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The Importance of Bacillus Thuringiensis in Biological Protection

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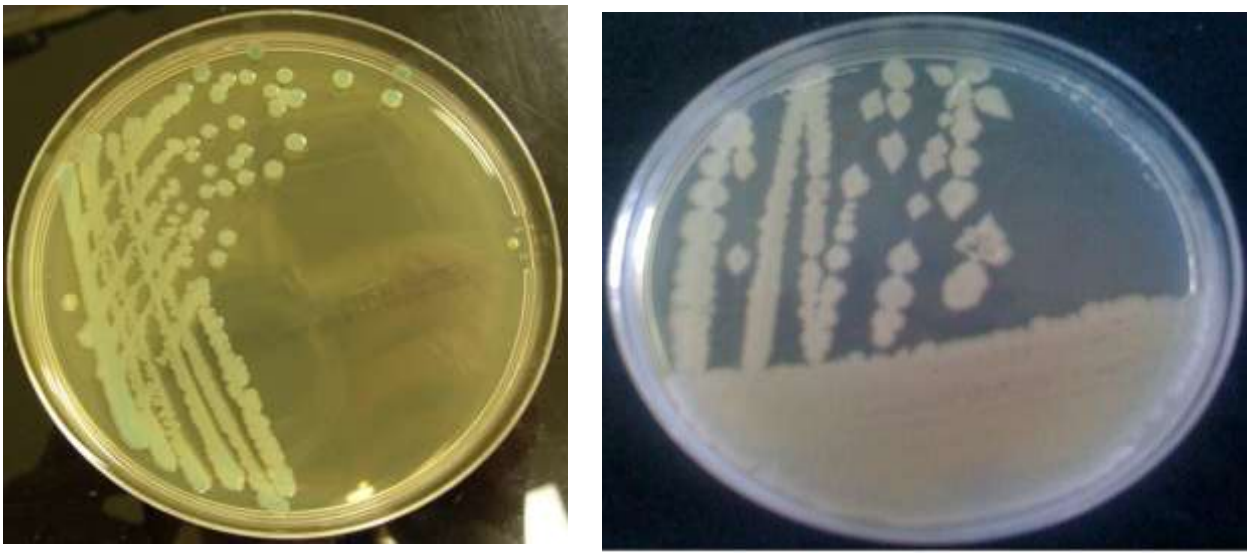
Abstract: *Protection of agricultural plants from harmful organisms successfully solves its problems when carrying out a complex integrated system, including compliance with quarantine rules, organizational, economic, agrotechnical, biological and chemical measures. According to the FAO, only harmful insects destroy at least 30% of the world's crop.*

Keywords: Biological measures, Bacillus thuringiensis, characteristics of biological preparations.

Introduction.

Bacillus thuringiensis (lat.) is a type of gram-positive, spore-forming soil bacteria. Cells and a specific crystalline protein δ-endotoxin exhibit insecticidal action against caterpillars of many representatives of insect orders of Lepidoptera and Coleoptera, larvae of mosquitoes, midges, and nematodes [1]. It is used in plant biosecurity, with the help of the endotoxin gene (Cry-toxin), the transformation of plants is carried out and GM plants are obtained that are resistant to eating by pests. A characteristic morphological feature is the presence of toxin crystals in the cytoplasm, stained with aniline black dye.



1-picture. B. thuringiensis bacterium

Main part: The problem of developing new microbiological preparations for plant protection continues to be relevant, despite the significant expansion of the range noted in recent years. The massive use of chemical plant protection products in the past has led to a number of negative consequences: the formation of stable populations of pests, depletion of the quantitative and qualitative composition of natural microbiocenoses due to a decrease in the number of beneficial insects, and the accumulation of toxic residues in the environment. Among the variety of entomopathogenic microorganisms, bacterias are one of the most promising groups from an applied point of view. Research on the study and practical use of entomopathogenic bacteria (hereinafter EB) is being conducted in many countries of the world in several directions: identification from nature, selection and selection of new highly virulent strains, study of the nature of the effect of EB on pests and their entomophages, development of technology for the use of industrial biological products. Isolation of active microorganisms, regulators of the number of phytophages from natural sources, remains an urgent problem not only from the standpoint of improving microbiological protection, but also from the point

of view of identifying their natural diversity. The advantages of bacterial preparations in comparison with chemical pesticides are specificity of action against phytophages, absence of toxic residues, harmlessness to humans and also useful entomofauna. It is generally recognized that one of the most promising and widely used microorganisms as the basis for entomopathogenic bacterial preparations is currently the bacteria of the Bacillus thuringiensis species, which are capable of synthesizing a number of biologically active substances during vegetative growth that cause virulence towards pests. Since 1962, when the B. thuringiensis bacterium entered the world nomenclature as an independent species, the search for new varieties of strains of crystalline bacteria in various climatic zones of the world continues, and due to their wide distribution in nature, the range of target insects is constantly expanding (Kandybin, 2009). Biological insecticides based on the entomopathogenic bacterium Bacillus thuringiensis ssp. The specificity of the action of bacteria is complex, associated with various metabolites, the main of which is the protein vapor-spore formation in the form of a crystal. Crystallization is a permanent feature of Bt and plays an important role in its pathogenicity. In the process of infection, toxic crystals cause the cessation of intestinal motility and destruction of the epithelium, as a result of which bacteria easily penetrate from the intestine into the body cavity, where they multiply rapidly and lead to a fatal septicemia. The death of the pest, depending on the dose of the drug, may not occur immediately (from 1 to 7 days). Bacillus thuringiensis crystals interfere with the pest's ability to digest food, cause nutritional interruption, and thereby reduce damage to the protected crop. Preparations based on entomopathogenic bacteria are low-toxic, safe for humans and warm-blooded animals, and do not have a negative effect on the useful fauna of agrocenoses. They also do not have phytotoxicity, do not affect the smell or taste of the treated plants, they can be used in any phase of the vegetation of plants, including during the flowering period and 1 day before harvesting.

Conclusion. A characteristic feature of biological preparations is their harmlessness to plants, humans, warm-blooded animals, bees and other beneficial insects, as well as the duration of exposure to pest populations and the impact on limiting their number in the next generation. Biological products based on Bacillus thuringiensis are widely used to control the number of pests in agriculture and forestry, as well as blood-sucking and dipteran insects. So, based on Bt ssp. dendrolimus (sotto), a biological product dendrobacillin was created against a number of Lepidoptera (Siberian silkworm, cabbage and turnip whiteworm, meadow moth, etc.). Based on Bt. ssp.galleriae - entobactrin, which was used mainly against lepidoptera phytophages of cabbage and fruit crops. Strain Btssp. kurstaki served as the basis for lepidocid (against Lepidoptera) Bt var. tenebrionis (morrisoni), whose crystals are toxic to the larvae of the order Coleoptera, based on Bt. ssp. israilensis, drugs were obtained against mosquitoes and midges. Based on Bt. ssp. thuringiensis, a broad-spectrum drug bitoxibacillin has been developed (Colorado potato beetle, many species of Lepidoptera, spider mites and others). Currently, biological products based on Bacillus thuringiensis are widely used in agriculture and forestry, as well as in the fight against blood-sucking insects.

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