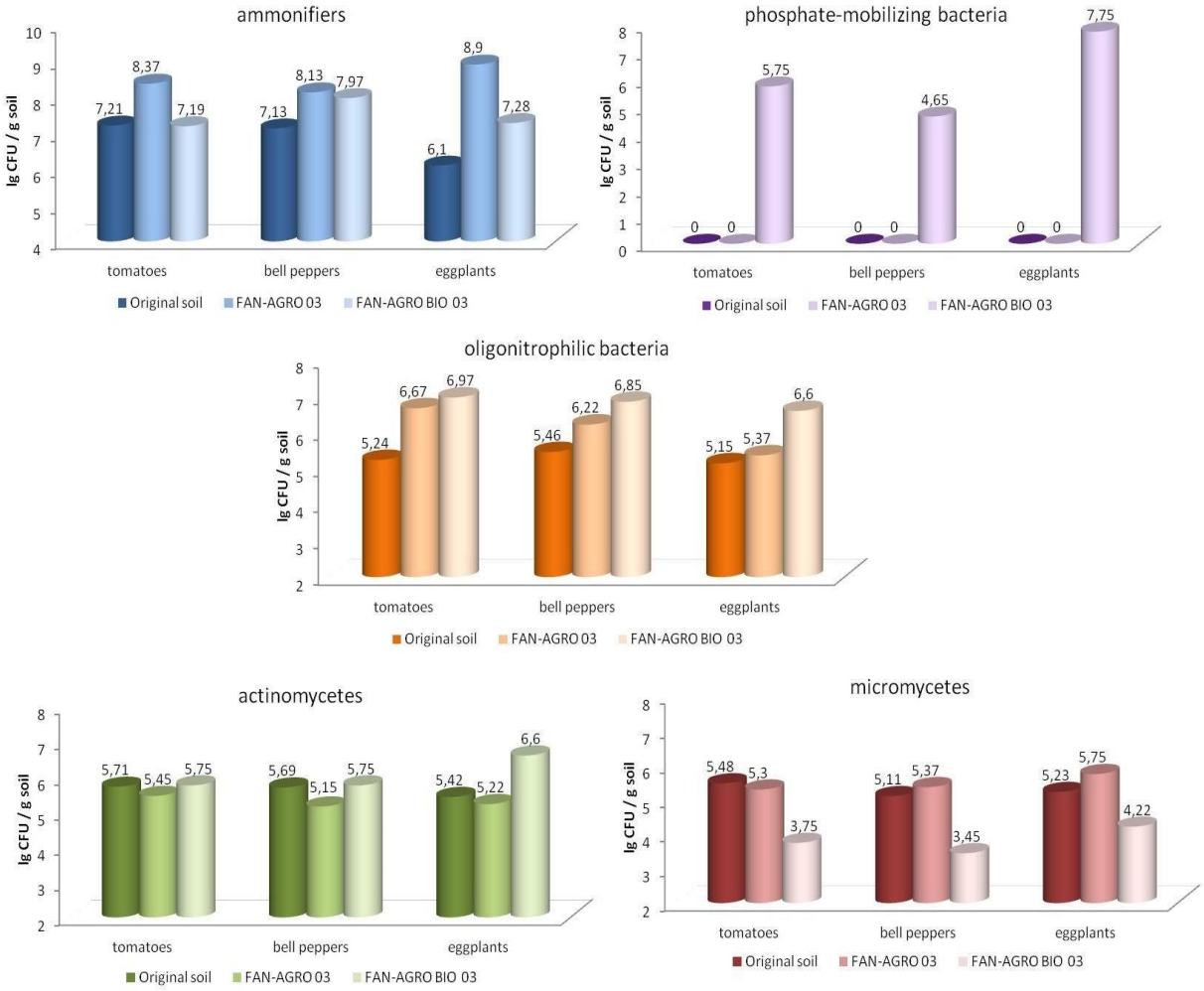

Fig. 1. The influence of complex mineral and biomineral fertilizers on the number of agronomically important groups of microorganisms in the arable layer of the soil under vegetable crops (lg CFU / g soil)

The number of cellulose-decomposing aerobic and anaerobic, butyric acid bacteria, nitrifying bacteria of the I and II phases was 1-2 orders of magnitude higher in soils in variants with biomineral fertilizers of the FAN-AGRO BIO series under all studied vegetable crops, in comparison with variants with mineral fertilizers of the FAN-series. AGRO, which is a good indicator for soils, since it does not cause an imbalance in the soil microbial community.

Conclusion

Thus, on the basis of the conducted microbiological studies of soils to study the effect of complex mineral and biomineral fertilizers on the soil microbial community under vegetable crops (tomatoes, bell peppers, eggplants), it can be concluded that new complex biomineral fertilizers of the FAN-AGRO BIO series are created in the arable layer of soils favorable conditions for the reproduction of beneficial soil microflora and adjust its

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balance in favor of agronomically beneficial microorganisms, which in turn leads to better development of the root system of plants and better assimilation of nutrients in the studied vegetable crops, as evidenced by an increase in biometric indicators of plant growth and development and the yield of vegetable crops.

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