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TABLE OF CONTENTS

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MODERN BIOPREPARATIONS IN SOYBEAN GROWING TECHNOLOGY

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Abstract. The main purpose of the introduction of organic agriculture in Ukraine is the production of environmentally friendly products. In recent years, the interest of producers in growing organic soybeans has grown. Through analysis of the modern market of biological products, we can identify products used as inoculants for legumes, biological fertilizers, growth regulators, and microbiological fungicides. **Keywords:** soybeans, biological protection, biopreparations, growth stimulants, biofungicides.

Ecologization of crop production is the starting point on the way to a model of sustainable agricultural development. The study of agri-environmental issues in modern crop production is impossible without taking into account the environmental requirements of the agricultural sector [1, 4]. This is due to the fact that the object of crop production are living organisms united in agrobiocenoses. To create a theoretical basis for the management of the production process in agricultural production, it is necessary to develop techniques for the effective use of methods of integrated plant protection.

In Ukraine, the increase in the area for growing organic crops and the number of organic producers is observed. However, despite the significant prospects for the

expansion of this area in the domestic market, there are many contradictions in the nature and content of organic production [1].

The main purpose of the introduction of organic agriculture in Ukraine is the production of environmentally friendly products. In recent years, the interest of producers in growing organic soybeans has grown. According to statistics, soybean production in Ukraine ranks fourth after wheat, corn and sunflower. The potential yield of soybeans, unfortunately, is not fully achieved for a number of reasons, among which the phytosanitary condition of seeds and plants during the growing season is crucial. Pathogens negatively affect both the quality of seeds and the development and productivity of plants in the field [2, 3].

Among all elements of soybean cultivation technology designed to achieve the genetic potential of modern varieties, special attention should be paid to pre-sowing seed preparation: inoculation, treatment with chemical and biological pesticides, plant growth and development stimulants [6, 7]. Also, disease development should be monitored regularly throughout the growing season, which will allow timely decisions to be made to control the spread of soybean diseases.

Endosymbiosis with nitrogen-fixing subbacteria, rhizobia, is an important feature of soybeans. Due to symbiotic nitrogen fixation, soybeans can significantly or even completely satisfy their need for nitrogen through symbiotrophic nutrition [7]. This allows to grow soybeans without or with minimal doses of environmentally hazardous mineral nitrogen fertilizers. In addition to inoculation, there are many proposals for the use of biofungicides aimed not only at biocontrol of diseases, but also to stimulate growth and increase crop resistance to stress.

Through analysis of the modern market of biological products of both domestic and foreign crop production, we can identify products used as inoculants for legumes, biological fertilizers, growth regulators, and microbiological fungicides.

Inoculation is the most known and widespread measure in the world to provide quality nitrogen nutrition for legumes [3]. Nodule bacteria are the basis of any inoculants. The next element of soybean cultivation technology is the use of fertilizers, preference is given to biological fertiluzers. Their use is associated with a

reduction in the use of mineral fertilizers that adversely affect soil biota, while biological products enrich the rhizosphere of plants with beneficial microorganisms that are responsible for efficient plant nutrition.

By inhabiting the root zone, microorganisms convert inaccessible nitrogen, phosphorus and potassium of the soil into accessible forms for plants, stimulate plant development and destroy pathogenic microflora - plant pathogens, produce phytohormones that directly affect plant growth and development, their resistance to external stresses, and hence the yield [5].

Biofertilizers available on the market in Ukraine contain bacteria *Azotobacter chroococcum* and *Bacillus megaterium.* Preparations based on *Azotobacter chroococcum* are used for pre-sowing treatment of soybean seeds as well as for plant nutrition, leaf treatment and improvement of soil fertility. The beneficial effect of this product on plants is due to its ability to absorb molecular nitrogen from the air and synthesize various biologically active substances. Preparations based on *Bacillus megaterium* are used to reduce the use of phosphorus-potassium fertilizers by 20-30% due to the transformation of insoluble phosphorus and potassium in the soil into accessible forms for plants [5].

The technology of soybean cultivation provides for the use of fungicides. Microbiological fungicides include preparations with a significant range of action. This protects plants from a wide range of diseases, including seed mold, root rot, late blight, Alternariosis, Fusarium wilt, *Phoma destructiva* disease, and bacterioses, etc. [2, 6].

Living organisms, on the basis of which biofungicides are developed, are absolutely safe for the environment because they are part of it. It is worth noting that pests do not develop resistance to the preparations from this group and, thus, can be used effectively for many years.

Biofungicides based on different strains of fungus *Trichoderma viride* and bacteria *Pseudomonas aureofaciens* and *Bacillus subtilis* are recommended for soybeans.

Thus, bacteria *Pseudomonas aureofaciens,* a component of a preparation called Gaubsin, control the development of diseases such as septoria leaf spot, Fusarium

wilt, perenosporosis, ascochitosis, and bacterioses. This preparation not only destroys the pathogens, but also has a healing effect on plants. Biofungicides based on bacteria *Bacillus subtilis* (Phytocid and Phytodoctor) inhibit the reproduction and development of many phytopathogenic fungi (genera *Botrytis, Fusarium, Rhizoctonia,* and *Septoria)* and bacteria of the genus *Erwinia.* Strains of the fungus *Trichoderma viride* have long been used in biological plant protection. The well- known preparation Trichodermin *(Trichoderma viride)* inhibits the development of phytopathogens by direct parasitism, competition for the substrate, the release of enzymes, antibiotics and other biologically active substances that inhibit the development of many pathogens and inhibit their reproductive capacity. They control bacterioses, anthracnosis, septoria leaf spot and other fungal diseases in soybean crops [4-6].

The integrated use of biological products of different functionality is still insufficiently studied. Therefore, research is extremely relevant and should be aimed at improving the elements of biological technology of soybean cultivation.

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