

ISSN 2181-8622

Manufacturing technology problems



Scientific and Technical Journal Namangan Institute of Engineering and Technology

INDEX  COPERNICUS
I N T E R N A T I O N A L

**Volume 10
Issue 1
2025**



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

VOKKOSOV ZUHRIDDIN

Docent, Namangan Institute of Engineering Technology, Namangan, Uzbekistan
Phone.: (0899) 973-9430, E-mail.: zvoqqosov@gmail.com

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

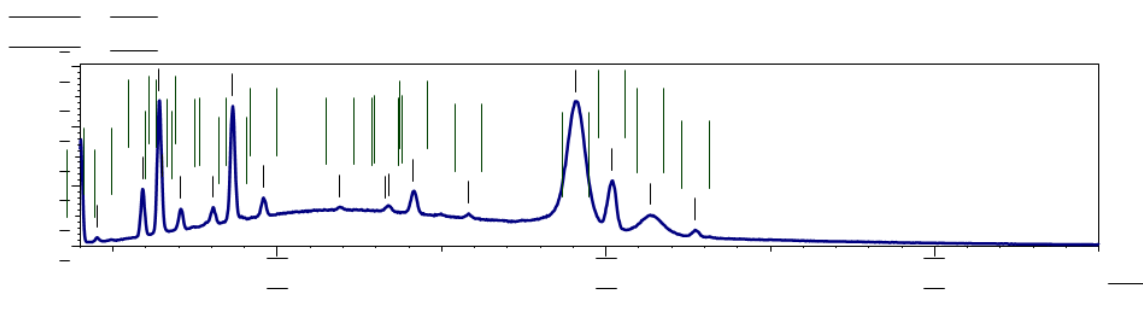


Figure 1. Shows the elemental analysis of chicken manure

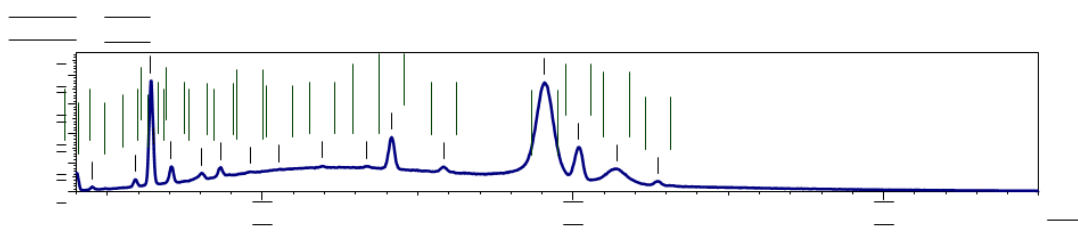


Figure 2 Shows the elemental analysis of cattle manure

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 ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	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
<i>Bacillus</i> sp.	Soybeans, melons, potatoes, barley, corn	Vocs, antibacterial compound, organic acids, exopolysaccharides, various enzymes, ISR
<i>Rhizobium</i> sp.	Soybeans, peanuts,	Nitrogen fixation, exopolysaccharides, phosphate solubility
<i>Azotobacter</i> 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.

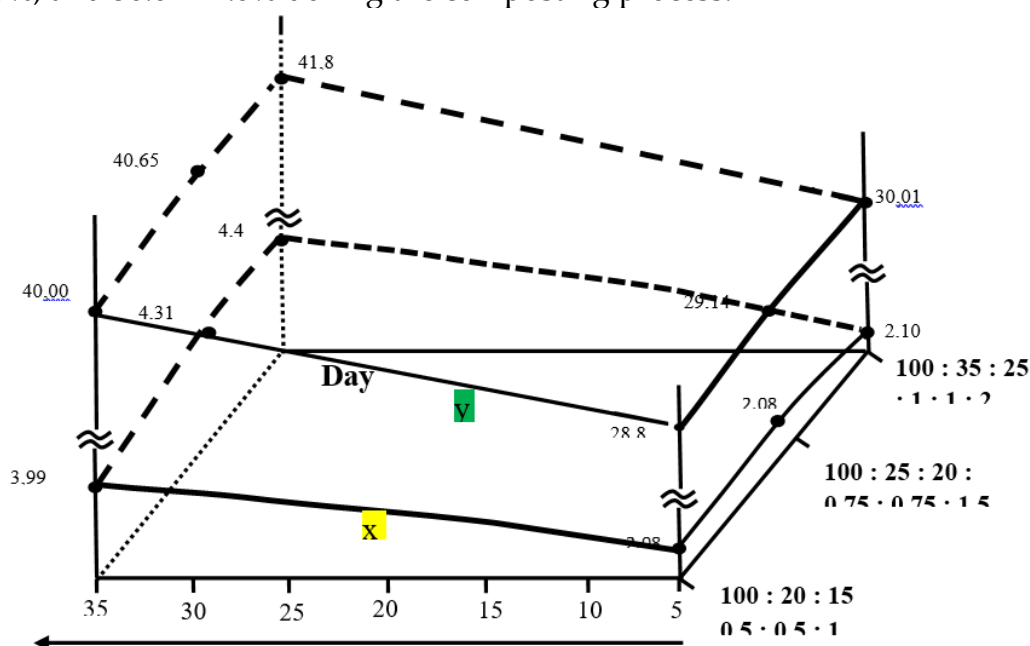


Figure 3. The content of gum acids and organic matter in microbiological fertilizers obtained with the ratios CM:PM:FT:M was studied

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.

Literature

1. Kerr R.B., Madsen S., Stüber M., Liebert J., Enloe S., Borghino N., Parros P., Mutyambai D.M., Prudhon M., Wezel A. Can agroecology improve food security and nutrition? A review. *Glob. Food Secur.* 2021;29:100540. doi: 10.1016/j.gfs.2021.100540. [DOI] [Google Scholar]
2. Akanmu A.O., Olowe O.M., Phiri A.T., Nirere D., Odebode A.J., Umuhoza N.J.K., Asemoloye M.D., Babalola O.O. Bioresources in Organic Farming: Implications for Sustainable Agricultural Systems. *Horticulturae*. 2023;9:659. doi: 10.3390/horticulturae9060659. [DOI] [Google Scholar]
3. Sharipov S. Y., Azizov A. S., Vakkasov Z. K. Storage of apples in different methods in the valley region of Uzbekistan //IOP Conference Series: Earth and Environmental Science. – IOP Publishing, 2022. – T. 1068. – №. 1. – C. 012029.]

4. Vokkosov Z. K. XM Kanoatov Analysis of physical-chemical and mineralogical indications of local agriculture (bentonite and phosphorite flour) in the production of organomineral fertilizers //NamMTI ILMIY-TEXNIKA JURNALI. ISSN. – 2022. – С. 2181-8622.. [[DOI](#)] [[Google Scholar](#)]

5. Воккосов З. К. У. Получение органоминеральных удобрений на основе местных агроуд, минеральных удобрений, навоза крупного рогатого скота и растворов азотфиксирующих микроорганизмов //Universum: технические науки. – 2022. – №. 6-4 (99). – С. 44-48.. [[DOI](#)] [[Google Scholar](#)]

6. Voqqosov Z., Kanoatov K. The influence of organo-mineral fertilizers on the growth of evening apple varieties throughout the year //E3S Web of Conferences. – EDP Sciences, 2023. – Т. 390. – С. 02035. [[DOI](#)] [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

7. Voqqosov Z., Ikramova M., Olimjanova M. Production of organomineral fertilizers based on local raw materials and nitrogen-fixing microorganisms //E3S Web of Conferences. – EDP Sciences, 2024. – Т. 486. – С. 05009. [[DOI](#)] [[Google Scholar](#)]

8. Zuhridin V. Production of organic fertilizers using local raw materials //Universum: технические науки. – 2023. – №. 4-8 (109). – С. 12-14.

9. Callaghan M., Ballard R.A., Wright D. Soil microbial inoculants for sustainable agriculture: Limitations and opportunities. Soil Use Manag. 2022;38:1340–1369. doi: 10.1111/sum.12811. [[DOI](#)] [[Google Scholar](#)]

CONTENTS

TECHNICAL SCIENCES: COTTON, TEXTILE AND LIGHT INDUSTRY

Rakhimov R., Sultonov M.	3
Inspection of the strength of the column lattice of the improved fiber cleaner	
Turdiyev B., Rosulov R.	10
The influence of technological parameters of the elevator on cotton seed damage	
Khuramova Kh.	15
Graphic analysis of the obtained results on cotton regeneration	
Sharifbayev R.	20
Optimizing feature extraction in Ai-based cocoon classification: a hybrid approach for enhanced silk quality	
Akramov A., Khodzhiev M.	24
The current state and challenges of the global textile industry: key directions for the development of Uzbekistan's textile sector	

TECHNICAL SCIENCES: AGRICULTURE AND FOOD TECHNOLOGIES

Sattarov K., Jankurazov A., Tukhtamyshova G.	30
Study of food additives on bread quality	
Madaminova Z., Khamdamov A., Xudayberdiyev A.	37
Determination of amygdalin content in peach oil obtained by pressing method	
Kobilov N., Dodayev K.	43
Food safety and industrial importance of corn starch. the impact of the hydration process on the starch content in the grain	
Mustafaev O., Ravshanov S., Dzhakhangirova G., Kanoatov X.	50
The effect of storing wheat grain in open warehouses on the "aging" process of bread products	
Erkayeva N., Ahmedov A.	58
Industrial trials of the refining technology for long-term stored sunflower oil	
Boynazarova Y., Farmonov J.	64
Microscopic investigations on the effect of temperature on onion seed cell degradation	
Rasulova M., Xamdamov A.	79
Theoretical analysis of distillators used in the distillation of vegetable oil miscella	

CHEMICAL SCIENCES

Ergashev O., Bazarbaev M., Juraeva Z., Bakhronov H., Kokharov M., Mamadaliyev U.	84
Isotherm of ammonia adsorption on zeolite CaA (MSS-622)	
Ergashev O., Bakhronov H., Sobirjonova S., Kokharov M., Mamadaliyev U.	93
Differential heat of ammonia adsorption and adsorption mechanism in Ca ₄ Na ₄ A zeolite	
Boymirzaev A., Erniyazova I.	101
Recent advances in the synthesis and characterisation of methylated chitosan derivatives	
Kalbaev A., Mamataliyev N., Abdikamalova A., Ochilov A., Masharipova M.	106
Adsorption and kinetics of methylene blue on modified laponite	
Ibragimov T., Tolipov F., Talipova X.	114
Studies of adsorption, kinetics and thermodynamics of heavy metall ions on clay adsorbents	
Muratova M.	123
Method for producing a fire retardant agent with nitric acid solutions of various concentrations	
Shavkatova D.	132
Preparation of sulphur concrete using modified sulphur and melamine	
Umarov Sh., Ismailov R.	139
Analysis of hydroxybenzene-methanal oligomers using ¹ H nmr spectroscopy methods	
Vokkosov Z.	148
Studying the role and mechanism of microorganisms in the production of microbiological fertilizers	
Mukhammadjonov M., Rakhmatkarieva F., Oydinov M.	153
The physical-chemical analysis of KA zeolite obtained from local kaolin	
Shermatov A., Sherkuziev D.	160
Study of the decomposition process of local phosphorites using industrial waste sulfuric acid	
Khudayberdiev N., Ergashev O.	168
Study of the main characteristics of polystyrene and phenol-formaldehyde resin waste	

TECHNICAL SCIENCES: MECHANICS AND MECHANICAL ENGINEERING

Kudratov Sh.	
UZTE16M locomotive oil system and requirements for diesel locomotive reliability and operating conditions	174
Dadakhonov N.	181
Device studying the wear process of different materials	
Dadakhonov N., Karimov R.	189
Investigation of irregularity of yarn produced in an improved drawn tool	
Mirzaumidov A., Azizov J., Siddiqov A.	196
Static analysis of the spindle shaft with a split cylinder	
Mirjalolzoda B., Umarov A., Akbaraliyev A., Abduvakhidov M.	203
Static calculation of the saw blade of the saw gin	
Obidov A., Mirzaumidov A., Abdurasulov A.	208
A study of critical speed of linter shaft rotation and resonance phenomenon	
Khakimov B., Abdurakhmanov O.	217
Monitoring the effectiveness of the quality management system in manufacturing enterprises	
Bayboboev N., Muminov A.	232
Analysis of the indicators of the average speed of units for the process of loading into a potato harvesting machine	
Kayumov U., Kakhkharov O., Pardaeva Sh.	237
Analysis of factors influencing the increased consumption of diesel fuel by belaz dump trucks in a quarry	
Abdurahmonov J.	244
Theoretical study of the effect of a brushed drum shaft on the efficiency of flush separation	
Ishnazarov O., Otabayev B., Kurvonboyev B.	250
Modern methods of smooth starting of asynchronous motors: their technologies and industrial applications	
Kadirov K., Toxtashev A.	263
The influence of the cost of electricity production on the formation of tariffs	
Azambayev M.	271
An innovative approach to cleaning cotton linters	
Abdullayev R.	277
Theoretical substantiation of the pneumomechanics of the Czech gin for the separation of fiber from seeds	
Siddikov I., A'zamov S.	282
Study of power balance of small power asynchronous motor	

Obidov A., Mirzaakhmedova D., Ibrohimov I.	288
Theoretical research of a heavy pollutant cleaning device	
Xudayberdiyeva D., Obidov A.	294
Reactive power compensation and energy waste reduction during start-up of the electric motor of uxk cotton cleaning device	
Jumaniyazov K., Sarbarov X.	302
Analysis of the movement of cotton seeds under the influence of a screw conveyor	
Abdusalomova N., Muradov R.	310
Analysis of the device design for discharging heavy mixtures from the sedimentation chamber	
Ikromov M., Shomurodov S., Boborajabov B., Mamayev Sh., Nigmatova D.	318
Study of obtaining an organomineral modifier from local raw materials to improve the operational properties of bitumen	
Ikromov M., Shomurodov S., Boborajabov B., Mamayev Sh., Nigmatova D.	324
Development of composition and production technology for polymer-bitumen mixtures for automobile roads	
Muradov R., Mirzaakbarov A.	332
Effective ways to separate fibers suitable for spinning from waste material	

ADVANCED PEDAGOGICAL TECHNOLOGIES IN EDUCATION

Xoliddinov I., Begmatova M.	336
A method of load balancing based on fuzzy logic in low-voltage networks with solar panel integration	
Murodov R., Kuchqarov A., Boynazarov B., Uzbekov M.	345
Research on the efficiency of using hydro turbines in pumping mode and for electricity generation	
Abdurakhimova M., Romanov J., Masharipov Sh.	353
A literature review of settlement land trends (past, present, and future) based on english-language articles indexed in the web of science database from 2014 to 2023	
Muhammedova M.	360
Development and scientific justification of the design of orthopedical footwear for patients with injuries to the soul-foot joint	
Akbaraliyev M., Egamberdiyev A.	367
Methods of effective organization of fire and rescue operations	

A'zamxonov O., Egamberdiyev A.

Principles of organizing material and technical support in emergency situations **373**

Tuychibayeva G., Kukibayeva M.

The module of developing communicative competence of seventh and eighth-grade students in uzbekistan secondary schools **379**

Ismoilova Z.

Methods for enhancing the competence of future english teachers **383**

ECONOMICAL SCIENCES

Yuldashev K., Makhamadaliev B.

The role of small business entities in the program "From poverty to well-being" **389**

Mirzakhlikov B.

Organizational mechanism for the development of state programs for poverty reduction **397**

Rustamova S.

Specific characteristics of administration in developed countries **402**
