

NATURAL NANOMATERIALS IN TECHNOLOGY OF CREATION OF THE COMPLEX BACTERIAL PREPARATIONS FOR INCREASING OF CROP

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The microorganisms in natural environment typically operate in contact with solid surfaces which give them certain advantages. In such state (especially in the interaction of microbial populations with nanomaterials) their physiological and biochemical activity is significantly increased. We have shown that, when interacting phosphate-mobilizing bacteria *Bacillus subtilis* IMV B-7023 and nitrogen-fixing bacteria *Azotobacter vinelandii* IMV B-7076 (they are used in manufacturing biotechnology of high-performance complex bacterial preparation for horticulture Azogran) with nanoparticles of clay minerals and other materials, their growth and enzymatic activity, stability of microbial populations to adverse environmental factors are significantly increased. It is a background of the natural nanomaterial application in biotechnological processes for manufacturing of various forms of the bacterial preparation for horticulture. On the basis of interaction between these bacteria with nanoparticles of bentonite it was created the granulated complex bacterial preparation for crop. Its application in the agroecosystems allows increasing yield of plants on 18-37 % [1].

An interaction of the bacteria-components of the complex preparation with nanoparticles of the natural minerals causes stimulating effect on energetic processes of microbial populations. The dehydrogenase activity of *Bacillus subtilis* IMV B-7023 was increased on 34 % when 0.5 g/l vermiculite particles were introduced into the reaction mixture. Silica nanoparticles caused less noticeable stimulating effect on this activity. If its content in the nutrient medium was 1 g/l dehydrogenase activity was increased on 20,6 %. On the basis of interaction of these bacteria with nanoparticles of the vermiculite the flowing complex bacterial preparation for horticulture was developed. It is suitable for bacterization of cereals seeds. Its application in the agroecosystems of wheat and barley allows to increase yield on 17-20%. This effect is achieved due to improvement of nitrogen, phosphorus nutrition of plants, synthesis growth-stimulating substances by bacteria, inhibition of phytopathogenic microbiota.

We have established that preparation Azogran is able to limit the spread of phytophages in agroecosystems. Thus, after processing of the flowering plants of Pelargonium and Coleus by such preparation the number of greenhouse whitefly was significantly decreased. The preparation caused a noticeable effect on the distribution of greenhouse aphids in phytosphere of these plants. The obtained results indicate the prospects of application of integrated bacterial preparation Azogran for limitation of phytophage spread in various agroecosystems.

We have shown that nanocomposite on the basis of clay mineral bentonite can function as adhesive during bacterization of the plant seeds by complex bacterial preparation [2]. Such approach will be a new optimization stage of application of the complex bacterial preparation in corn production.

1. Kurdish I.K. Introduction of microorganisms in agroecosystems. –Kyiv. Naukova dumka, 2010. – P. 253. (in Ukraine).

2. Patent of Ukraine на винахід № 95376. Bacterization method of the plant seeds.
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