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MODERN TRENDS IN AGRICULTURE SCIENCE: PROBLEMS AND SOLUTIONS

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The monograph is a collection of the results of actual achievements of domestic agricultural scientists, obtained directly in real conditions. The authors are recognized experts in their fields, as well as young scientists and postgraduate students of Ukraine. Research is conceptually grouped at 7 sections: Plants protection and quarantine; vegetable growing in open and closed ground; horticulture, fruit growing, viticulture; breeding and seed production; agrochemistry and soil science; agriculture and modern agricultural technologies; management and strategies for future development. The monograph will be interesting for experts in plant breeding, economics, plant protection, selection, agrochemistry, soil science, scientific workers, teachers, graduate students and students of agricultural specialties of higher education institutions, and for all those who are interested in increasing the quantity and quality of agricultural products.

Keywords: agriculture, modern technologies, plants protection, quarantine, vegetable growing, horticulture, fruit growing, viticulture, breeding and seed production, agrochemistry, soil, management, strategies, development.

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PROSPECTS OF THE USE OF BIO PREPARATIONS IN MODERN AGRICULTURAL CROP GROWING TECHNOLOGIES

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The effect of the biologicals Ecorost on CO_2 emission from the soil is shown. The results of the functional diagnosis of mineral nutrition of winter wheat, which was grown according to the traditional and organic technology of ECOROST, are given. Based on the results, the harvest of winter wheat, barley and corn, an assessment of the efficiency of the ECOROST technology on typical chernozems of the Kharkiv region ,was made.

Key words: *biologicals, efficiency technology , "ECOROST".*

The enjoyment of manufacturers and scientists for biological medcines began in the 90s on the background of the decline in the production and use of mineral fertilizers. Initially, these were mainly plant protection products (fungal, viral preparations, trichogram) and bacterial preparations that improve nitrogen and phosphorus nutrition of plants. The author of this article directly studied the efficient use of such drugs as Baikal M, Vimpel, Emistym , Bioglobin on grain crops and, not receiving significant increases in yield (except for the variant using Vimpel), stopped such research.

The situation today is somewhat different. The total chemicalization of agriculture has a negative effect on natural ecosystems, and in connection with this, agricultural producers are increasingly using an integrated system of plant protection. Together with the achievement of positive results in crop production, this approach ensures reproduction of soil fertility, helps restore its biological potential, and ensures minimal negative impact on the environment. It is difficult to imagine modern crop cultivation technologies, where various biological preparations are not used: stubble destructors, phytohormones, anti-stressors , biological pesticides. On 2017, a list of biologics approved for use, was registered in Ukraine (Kozushko M., 2016, Dymuch V., 2018). Of course, agrochemists are primarily interested in

bacterial fertilizers. Bacterial fertilizers widely used in Ukraine include rhizorthorphin, nitragin, rhizobophyte based on Vas. Rhizobium (symbiotic nitrogen fixers). The second, no less common group of bacterial fertilizers is based on the use of free-living and associative nitrogen fixers . These are such bacterial fertilizers as azotobacterin , diazophyte , azorizin , diazobacterin , flavobacterin and rhizoenterin . Diazophyte is used to disinfect wheat and rice, diazobacterin is used to disinfect rye, buckwheat, and cereal grasses; azotobacterin and agrofil for bacteriization of vegetable crops. The assortment of bacterial fertilizers based on phosphate-mobilizing microorganisms is much smaller. Such microbial preparations based on phosphate-mobilizing microorganisms as polymyxobacterin and albobacterin are registered in Ukraine . Phosphate-mobilizing microflora is capable of hydrolyzing organic forms of phosphates, moving (with the help of root systems) phosphorus from the lower layers of the soil to the upper arable horizon of the soil.

In recent years, new microbiological preparations have appeared on the fertilizer market, the principle of action of which is somewhat different from its predecessors. Examples of the latter can be Filazonite, Fiokompleks – BTU, Groundfix, Mipromik, Ecorost. The composition of these drugs has something in common. Yes, the composition of Filozonite includes*: psendomonas putida, Azotobacter chromococcum, Bacillus Circulans, Bacillus megaterium*. To composition of the preparation Groundfix - *Bacillus subtilis, Bacillus megaterium var. phosphaticum, Azotobacter chroococcum, Enterobacter, Paenibacillus polymyxa,* Ecorost contains *Bacillus subtilis, Bacillus stearothermophilus*. We will briefly describe the characteristics of the biological preparation ECOROST. In fig. 1 shows the composition of the drug.

The developers claim that the use of the preparation "EKOROST" allows you to restore the beneficial microflora of the soil, return the soil to its natural state, abandon synthetic fungicides, increase the immune status of plants, eliminate the effects of abiotic stressors (high and low temperatures, the effects of herbicides, salt stress, etc.).

The drug is prepared from dry spores a day before its use. The production of the drug is carried out directly on farms in specially designated places.

The technology of using the drug " Ekorost " for winter and spring cereals includes soil cultivation (spraying), seed treatment, foliar application in the 2-4 leaf phase, tillering, emergence into a tube, earing. The first three operations are mandatory for all crops. The terms of foliar

application of the drug depend on the culture being grown and the technical characteristics of the sprayer. So, for sunflower, this application is carried out at the beginning of the formation of the basket, for corn in the phase of 3-5 leaves.

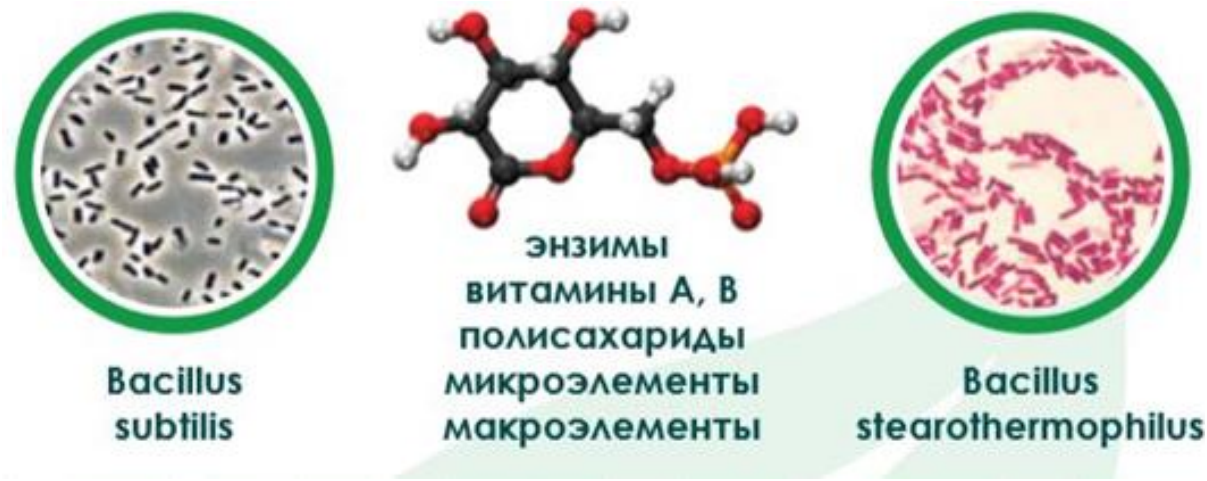

Figure 1. The composition of the preparation "EKOROST"

Below are the results of studies of the efficiency of the ECOROST technology on ground typical of the Kharkiv region. Research was conducted at the experimental field of the Kharkiv National Agrarian University named after V.V. Dokuchaev and in the conditions of farms of the Kharkiv region.

The first thing we were interested in was the effect of the drug on the microbiological activity of the soil. When the drug was registered in Ukraine, it was stated that, along with improving plant nutrition, it acts as a stubble destructor. As you know, the decomposition of plant residues ,is accompanied by the emission of CO_2 from the soil. The determination of the content of CO_2 in the surface layer of the air on the variant with the traditional technology of growing agricultural crops using the ECOROST technology revealed the following (table.1)

Table 1

The content of CO_2 in the surface layer of the air depending on the technology of growing crops, pp

Technology	Winter wheat	Soy
Traditional	437	530
"ECOROST"	651	671

Content of CO_2 under winter wheat on the option with traditional technology was 437 ppm , on the option with EKOROST technology - 651 ppm . Under sowing of soybeans, the indicated values were 530 and 671 ppm , respectively , which indicates the activation of the decomposition of plant residues. The latter ends with the release of nutrients in an accessible form. Functional diagnostics (Filon V.) of winter wheat nutrition were performed to assess changes in the nutritional regime of soils. The results of the latter are shown in Figs. 2-3. It can be seen from the above drawings that there was clearly not enough nitrogen, phosphorus, potassium, copper and molybdenum for the normal development of plants using traditional technology. The use of ECOROST technology eliminated the deficiency of basic nutrients, promoted the activation of growth processes and determined the need for trace elements.

The general condition of the crops (Fig. 4) according to the Ecorost technology was significantly better compared to the traditional technology.

Figure 2. Results of functional diagnosis of winter wheat on control: along the ordinate axis - photosynthetic activity of chloroplasts; along the abscissa axis - macro- and microelements, which are determined by their availability. The red line indicates the level of chloroplast activity in the control. Above the red line - there is a need to introduce a nutrient element, below – not

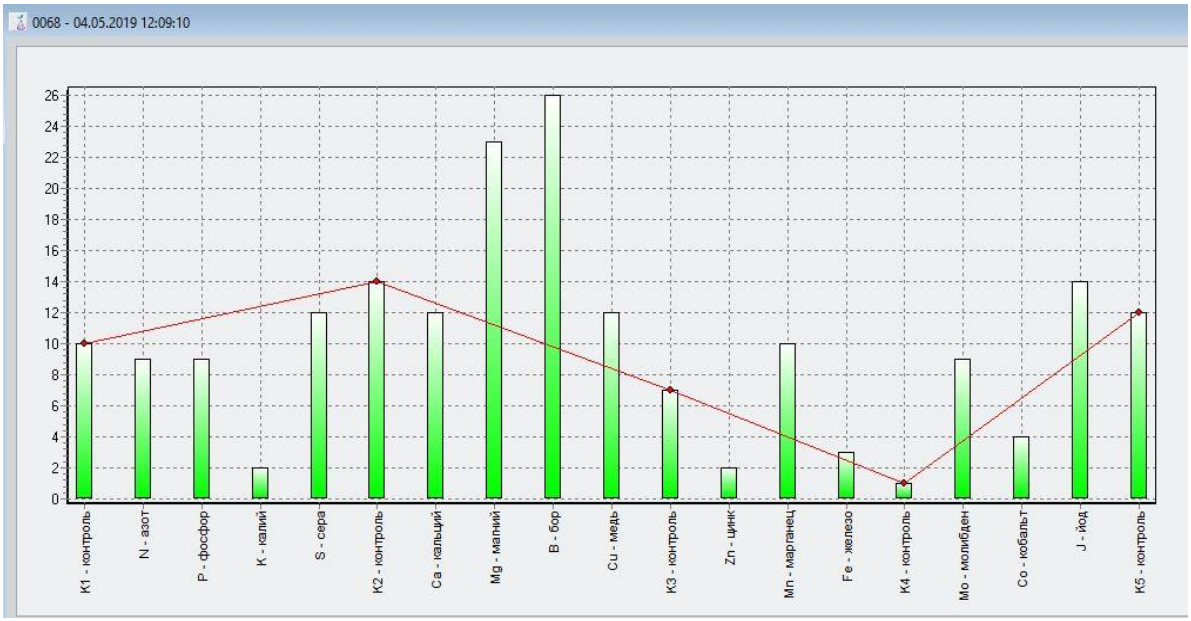

Figure 3.The results of functional diagnostics of winter wheat when grown according to the "EKOROST" technology: along the ordinate axis - photosynthetic activity of chloroplasts; along the abscissa axis - macro- and microelements, which are determined by their availability. The red line indicates the level of chloroplast activity in the control. Above the red line - there is a need to introduce a nutrient element, below - not.

Figure 4.General appearance of the experiment with winter wheat We mean the height of the plants, the area of the leaf surface, the content of chlorophyll and the manifestation of diseases in the lower layer of the leaves. Harvest accounting showed (Table 2) that the use of Ecorost technology allows for a fairly significant increase in yield (0.39 t/ha).

Table 2

Efficiency of the "EKOROST" technology during the cultivation of winter wheat on the experimental field of the KHNAU named after VV Dokuchaeva

Technology	Productivity, t/ha	Crop growth, t/ha
Traditional	4.84	
"ECOROST"	5.23	0.39

A somewhat different picture was observed during the implementation of the specified technology at Pechenizke LLC (Table 3). Ecorost technology not only helped to increase the yield of winter wheat, but on the contrary, led to its decrease. It should be noted that the introduction of Ecorost technology is economically beneficial even with the same levels of productivity. It does not provide for the use of quite expensive mineral fertilizers and pesticides. This, in turn, allows you to sell products (as environmentally friendly) at higher prices. Another of the main reasons for the low efficiency of Ecorost technology in the economy is the management's lack of interest in paying the company money for its implementation. By the way, in the same farm, the Ecorost technology did not increase the growth and yield of barley (Table 4).

Table 3

The effectiveness of the "ECOROST" technology in the cultivation of winter wheat at "Pechenizke" LLC

Technology	Productivity, t /ha	Crop growth, t/ha
Traditional	3.2	
"ECOROST"	2.4	– 0.8

At the same time, the management of the farm recognized the fact that the specified technology saves money on the application of fertilizers and pesticides. As for the cultivation of corn using the Ecorost technology , positive results were observed from the emergence of seedlings to harvesting (Table 5).

Table 4

Effectiveness of "EKOROST" technology in growing barley at "Pechenizke" LLC

Technology	Productivity, t /ha	Crop growth, t/ha
Traditional	4,5	
"ECOROST"	4,2	_ - 0,3

Table 5

Yield of corn when grown according to ECOROST technology, t/ha

	Technology	Productivity, t /ha	Crop growth, t/ha
1	Traditional	3,88	
2	"ECOROST"	5,13	1,25
3	NIR 05 t/ha		0,35

The increase in the yield of corn grain was quite significant and statistically reliable. The patent search and conducted research allow us to come to the conclusion that the use of biopreparations cannot guarantee high increases in the yield of agricultural crops. Although in the literature (Romanov O, Romanova T.,2022) there are reports when foliar application on cabbage 2l. Vuksalu Aminoplant provides a net profit of UAH 145 000 /ha. It has been proven for years that only mineral fertilizers can provide high increases in grain yield. The use of biological preparations really has the right to life, because it enhances the effect of fertilizers, protects against the negative manifestation of biotic and abiotic stressors, and ultimately contributes to the realization of the genetic potential of the variety.

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