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Environmental Aspects of the Use of Biofertilizer

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Abstract:
Microorganisms present in organic fertilizers restore the natural nutrient cycle in the soil, increase soil productivity and make it more fertile by creating and maintaining soil organic matter. Biofertilizers do not increase the content of nitrates in products and soil, while maintaining high yields. Liquid organic fertilizer contains a large number of various microelements necessary for plants for growth and fertility, positively affects the soil and beneficial soil microorganisms, stimulating their development. Natural biofertilizers have one very useful property: they even out the acid-base balance of the soil and contribute to less depletion. Unlike mineral fertilizers, which are absorbed by only 35-50%, biofertilizers are absorbed almost completely. Population growth is forcing followers to seek ways to increase food production. One such way is to increase the productivity of crops by providing them with additional sources of nitrogen bound. Therefore, in the leading countries of the world large-scale mineral nitrogen production has been created (50 million. tons per year). Its application has increased world plant production by about one third. But it turned out that the global application of mineral nitrogen has many negative sides. One of the main ones is the accumulation of nitrites and nitrates in the environment, the decline in food quality and their negative impact on human health. Another method known for nitrogen input into soil is biological nitrogen fixation by various soil micro-organisms. The latter is the cheapest and most environmentally friendly source of nitrogen for agriculture. There are innumerable environmental problems, but biological pollution plays a significant role among them.

In recent years, Uzbekistan has made extensive use of bio-preparations in agricultural production, and new branches of the biological industry - bio-factories and bio-laboratories - have been established. Consequently, the number of workers in contact with biological pollutants that are not safe for human health is increasing.

The increase in crop yields due primarily to the use of fertilizers is undeniable. Nitrogen fertilizers play a crucial role in this process, as they are used to introduce nitrogen into the soil, which is transformed into protein compounds by plants. Nitrogen fertilizers have a beneficial effect on plants: they improve their chemical composition, protein content, carotene. At the same time, the use of mineral fertilizers in excessively large quantities can have an adverse impact on the quality of plant food, which is expressed primarily in the accumulation of nitrates, nitrites and nitrozoamines, changes in macro- and microelement composition.

When high doses of nitrogen fertilizers are applied to the soil, especially nitrate (over 200-300), a significant amount of nitrate is cumulated in plants under adverse weather conditions. The greatest accumulation occurs in the stalks of maize, roots and bottoms of beet, green mass and hay oats, green plants of wheat, rye and in

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many weeds, and more in the root part. The nitrate content in the stalks is significantly higher than in the leaves. This implies that nitrate accumulation is more pronounced in those plants and parts of them that feed livestock. However, they are later converted into food of animal origin, which poses a risk to humans. The critical norm of fertilizer nitrogen for grasses, for example, is 100-120 kg/ha. At higher doses, the yield increase is negligible and the biological value of the feed is drastically reduced due to the exceedance of the critical nitrate level in dry matter and an increase in the non-white fraction of raw protein. There are known crops that accumulate large quantities of nitrates and crops that are less prone to their accumulation. The first are, first of all, radishes, beet red, spinach, lettuce, celery, and the second - tomatoes, cucumbers, carrots, peas. The bio-products used in agricultural production are either protective against pests and diseases or fertilizers. The main positive property of biopreparations compared to chemicals is their specificity and low toxicity for humans and warm-blooded animals.

1. Methods of research:

The subject of our research was biological fertilizer "Yer malhami". The study of the toxicity and nature of biofertilizer biological activity was carried out in accordance with the requirements of the guidelines "Towards the formulation of studies to substantiate the MAC of bioinsecticides of the environment", and "Guidelines for the Integrated Hygienic Assessment of New Pesticides", Guidelines for the Definition of Plant Biological Protection Agent "Yer Malhami" in the Ambient Air and Air Working Area. A chronic four-month inhalation experiment. Integral indicators were used as tests reflecting the general state of organs and systems in the toxicological experiment: general state, behavior of animals, dynamics of body mass. To assess the action of "Yerr malhami" on the morphological composition of peripheral blood, the content of hemoglobin, the number of erythrocytes, white cells, eosinophils was determined by conventional methods. The determination of the content of sulfhydril groups in the blood was carried out by spectrophotometric method.The results of the studies were processed according to the generally accepted method of variation statistics with the estimation of the validity of differences in empirical samples according to the Student criterion. The differences were considered valid under $P<0.05$.

2. Research findings:

Biofertilizer is intended for pre-seedbed treatment of seeds and seedlings of vegetable, industrial crops, potatoes, roots of young fruit tree seedlings, forest crops to accelerate the growth of plants, increase the yield, improve its quality, suppress phytopathological microflora. The "Yer Malhami" has been shown to be effective in agricultural production tests. Cotton yields increased by more than 8 to 10 per cent.In order to develop the MPC "Yer malhami" in the air of the work area, studies have been conducted to substantiate the threshold of the chronic inhalation effect of the drug. Based on the results of the toxicometry of the drug for the 4-month chronic experiment, we had previously worked out the following concentrations in the treatment chambers: 483.3 3 3.07; 48.65 0.6; 9.76 0.2 mg/m3. Animals were sucked daily for 4 hours a day in 200 liters of sealed chambers.At 4-hour-a-month inhalation in experimental animals, there was no fatality or visible clinical effects of intoxication throughout the experience. Toxicity was judged on the basis of a number of integral and biochemical indicators: body weight dynamics, the content of lactic and pyrogravic acids in the blood, LDG activity and alkaline phosphatase.The long-term inhalation of biofertilizer caused statistically visible changes by the end of the experiment in all "Yer malham" animals with a concentration of 483.35 3.07 mg/m3 in the first group. For example, the increase in animal body mass began to decline after 2 weeks of the experiment, remaining at low values until its end with a high degree of confidence ($P<0.01$, $P<0.001$). In animals of the second and third groups the increase in body mass was at the level of control values and did not go beyond physiological oscillations (Table. 1).

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Table 1 White rats with 4-month inhalation "Yer malhami"

Groups and concentrations in mg/m3	statistical indicators	Terms of study in months						
		background	0,5	1	2	3	4	recovery period
I - 483,3	M±m P	134,35±1,22 >0,05	149,75±1,22 <0,01	165,65±1,35 <0,001	183,4±1,59 <0,001	201,2±1,72 <0,001	219,2±2,15 <0,001	241,6±2,94 <0,05
II - 48,6	M±m P	138,35±1,04 >0,05	156,6±1,29 >0,05	176,7±1,84 >0,05	194,75±2,15 >0,05	213,8±1,96 >0,05	230,65±2,15 >0,05	252,85±2,21 >0,05
III - 9,8	M±m P	134,5±1,10 >0,05	153,5±1,04 >0,05	172,75±1,10 >0,05	190,95±1,35 >0,05	212,25±1,53 >0,05	234,2±1,84 >0,05	258,75±6,70 >0,05
Control	M±m	137,1±1,10	156,4±1,35	176,15±1,41	196,05±1,84	217,26±1,96	238,75±2,15	251,85±2,21

Long-term inhalation of "Yer malhami" at a concentration of 483.3 mg/m3 resulted in a persistent breakdown of carbohydrate exchange in experimental animals. The levels of lactic and pyro-vitic acids were 44.1 and 2.33 mg (P<0.001) as shown in Figure 1 and Table 2.

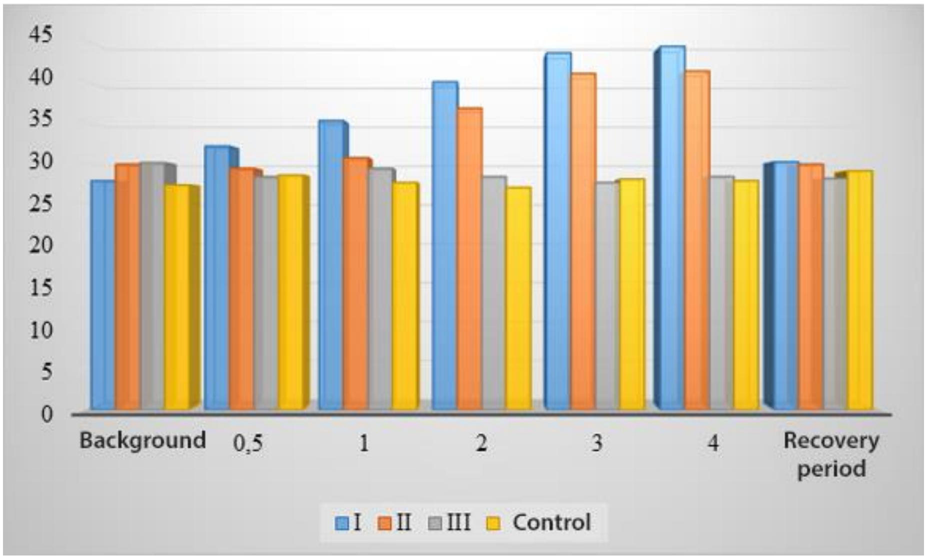

Figure. 1. Lactic acid content in experimental animals at inhalation "Yer malhami"

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Table 2 Pyro acid content in experimental animals Inhalation of "Yer Malhami" (mg/%)

Groups and concentrations in mg/m3	statistical indicators	Terms of study in months						
		Background	0,5	1	2	3	4	recovery period
I - 483,3	M±m P	2,28±0,088 >0,05	2,45±0,14 >0,05	2,64±0,17 >0,05	2,82±0,21 <0,05	3,15±0,26 <0,01	4,05±0,28 <0,001	2,5±0,088 >0,05
II - 48,6	M±m P	2,2±0,10 >0,05	2,36±0,10 >0,05	2,55±0,12 >0,05	2,99±0,14 <0,01	3,11±0,21 <0,01	3,5±0,24 <0,001	2,29±0,11 >0,05
III - 9,8	M±m P	2,3±0,11 >0,05	2,19±0,13 >0,05	2,2±0,12 >0,05	2,35±0,12 >0,05	2,3± 0,11 >0,05	2,33± 0,15 >0,05	2,31± 0,12 >0,05
Control	M±m	2,33±0,12	2,25±0,14	2,33±0,12	2,26±0,12	2,21±0,12	2,33±0,12	2,31±0,10

In animals receiving "Yer malhami" at a concentration of 48.6 mg/m3, carbohydrate metabolites of pyruvate and lactate also accumulated in the blood, but since the third month of the experiment and the level of indicators was lower. The drug concentration of 9.8 mg/m3 did not affect the above tests. The enzyme activity of lactate dehydrogenase in the first group of white rats increased towards the end of the second month and remained high until the end of the experiment. In animals of the second group, the activity of lactate dehydrogenase was increased, but the values of the indicator were lower (fig. 2).

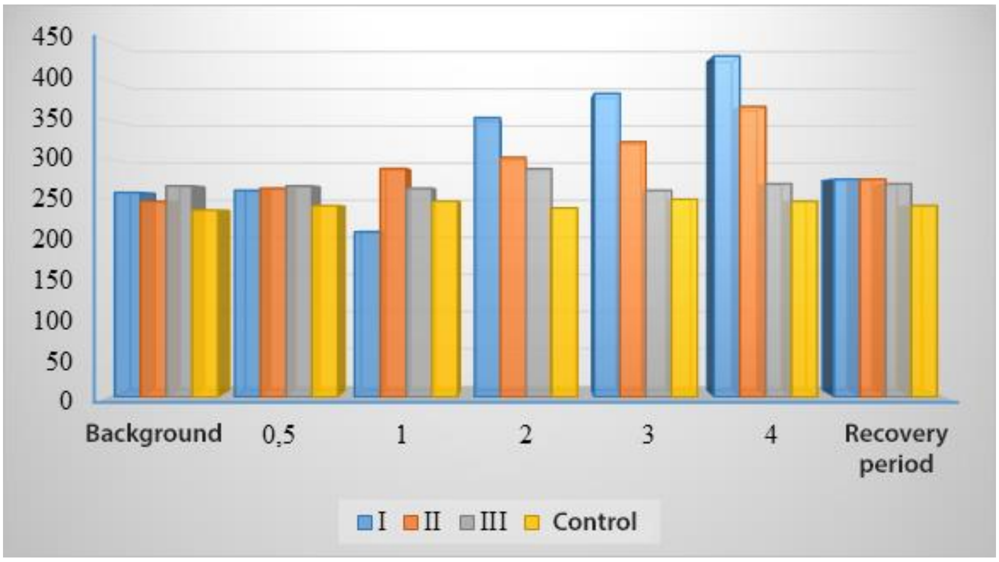

Figure.2. Activity of lactate dehydrogenase in experimental animals at inhalation "Yer malhami"

The functional state of the liver was assessed by the state of alkaline phosphatase enzyme activity. Activation of alkaline phosphatase enzyme activity in animals of the second group that received the drug in concentration. 48.6 mg/m3, alkaline phosphatase activity was 2.74 mmol/l to the 4th month of the experience, with a target value of 0.9 mmol/l. In the third group of white rats, the level of alkaline phosphatase did not differ from the control values. Changes in the internal organs were detected by histomorphological studies in animals of the 1st and 2nd groups, noted: in the lungs, in the course of small vessels and bronchial oedema dystelectase, interstitial pneumonia. In the liver, grainy dystrophy of hepatocytes, cyclonic infiltrates along the triads and in the center of the lobes. In the brain, perivascular edema. In the kidneys - edema capsules Shumlyansky, granular dystrophy of the epithelium of twisted canals, venous full blood. In the spleen, follicle atrophy, macrophage reaction is expressed. In the heart, intercostal edema, intertrabecular thrombi, cardiocyte fragmentation.

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3. Conclusion:

Generalizing the results of the 4-month biofertilizer exposure of white rats, 483.3 mg/m3 toxic, 48.6 mg/m3 threshold and 9.76 mg/m3---- inactive.

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