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Influence Of Biological Preparations And Their Metabolites On The Number And Seasonal Dynamics Of Micromycetes In The Ordinary Chernozems Of The Central Ciscaucasia.

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ABSTRACT

The article presents the results of a study of the state of microscopic fungi in ordinary chernozem using biological preparations. The use of biological products and their metabolites is one of the main ways to enhance the growth and development of maize plants, improve the quality of grain, increase productivity, increase plant resistance to diseases and pests. In addition, these drugs, thanks to a diverse range of effects, contribute to reducing the use of chemical plant protection products.

Keywords: micromycetes, chernozem, number of microorganisms, corn for grain.

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INTRODUCTION

Analysis of modern domestic and international experience in the use of beneficial microorganisms in agrobiotechnology confirms the possibility of creating highly productive plant-microbial systems and indicates the need to study the conditions for their effective functioning in certain soil and climatic conditions [2, 6-8]. This is due to the fact that the microbiota is an indispensable and integral component of the soil and is capable of exerting a complex effect on plants and soil in agrocenoses, since with its direct participation natural processes of biological nitrogen fixation, phosphate mobilization, growth stimulation, bioprotection, humus formation are carried out. Bacterization of seeds with microbial preparations facilitates the introduction into agrocenoses of agronomically beneficial microorganisms and is an element of organic farming, which is based on the methodology of environmentally safe technologies, the renewal of natural resources and their energy saving, healthier population [1, 3]. Possessing anti-stress properties, biological preparations increase plant resistance to excessive waterlogging or dryness, low and high temperatures, as well as frost. That is why their extensive use is an important factor in the effectiveness of the technology of cultivation of corn for grain. Recently, an integrated approach to the use of polyfunctional drugs, which have a growth regulating, anti-stress and protective effect, is becoming increasingly important [9, 10].

In the socio-economic development of the Central Ciscaucasia, an increase in the production of corn grain and an improvement in its quality are of crucial importance. However, until now, these indicators remain unstable, the potential capabilities of varieties are not fully disclosed, and the agrotechnical methods that are used in the cultivation of this crop are not well developed.

The goal of the research is to increase the productivity and quality of corn grain and increase soil fertility when using biological preparations and their metabolites on the black chernozem of the Central Ciscaucasia.

MATERIAL AND METHODS

The object of research is ordinary chernozems and polyfunctional microbial preparations and their metabolites: KBP - standard (complex of biological preparations), KBP - innovative (complex of biological preparations), PKM (policulture complex of microorganisms); KMP-92 (microbial preparation complex -92), nikfan, potassium humate, atlant.

Observations were carried out in 2017 on ordinary chernozem. Corn was planted for grain. The selection of soil samples was carried out from the rhizosphere of plants in corn crops from a layer of 0–20 cm using the generally accepted method (Methods of soil microbiology ..., 1991) with the principle of single-step research. Of the 5–7 point samples, an average sample was made. The number of micromycetes (total number of colony forming units - CFU) was studied by sowing soil suspension at a dilution of 10-2 on the Czapek - Doks medium, acidified with citric acid and supplemented with 100 μg / ml of streptomycin to suppress the growth of bacteria, followed by direct counting of colonies. Identification of fungi was carried out on the basis of cultural-morphological traits according to traditional determinants [1, 2].

The complex of microbial preparations (KBP), both standard and innovative, as well as KMP-92, is obtained by mechanical mixing of the finished preparations Diazofit, Phosphoenterin, Biopolycid in different proportions.

Diazofit - a biological product based on associative nitrogen-fixing bacteria, improves nitrogen nutrition of plants.

Phosphoenterin on the basis of microorganisms that mobilize hard-to-reach phosphates increases the utilization of phosphate fertilizers and soil phosphates.

Biopolycide is a biological product whose bioagent is microorganisms that suppress the growth of phytopathogens.

Biologics are also stimulants of plant growth and development, contribute to increasing plant resistance to biotic and abiotic stress factors.

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The dominant functions of biological agents: Agrobacterium radiobacter 204 (nitrogen fixer), Bionova microbial Diazofit (risogrin), Enterobacteriumipressuralis 32-3 (phosphatability, producer of phytohormones), the bioagent of the drug Phosphoenterine (FMB), Paenibacillus polymyxa P (antagonist of phytopathogenic micromycetes (14 species, acts at the level of chemical protectants Vitavax 200FF, Maxim) is able to fix atmospheric nitrogen, a very weak phosphatmobilizer) – Biopolycid (BSP).

Polyculture the complex of preparations (PKM) is created on the basis of bacteria antagonists of phytopathogens with growth - stimulating effect.

Paenibacillus polymyxa N + Bacillus sp.10 (associative with rice plants, phytopathogen antagonists, nitrogen fixator, stimulates the development of grain sprouts) + Bacillussubtilis 01-1 –phytopathogen antagonist.

Potassium HUMATE is a fertilizer with a large amount of humic acids (above 80 %), its application accelerates the growth and development of various plant species. Humates stimulate metabolic and biochemical processes in the soil.

Nikfan – plant growth stimulator based on the secretions endocrine of mycorrhizae.

Atlant - microbiological phosphorus-potassium fertilizer with the addition of microorganisms of the genus Bacillus sp.

Culture: corn hybrid Mashuk 355 and Veralia.

RESULTS AND DISCUSSION

Of great importance in the decomposition of organic residues are microscopic fungi. In the soil they are contained both in the form of spores and in the form of physiologically active mycelium. Most of them are saprophytes.

Fungi can decompose highly persistent organic soil compounds and are able to make much more complete use of the energy of organic substances than bacteria; under aerobic conditions, they completely oxidize organic matter to CO_2 and H_2O, and in anaerobic, not fully oxidized metabolites can accumulate in the soil. During the day, the mushrooms decompose 2-7 times more organic matter than they consume. In addition, mushrooms begin the destruction of such persistent compounds as lignin, chitin, fiber, tannins. Mushrooms are actively involved in the transformation of nitrogen compounds and contribute to the improvement of soil structure, aggregating soil particles. Many species are resistant to increased salt content in the soil and develop over wide pH ranges, although they prefer a weak acid reaction. However, mushrooms are very demanding to the conditions of aeration.

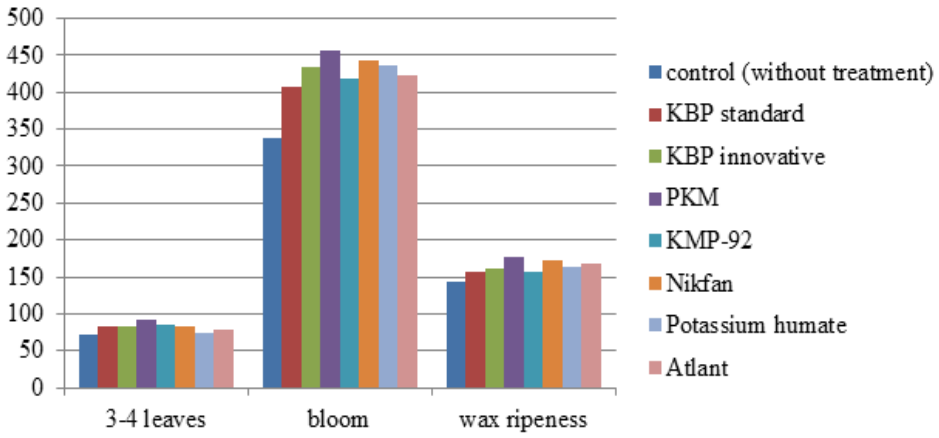

Figure 1: Dynamics of the number of microscopic fungi, thousand CFU / g

When analyzing the seasonal dynamics of the number of micromycetes in ordinary chernozem (figure), it was found that the minimum values fall on the 3-4 leaf phase and make up 72 thousand colony-forming units (CFU) per 1 g of soil, and when using biologics from 72 thousand CFU / 1 g of soil when treated with potassium humate up to 91 thousand CFU / 1 g of soil when applying PKM.

Revealed a clear pattern of the number of microorganisms in seasonal dynamics. The greatest number of fungi in all variants was noted in the terms corresponding to the phase of flowering of corn plants. This is consistent with the general idea of the dynamics of transformation of soil organic matter. The greatest abundance of food mushrooms get in this period.

The number of micromycetes under control was during this period 337 thousand. CFU / g soil. The highest number of microscopic fungi is established when using PCM and is 456 thousand CFU / g soil, which is 1.4 times higher than in the control.

In the phase of wax ripeness, all variants experienced a sharp decrease in the number of micromycetes. This is probably due to adverse weather conditions, namely a prolonged drought.

144 thousand cfu / g were allocated for control. Soils, on the version with the use of PKM 178 thousand CFU / g, and on the other variants of the experiment from 157 to 169 thousand CFU / g.

CONCLUSION

Thus, the smallest number of fungi is noted in the phase of 3-4 leaves. When analyzing the dynamics of the number of micromycetes, a regular increase in their number was revealed on all variants of the experiment in the flowering phase of corn 1.1-1.4 times. This is due to the increased flow of readily available organic matter into the soil with root exudates of corn. Analysis of further dynamics suggests that there is a decrease in the number of microscopic fungi in the soil by 2.3-2.6 times. The main factors influencing the dynamics of the studied indicator are the temperature and humidity of the soil.

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