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STUDYING THE ROLE AND MECHANISM OF MICROORGANISMS IN THE PRODUCTION OF MICROBIOLOGICAL FERTILIZERS

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Abstract: In this article, we will discuss the identification and mechanism of the application of microorganisms to fertilizers in soil processing. This will help to provide microbiological fertilizer research processes and provide new prospects for the development of new agents, especially microorganisms in the production of microbiological fertilizers in economic agriculture. The research conducted by us was carried out on 3 types of local raw materials: Cattle manure, Poultry manure, Freshwater sludge in the ratio of 100: (35): (50) and selected microorganisms Bacillus sp, Rhizobium sp, Azotobacter sp. in the ratio of 1; 1; 2 for 35 days. As a result, the amount of GK, FK and OM in the fertilizer mixture was 2.08-4.4%, 4.10-4.53% and 30.01-41.8%, respectively, after 35 days. The change in the chemical composition during the composting process was studied.

Keywords: microbiological fertilizer, plant growth promoting bacteria, crop growth, soil regeneration.

Introduction. The world population continues to grow and is expected to exceed 9 billion by 2050, requiring a rapid increase in crop production [1]. Urbanization and industrialization have led to a significant reduction in cropland, and at the same time, have damaged agroecosystems. The need to increase productivity to feed a growing population on limited cropland requires a significant input of agrochemicals into the agricultural environment [2]. Bioorganic fertilizers consist primarily of livestock and poultry manure, crop residues, household waste, and other organic wastes that have undergone harmless treatment [3-7]. It is enriched with specific functional microorganisms and serves as a compound fertilizer for organic matter. Bioorganic fertilizer offers the dual advantages of microbial fungicide and traditional organic fertilizer. In addition to the high content of organic matter, it also contains specific microorganisms with unique functions [8]. In recent years, the increase in organic waste and pollutants has led to a gradual decline in agricultural quality, which will subsequently affect soil health. By formulating fertilizer application and straw return to the field and other measures, it is possible to enhance the fertilizer effect of organic fertilizer and reduce the threat to the soil environment caused by excessive chemical fertilizers. Promote the development of bioorganic fertilizers. Compared with chemical fertilizers, bioorganic fertilizers have the efficiency of traditional organic fertilizers on the one hand and the special function of beneficial microorganisms on the other; through the combination of the two, they play the role of maximizing fertilizer efficiency.

Microbial agents, also known as microbial inoculants, are defined as biofertilizers containing a range of live microbial products [8]. Beneficial bacteria with specific functions are isolated from bacteria, fungi, actinomycetes, and algae to develop microbial inoculants [8-9]. Recently, novel inoculants provided by PGPR have attracted wide attention. PGPR such as Klebsiella, Azotobacter, Azoospirillum, and Bacillus are grown in the inter-root soil. Bacillus and Pseudomonas isolated from the rhizosphere have been

widely used to develop microbial inoculants based on the identification of microbial diversity [9].

Methods. In order to quickly and easily achieve the intended goal in conducting scientific research and conducting experiments, it is first of all necessary to have complete information about the subject under study. In particular, when obtaining non-traditional fertilizers based on local raw materials, it is advisable to use fast, modern and, of course, high-precision analytical methods to determine various physicochemical parameters of raw materials and finished products.

In carrying out laboratory work for scientific research, the main raw materials used were cattle and poultry manure, freshwater sludge, and samples. The main chemical composition of these raw materials is given in Table 1. The mechanism of their action on crops as a result of the action of the above raw materials on the following microorganisms is given in Table 2

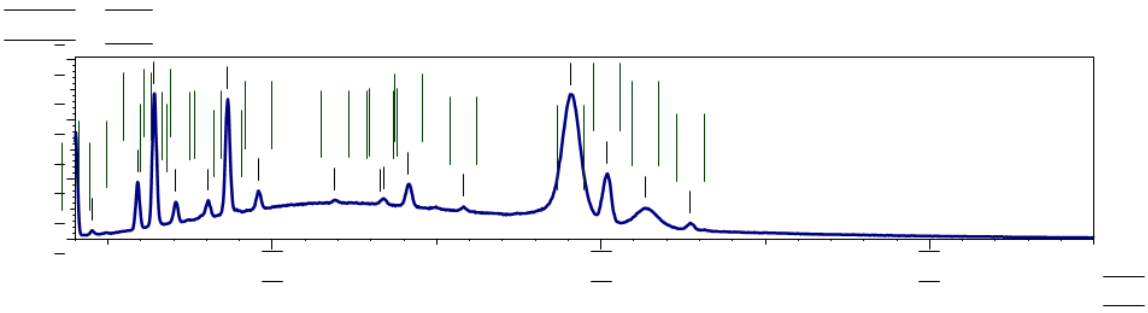

Figure 1. Shows the elemental analysis of chicken manure

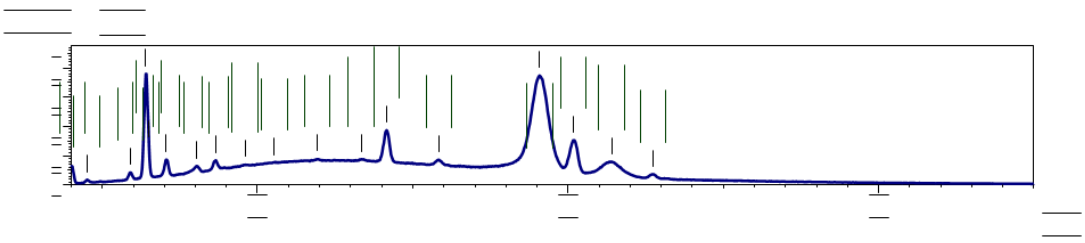

Figure 2 Shows the elemental analysis of cattle manure

Table 1. Chemical composition of raw materials selected for the experiment

Waste and debris	Organic mass	Mass ratio of air humidity in %			Quantity in 20t mass (kg)			
		N	P_2O_5	K_2O	N	P_2O_5	K_2O	Organics (kg)
Cattle manure	60	0.50	0.25	0.60	100	50	120	12000
Poultry manure	66	2.06	1.80	1.10	412.0	360	220	13200
Freshwater turbidity	40.4	0.58	0.18	0.69	116.0	36	138	8000

Table 2. Mechanism of action of microorganisms selected for the experiment on crops

Microorganisms	Crop	Movement mechanism
Bacillus sp.	Soybeans, melons, potatoes, barley, corn	Vocs, antibacterial compound, organic acids, exopolysaccharides, various enzymes, ISR
Rhizobium sp.	Soybeans, peanuts,	Nitrogen fixation, exopolysaccharides, phosphate solubility
Azotobacter sp.	Rice, tomatoes, peas,	Nitrogen fixation, dissolved phosphorus and potassium, IAA formation, siderophore

Results. We studied the mechanism of action of the above 3 types of local raw materials Cattle manure, Poultry manure, Freshwater sludge in the ratio of 100: (35): (50) and selected microorganisms Bacillus sp, Rhizobium sp, Azotobacter sp. in the ratio of 1; 1; 2 for 35 days, as a result of which we analyzed the change in the total complex content of humic and fulvic acids, organic matter (OM) and the mechanism of action. An increase in humic and fulvic acids, organic matter (OM) is observed in the fertilizer samples obtained as a result of processing with microorganisms. For example, the amount of GC, FC, and OM in the mixture of microbiological fertilizers on the day of preparation was 2.8%, 2.9%, and 31.8%, respectively, but after 35 days, this state was changed to 2.08-4.4%, 4.10-4.53%, and 30.01-41.8% during the composting process.

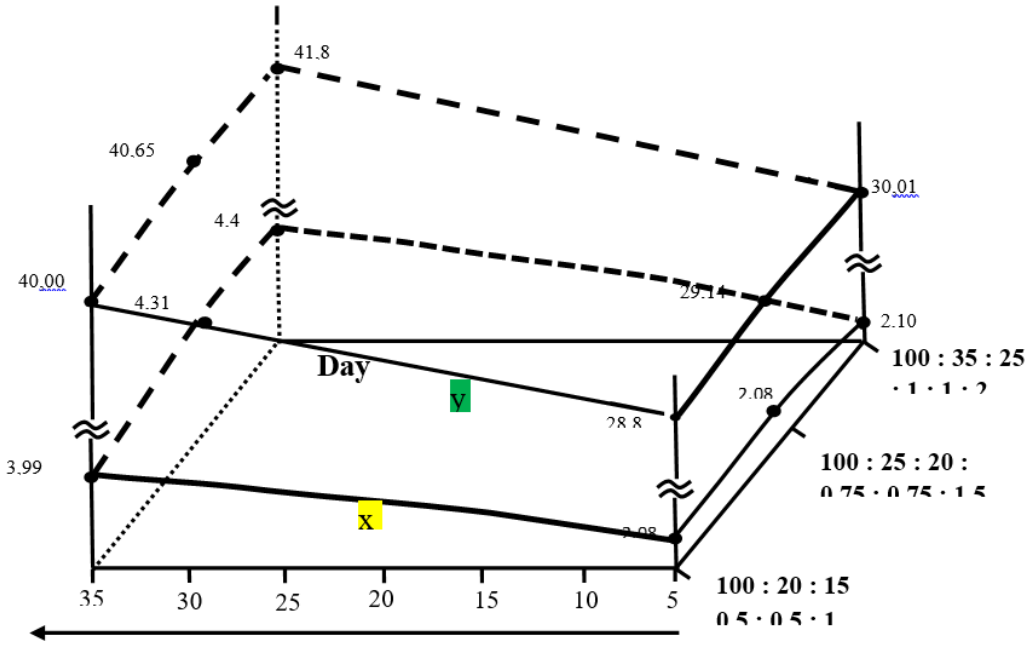

Figure 3. The content of gum acids and organic matter in microbiological fertilizers obtained with the ratios CM:PM:FT:M was studied

Figure 3 shows the 3 different ratios of CM:PM:F namely the 1st 100:20:15 ratio Bacillus sp, Rhizobium sp, Azotobacter sp 0.5:0.5:1 ratio, during the composting process for 35 days, we can see that the humic acid content changed from 2.08% to 3.99%, and the

organic matter content changed from 28.8% to 40.0%. The 2nd type 100:25:20 Bacillus sp, Rhizobium sp, Azotobacter sp 0.75:0.75:1.5 ratio, during the composting process for 35 days, we can see that the humic acid content changed from 2.08% to 4.31%, and the organic matter content changed from 29.14% to 40.65%. The 3rd type 100:35:25 Bacillus sp, Rhizobium sp, Azotobacter sp 1:1:12 ratio for 35 days, we can see that the humic acid content changed from 2.10% to 4.4%, and the organic matter decreased from 30.01% to 41.8%.

Discussion. Currently, microbial fertilizers are being used as an effective method to increase crop yields. On the one hand, they improve the nutrients necessary for plant growth and development. On the other hand, they are environmentally friendly to the soil and serve to improve the ecological status of plants. In recent years, biofertilizers have emerged as a green and sustainable development strategy that will contribute to the sustainability of the agricultural ecosystem in the future. At the same time, the precise application of microbial fertilizers should include consideration of soil properties, soil environment, and the interaction between the host plants of the strains for the application of biofertilizers. These studies will help minimize the impact on the agricultural ecosystem in our Republic and increase its efficiency. In general, microbial fertilizers have a wide range of applications and serve as a green strategy that contributes to the sustainable development of agriculture.

Conclusion. It is precisely this type of fertilizer that is required to increase food production despite the increasing environmental degradation of soil and the limited arable land, despite the population growth. Chemical fertilizers significantly increase yields in a short time. To avoid the negative effects of chemicals, environmentally friendly substitutes have been identified. In conclusion, overreliance on chemical fertilizers perpetuates ecological imbalances. Biofertilizers consisting of beneficial PGPR strains have many advantages. It is cost-effective, has significant potential to improve plant growth, increases plant resilience and serves as a key strategy for the development of sustainable green agriculture.

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