CHEMICAL COMPOSITION OF BIOHUMUS AND THE SIGNIFICANCE OF ITS GROWTH IN THE CONDITIONS OF FERGANA REGION

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Abstract. *Worms consume organic substances in the soil such as humus, manure, vegetable and fruit residues), enrich them with biologically active substances in the process of the intestinal transit, and as the result, the worm waste becomes valuable biohumus necessary for the good development of plants. Such biohumus contains microelements and macroelements in the necessary ratio for plant growth, and the biologically active substances in it ensure increase in the fertility process. Biohumus is 15-20 times more effective than any other organic fertilizers. Worms digest organic matter faster than bacteria and produce caprolites. As the result, it is possible to restore the amount of biohumus to a thickness of 1 cm in 2-3 years. Biohumus contains a large amount of humus, its microflora, amino acids, enzymes, vitamins and other biologically active substances have a positive effect on the soil microflora and eliminate plant root diseases. By applying biohumus, a sharp increase in the plant development and productivity is achieved, and an ecologically pure product is created.*

Keywords: *Fergana region, biohumus, California vermicompost, compost, biomass, vermicopost, earthworm, vermiculture, biotechnology, protein, food.*

ХИМИЧЕСКИЙ СОСТАВ БИОГУМУСА И ЗНАЧЕНИЕ ЕГО ВЫРАЩИВАНИЯ В УСЛОВИЯХ ФЕРГАНСКОЙ ОБЛАСТИ

Аннотация. *Дождевые черви питаются находящиеся в почве органическими веществами (перегной, навоз, растительные и плодовые остатки), обогащают их биологическими активными веществами в процессе кишечного транзита, в результате чего червячные отходы превращаются в ценный биогумус, необходимый для хорошего развития растений. Биогумус содержит микро- и макроэлементы в необходимым для роста растений, а содержащиеся в нем биологически активные вещества обеспечивает повышение плодородности. Биогумус в 15-20 раз эффективнее любых других органических удобрений. Черви переваривают органику быстрее, чем бактерии, и производят капролиты. В результате восстановить количество биогумуса до толщины 1 см можно будет за 2-3 года. Биогумус содержит большое количество гумуса, его микрофлора, аминокислоты, ферменты, витамины и другие биологически активные вещества положительно влияют на микрофлору почвы и устраняют корневые заболевания растений. Применение биогумуса достигается резкое повышение развития и продуктивности растений, создается экологически чистый продукт.*

Ключевые слова: *биогумус, калифорнийский биогумус, компост, биомасса, вермикопост, дождевой червь, вермикультура, биотехнология, белок, продукты питания.*

INTRODUCTION

According to the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization, more than 80 countries cannot fully provide their population with food products. That is, one out of eight people in the world is undernourished.

The population of our planet is increasing, the global strategy of agricultural development is primarily to increase the productivity and quality of agrophytocenoses of the agroindustrial complex with plant resources necessary to meet the constant growth of the population and their demand for food.

Therefore, it will be necessary to satisfy the population's need for food products. However, the low productivity of plants and the deterioration of soil fertility have a negative impact on agriculture and the ability of the society to produce sufficient food products.

Today, as in the whole world, one of the urgent problems in Uzbekistan is the abundance, quality and ecological purity of food products obtained from plants, the chemical composition of the fertilizers used, and the cultivation of ecologically pure products. It shows that the scientific research work is very relevant in the conditions of Fergana region.

LITERATURE REVIEW

It is known that even the ancient Egyptians understood the importance of earthworms to increase the productivity of plants. Worms processed the mud brought down from the Nile and their waste was used as fertilizer. In addition, the peasants of Ancient Egypt deified worms, even taking them out of the country was forbidden. Aristotle called earthworms the “intestines of the earth” because their action principle is really similar to the work of the intestine - they pass soil and organic residues through their bodies, thereby enrich the soil.

The positive effect of earthworms on soil formation was first reported in 1789 by the English naturalist G.White. He mentioned that the soil is “cold” and “unsatiable” (nenasytnoy).

This is what Charles Darwin wrote in his classic work, “Vegetable mould, through the action of worms, with observations on their habits” published a year before his death in 1881: “Worms prepare the ground in an excellent manner for the growth of fibrous-rooted plants and for seedlings of all kinds. They periodically expose the mould to the air, and sift it so that no stones larger than the particles which they can swallow are left in it. They mingle the whole intimately together, like a gardener who prepares fine soil for his choicest plants. In this state it is well fitted to retain moisture and to absorb all soluble substances, as well as for the process of nitrification” [1].

In 1939, the American doctor Thomas J.Barrett (1884-1975) noticed an increase in the number of earthworms where compost was piled near his kitchen. In addition, the soil there was very loose, soft. He then began to bring this compost under various plants with earthworms, and as a result, he found that the yield increased significantly. Moreover, he noticed that the fruits of the plants not only grew in size, but also improved in appearance and taste.

Barrett began trying to breed worms in boxes, and then created a special plantation to grow them. In 1946, he wrote the first book about the results of his research. In 1959, Dr. Barrett received a patent for the production of specialized worms of the red hybrid breed, or California redworm.

The most famous American worm farmer Mary Applehoff (1936-2005) is known throughout the world as a woman who grew worms, she devoted a significant part of her life to vermiculture.

In Russia, at the end of the 19th century, the first researches on soil-forming activity of earthworms were conducted by G.N.Vysotsky, who continued Charles Darwin's work. The results obtained by him, as well as the work of scientists such as G.N.Dimo and M.S.Gilyarov, expanded and deepened the information about earthworms and their role in soil formation [2, 3,

4]. For example, Vysotsky paid great attention to the role of earthworms in the structure of soils and their formation, as well as in the spread of tree roots. During his research, he discovered a new species of giant earthworm, Dendrobaena mariupoliensis Wyssotzky [2]. However, for many years later, the earthworm was forgotten as an object of research, and neither biologists nor soil scientists addressed this topic for more than half a century.

The main fundamental scientific research in the field of earthworm recycling of organic waste was carried out in the late 1970s by Hartenstein and Mitchell at the State University of New York. They used vermiculture to treat wastewater. Studies have shown that hybrid worms are more effective.

In the 1980s, a research group led by Clive Edwards of Rothamsted Experimental Station (Hertfordshire, Great Britain) studied the biology of earthworms living in the surface layers of soil in temperate and tropical climates.

In 1985, at the Institute of Biology of the Kyrgyz Academy of Sciences, a research was conducted on the processing of organic fertilizers using earthworms.

At the experimental station of the Pamir Institute of Biology of the Academy of Sciences of Tajikistan, a work was carried out to monitor the effect of earthworms on the decomposition of manure in the soil and the processes of humus formation. Unfortunately, these experiences and observations were based only on scientific data at that time and were not put into practice.

Since 1989, a practical work on the industrial breeding of California worms started in the Fergana Valley. At first, 5 million pieces of California red worms were brought to Andijan region, and in 3 years their number reached 5 billion. As a result, for the first time in Central Asia, the method of industrial breeding of earthworms and the production of earthworms was created.

[5] studied that the chemical properties and microbiological properties of biohumus depend on the type of earthworm, the composition of waste that serves as raw material for the production of biohumus, as well as the conditions and time of composting.

[6] commented on the high content of organic substances and mobile forms of nitrogen, phosphorus and potassium in biohumus, the fact that the pH of the reaction medium is close to neutral, and the hydrophilic nature of biohumus. He says that the use of biohumus increases the erosion resistance of soils. He noted that biohumus, unlike manure, does not contain pathogens of various infectious and parasitic diseases, does not have weed seeds.

Biohumus increases the growth and development of plants, the phytosanitary condition of agrocenoses, the yield and quality of grain. It improves effectively soil fertility. The experiments proved that the most optimal and justified method for this is the need to add vermicompost to the soil in the amount of 3-6 t/ha before planting [7].

A number of researchers [8-16] have conducted scientific research in this direction abroad.

From the above-mentioned information, it can be seen that the scientific-research works in this direction have not been sufficiently studied in foreign countries and in Uzbekistan, including Fergana region, and today there is a need to continue scientific-research in this field.

RESEARCH METHODOLOGY

The study of the relationship between the structure, biomass, population dynamics, feeding characteristics, development, the influence of anthropogenic factors, hydrothermal conditions and the abundance of earthworms of the California red worm was carried out in semi-stationary conditions.

Work on the quantitative accounting of the California red worm was carried out in the following sequence: taking soil samples, extracting the California red worm from soil samples, counting them, processing accounting data.

Traditional special methods were used to obtain the California red worm [17].

During the research, phenological and biometric observations were carried out, as well as productivity in terms of grain weight, quantity and quality was taken into account.

The mathematical-statistical analyzes [18] were carried out in dispersion methods. The tabular data, charts and graphs were made on the basis of the Microsoft Excel program.

ANALYSIS AND RESULTS

The formation of biohumus is a complex chemical process, in which organic matter is not only broken down into simple compounds, but also compounds necessary for the plant are formed from them. After earthworms consume organic waste and excrete it from their body, an environmentally friendly organic fertilizer biohumus is formed.

Biohumus contains a large amount of macro and microelements, which are easily absorbed by plants. In addition, there are substances that promote rapid growth of plants: vitamins, antibiotics, about 20 microelements and useful microflora, and there will be no disease-causing microorganisms. As a result of the active fermentation process in biohumus, a large amount of biologically active substances, namely auxins and heteroauxins, are formed. These substances do not infect young seedlings when they are transplanted from one place to another, ensure that they are kept in a new place without error, accelerate the germination of seeds, increase the resistance of plants to diseases, and have a positive effect on rapid growth and development. In our research, the chemical composition of biohumus resulted in the following indicators (Diagram 1).

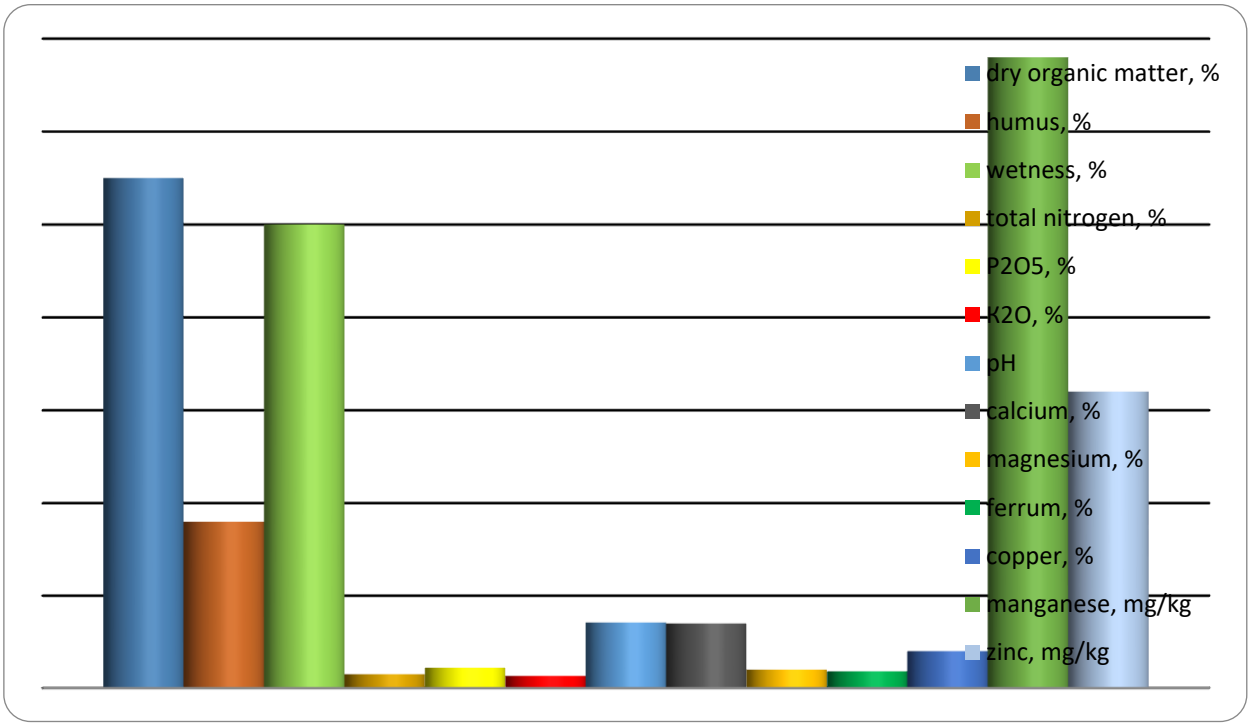

Diagram 1. Chemical composition of biohumus

Seedlings fertilized with biohumus ripen 12-15 days faster than other seedlings, and the time of planting and harvesting of plants is shortened by two weeks. Early ripening fruits are of

good quality, beautiful in appearance, delicious in taste, and have long shelf life. Biohumus has several other properties, i.e., it retains moisture in the soil for a long time, dissolves well in water, is mechanically stable, and does not contain weed seeds. In terms of moisture retention, biohumus is 15-20 times more effective than any organic fertilizer. Rotting bacteria make up 2 billion colonies in 1 g of biohumus. Livestock manure, been considered the best natural fertilizer until now, has 150-300 million colonies, that is, there are hundreds of times more bacteria in biohumus.

In biohumus, nutrients are in organic form, which prevents them from being washed away and preserves the properties of fertilizer for 3-4 years. As a result of decomposition by microorganisms, micro and macroelements are released, and provide carbon necessary for photosynthesis of plants. One of its other advantages is granularity, moisture management, ease of use, non-contamination of the soil, environmental cleanliness of the product obtained from it, low cost of production, ease of transportation, etc.

All plants and germinating seeds have a very high demand for biohumus, and productivity increases proportionally to the amount of biohumus applied to the soil. For example, 1 ton of manure added to the soil increases the yield of wheat by 0.3 t/h, when the same amount of biohumus is added, the yield increases by 3-4 t/h. The vegetation period of plants is reduced to 10-14 days. The yield of vegetables has been observed to be even higher.

The experiments conducted in the greenhouse of a private entrepreneur Nurali Akhmedov in Uchkoprik district of Fergana region gave high results. For example, when tomato seedlings were planted with 250 kg of biohumus in a 10-hectare greenhouse, the yield increased by 19% compared to the control area. In the same greenhouse, when tomato and cucumber seeds were sown on a bed mixed with biohumus in a ratio of 1:3, the seeds germinated 2-3 days earlier, and when the seedlings were transplanted to another place, the development was reduced to 9-10 days.

The amount of biologically active substances is very high in biohumus, that is, biologically active substances in 1 m^3 of biohumus correspond to the amount of biologically active substances in 70 thousand/m^2 of soil.

Biohumus affects the acidity of the soil to a certain extent, bringing the pH of the soil closer to the neutral environment. It should also be noted that the absorption of nitrogen and phosphorus in biohumus by plants is 7-10 times higher than the absorption of these substances in manure. Compared to other organic fertilizers, biohumus has much more mobile elements, and it has been determined that 11 times more potassium, 7 times more phosphorus, 2 times more calcium and magnesium are absorbed by plants.

This fertilizer does not lose its properties for several years, so it can be exported and imported over hundreds and thousands of kilometers. It shortens the period of accumulation of humus in the soil and increase of soil fertility, raises resistance to wind and water erosion.

Establishing the production of biohumus on an industrial scale allows us to restore and increase the productivity of our large cultivated areas.

The production of humic fertilizer from manure and other organic wastes using California earthworms is the only biologically appropriate way to improve soil humus and structure. This way increases soil fertility and productivity of all agricultural plants. It is the most effective way to provide the population with ecologically clean food products and preserve their health. The

most important thing is ecological purity and low cost. Another advantage of it is that it can be grown on farms.

Biohumus is a fertilizer that positively affects the agrochemical, physical and mechanical and microbiological properties of the soil.

Biohumus contains macro- and micronutrients that are easily absorbed by plants, while biohumus contains substances that promote rapid plant growth, vitamins, antibiotics, 18 amino acids and beneficial microflora. The pH indicator of biohumus is neutral, it destroys a fusari virus.

Biohumus can be used for all plants because it contains all the nutrients necessary for plants. The effect is especially high on plants that require complex fertilizers.

The acidity of biohumus decreases as a result of the California earthworm squeezing out calcium from the substrate. The humification of the substrate is around 25%, and that of manure is 10%.

Since nutrients in biohumus are in the form of organic matter, it is not quickly washed away by water, which serves as a nutrient for plants for a long time. As a result of its decomposition, macro and microelements and carbon are released, which participates in photosynthesis. Since biohumus has buffer properties, excess salts do not accumulate in the soil solution. This phenomenon reduces their harmful properties when a large amount of mineral fertilizers are applied to the soil.

The amount of humic acid in biohumus is 5.6-17.6% of dry matter, and according to studies of Ukrainian and Italian scientists, it improves the quality of vermoculture. The quality of biohumus is evaluated according to the amount of humic acid in its content. In Italy, the price of vermocompost is determined by the amount of humic acid in it. Biohumus contains 4-8 times more humin than manure and compost. This is one of its main qualities.

In addition to decomposed organic matter, vermocopost contains dead earthworms, which further improve the quality of biohumus.

CONCLUSIONS/RECOMMENDATIONS.

Vermocompost has a positive effect on the reaction environment of the soil and helps to neutralize the acidity of the soil reaction environment.

As a natural product, biohumus can be applied to the soil in unlimited quantities. Applying it to plants in excess of the norm does not cause negative consequences, that is, it is considered safe. It can be used immediately both in dry form and in solution form.

Biohumus can be used in extreme conditions to accelerate the germination of plant seeds, to ensure quality ripening of vegetables and fruits, and to increase the resistance of plants to drought, adverse climatic conditions and diseases.

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