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PREPARATION "ZHYTSEN" – MICROBIOLOGICAL FERTILIZER WITH COMPLEX ACTION

ПРЕПАРАТ «ЖЫЦЕНЬ» - МИКРОБИОЛОГИЧЕСКОЕ УДОБРЕНИЕ КОМПЛЕКСНОГО ДЕЙСТВИЯ

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Аннотация. *В работе рассматривается применение биологического препарата Жыцень. Пожнивные остатки являются важным источником пополнения питательных веществ в почве. Однако в период срока их разложения (3–5 лет) они являются источником распространения болезней растений, а содержащиеся в них питательные вещества длительное время остаются не доступными для растений. Комплексным решением проблемы контроля развития фитопатогенных микроорганизмов и поддержания баланса питательных веществ в почве является использование современных препаратов, содержащих живые культуры микроорганизмов. Такие микроорганизмы сочетают в себе способность улучшать минеральное питание растений путем ускорения разложения растительных остатков и фиксации атмосферного азота, снижать численность патогенных бактерий и грибов, а также стимулировать рост и развитие растений. Всеми перечисленными свойствами обладает микробиологическое удобрение Жыцень.*

Ключевые слова: *микробиологическое удобрение, биопрепараты, разложение растительных остатков, Жыцень.*

Abstract. *The paper considers the application of the biological preparation Zhytsen. Crop residues are an important source of nutrient replenishment in the soil. However, during the period of their decomposition (3–5 years), they are a source of the spread of plant diseases, and the nutrients contained within remain unavailable to plants for a long time. A comprehensive solution to the problem of controlling the development of phytopathogenic microorganisms and maintaining the balance of nutrients in the soil are modern preparations containing live cultures of microorganisms. Such microorganisms combine the ability to improve the mineral nutrition of plants by accelerating the decomposition of plant residues and fixing atmospheric nitrogen, reduce*

the number of pathogenic bacteria and fungi, and also stimulate the growth and development of plants. All these properties are possessed by the microbiological fertilizer Zhytsen.

Key words: *microbiological fertilizer, biological products, decomposition of plant residues, Zhytsen.*

Introduction.

After harvesting annual crops of continuous sowing, a source of organics remains in the fields - plant residues. Throughout the entire period of their decomposition (3-5 years) they present a problem because they interfere with the cultivation of the soil by agricultural machines and are a source of the spread of plant diseases, and what is more the nutrients they contain are too slowly converted into a form available to plants. On the other hand, in modern agriculture, the amount of organics entering the soil has decreased. Because of this, the structure of the soil is destroyed and, as a result, erosion processes are intensified. From the humus reserves, the soil annually loses 1-2 tons of organics from each hectare in the course of natural processes necessary for plant growth and crop formation. As a result, we annually remove a large amount of carbon and humus nitrogen from the soil with crops. An important source of carbon replenishment is straw and stubble of cereals and legumes. In addition, in the process of decomposition of plant residues in the soil, its structure improves - its water-retaining layer increases.

One of the ways to reduce the negative impact of human agricultural activities on soil fertility is the creation and application of effective preparations obtained on the basis of living cultures of microorganisms in agricultural technology. In this regard, a modern way to solve the current problem is the creation of microbiological preparations that accelerate the processes of biodegradation of crop residues in the fields. In addition to the high ability to decompose cellulose, proteins and starch - the main components of plant residues, it is important that microorganisms in such preparations have the ability to use air nitrogen and convert it into forms available to plants. This will reduce the amount of mineral nitrogen applied to the soil, which is important in the context of a shortage of nitrogen fertilizers in the farms of the Republic of Belarus. It should be noted that an important element of such products is the content of antagonistic bacteria, which are capable of restraining the accumulation of phytopathogenic microflora in the soil, the source of plant diseases, which occurs during the decomposition of plant residues.

The Research Laboratory of Molecular Genetics and Biotechnology of the Belarusian State University has developed the biopreparation Zhitsen, to be used to improve soil quality - accelerate the decomposition of crop residues in the fields, to "rehabilitate" of soil microflora, to prepare the soil for sowing and, as a result, to increas the productivity of crops. Zhytsen is a mixture of Pseudomonas sp.-11 and Bacillus sp.-49 cell strains. Bacteria selected as the basis of a microbiological preparation meet all the requirements for soil fertility increasing agents. They decompose natural biopolymers (cellulose, proteins and starch) with a high degree of efficiency, accelerating the mineralization of plant residues; are able to use atmospheric nitrogen, and are also antagonistic bacteria - they suppress plant pathogens.

Metodology and materials.

The process of mineralization of plant residues during the growing season was simulated in a model field experiment. The effect of accelerated destruction of sunflower plant residues on the increase in soil fertility was assessed in a stationary field experiment indirectly through the yield of the next agricultural crop (barley). Shredded plant residues of sunflower in the amount of 5.2 t/ha (standard moisture - 16%) were evenly distributed over the experimental plots. According to the experimental scheme for sunflower plant residues, a compensating dose of nitrogen (N48) was introduced and treated with Zhytsen at the rate of 3 l/ha (working fluid consumption 300 l/ha). After that, the straw in all variants was disked. Barley variety Ataman was sown on the experimental field in the first decade of April. During the experiment, the effect of Zhytsen on the soil microflora was evaluated. Soil sampling was carried out in the earing phase of spring barley plants - 8 months after treatment of the experimental and control areas with the Zhytsen.

Result and discussion.

When conducting a model field experiment, it was reliably shown that 7 months after the experiment was established (by the time of sowing spring barley), in the variant with Zhytsen application, 10% more by-products (straw) were mineralized, and 8% more stubble and root residues of sunflower than in untreated variants.

Studies of soil microflora showed that the treatment of sunflower crop residues with Zhytsen contributed to a significant decrease in the diversity and total number of microorganisms in soil samples that exhibit phytopathogenic properties - from 9 strains in control to 7 strains after treatment with Zhytsen. The decreasing amount of phytopathogenic microflora occurred due to a decreasing of phytopathogens. Zhytsen reduced number of phytopathogenic fungi by 43%. On the other hand, treatment with Zhytsen made it possible to significantly increase the diversity of saprotrophic (beneficial) soil microflora - from 31 strains in the control to 46 in the experiment.

On the background of the introduction of a compensating dose of nitrogen, additional treatment of sunflower crop residues with Zhytsen at a dose of 3 l/ha reduced both the number of strains: exhibiting phytopathogenic properties by 12.5% and their total number by 43%. It should be noted that such results of Zhytsen application make it highly promising for combating root rot of cereals and other agricultural plants, as well as dangerous diseases of flax in the absence of preparations allowed for use in the Republic of Belarus for effective plant protection against bacterial phytopathogens.

It was found that after sunflower straw plowdown, the yield of barley grain on soddy-podzolic sandy loamy soil was 30.7 c/ha. The treatment of sunflower by-products with Zhytsen at a dose of 3 l/ha had a positive effect on the barley yield, significantly increasing grain yield by 21.1% compared to untreated straw. The yield of the main products in this variant was characterized by the maximum rate in the experiment, reaching 38.4 c/ha.

At the autumn application of the compensating dose of mineral nitrogen on the plant residues of sunflower, the average yield of barley grain on the experimental variants was 3.5% higher compared to the variants where additional nitrogen was not applied; in this case, the treatment of plant residues of sunflower with the microbial

fertilizer Zhytsen provided an increase in barley yield by 6.1 centner/ha.

Indicators such as feed and feed protein units, as well as the indicator reflecting the harvest of raw protein, are important in assessing the quality of agricultural products. The content of raw protein in barley grain varied in the range of 10.3-11.2%, which corresponded to the economic and biological characteristics of this variety. After application of Zhytsen, the harvest of feed units increased by 21.1%, the harvest of feed protein units increased by 23.7% with an increase in the yield of raw protein per hectare by 27.0% relative to the areas where crude straw was applied.

According to the results of the tests, Zhytsen was included in the State Register of Plant Protection Products (Pesticides) and Fertilizers allowed for use in the territory of the Republic of Belarus as a microbiological fertilizer. Scheme of application: after harvesting, the chopped straw is evenly distributed over the plot. Treat crop residues with a 1% solution of microbiological fertilizer Zhytsen at the rate of 3 l/ha, consumption of the working solution is 300 l/ha, the straw should be disked.

Conclusion.

The ability of the microbiological fertilizer Zhytsen to influence the yield of crops, the decomposition of stubble and straw, and the “rehabilitation” of the soil was considered. Zhytsen application makes it possible to refuse the introduction of a compensating dose of nitrogen, accelerates the mineralization of plant residues in the soil by up to 10%, reduces the number of phytopathogenic microorganisms in the soil by 43%, increasing the content of saprotrophic soil microorganisms. As a result of the complex action of this biological preparation an increase in barley yield was obtained - 21.1% with an increase in harvest, feed units by 21.1%, feed protein units - by 23.7%, raw protein yield per hectare by 27.0% relative to the variant with untreated straw.

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