THE EFFECT OF BENTONITE ON SYNTHESIS OF VITAMIN B1 AND PP BY BACTERIA *AZOTOBACTER VINELANDII IMV B-7076*

Kurdish I.K.[1], Chobotarova V.V.[1], Parkhomenko Yu.M.[2]

[1] Zabolotny Institute of Microbiology and Virology of the NAS of Ukraine,

[2] Palladina Institute of Biochemistry of the NAS of Ukraine

In recent decades, considerable attention has been paid to the use of microbial preparations in agroecosystems to improve the growth, development and productivity of plants by improving their nitrogen and phosphorus nutrition, the release of plant growth stimulators, and their protection from phytopathogens and phytophages. Particularly promising are complex microbial preparations, the effectiveness of which is due to their multifactorial positive effect on the growth and development of plants. One of them is the complex bacterial preparation Azogran, developed at the Zabolotny Institute of Microbiology and Virology NAS of Ukraine. It is created on the basis of the interaction of nitrogen-fixing bacteria *Azotobacter vinelandii* IMV B-7076 and the phosphate-mobilizing strain *Bacillus subtilis* IMV B-7023 with particles of the clay mineral bentonite (Figure 1).

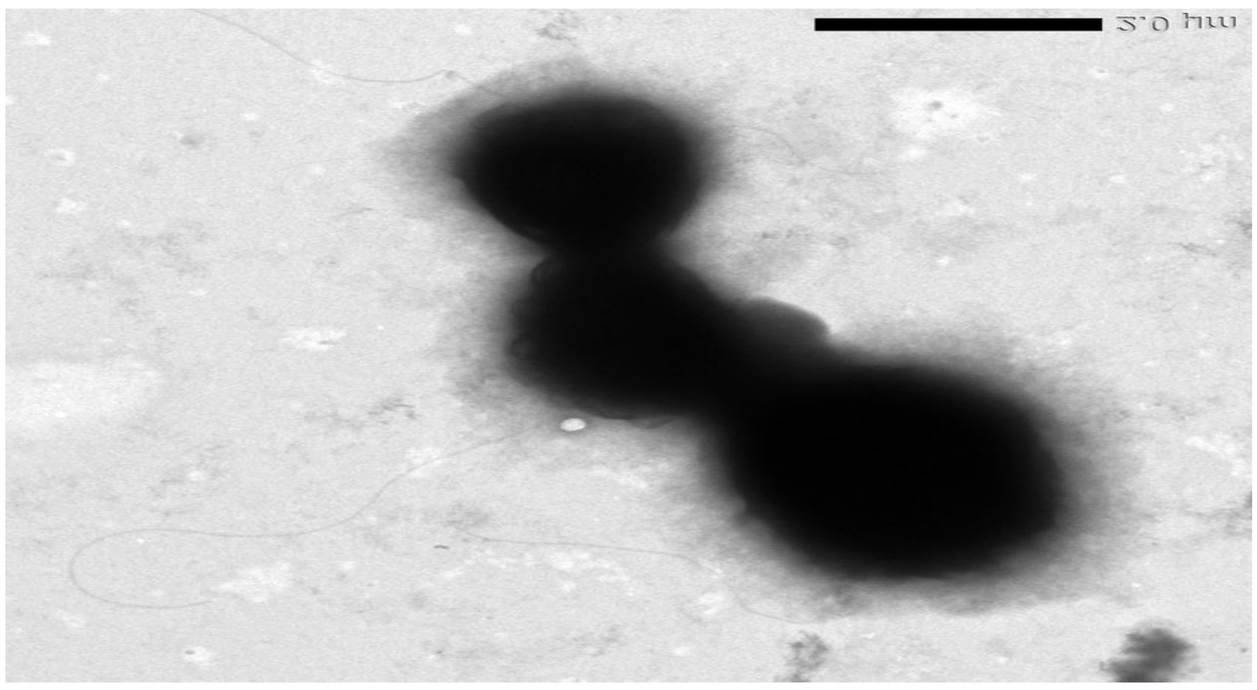

Fig.1. Interaction of bacteria *Azotobacter vinelandii* IMV B-7076 with bentonite nanoparticles

The interaction of bacteria with nanoparticles of natural minerals significantly increases the viability of cells during their storage. Thus, during storage of bacteria in a physiological solution for 3 months, the thickness of which layer was 10 or 50 mm, the number of viable Azotobacter cells decreased by more than 2 orders of magnitude, and after storage for 6 months - by almost 3 orders of magnitude (Table 1).

Table 1. The number of viable cells (cells/ml) *Azotobacter vinelandii* IMV B-7076 when stored in a physiological solution (Control) and in bentonite nanocomposite depending on the layer thickness.

Duration of storage, Months	The number of viable cells in 1 ml of physiological solution (control) and bentonite nanocomposite per layer thickness			
	10 mm		100 mm	
	Control	Nanocomposite	Control	Nanocomposite
0	$(7,1\pm0,5)\cdot10^8$	$(7,2\pm0,6)\cdot10^8$	$(7,3\pm0,6)\cdot10^8$	$(7,3\pm0,5)\cdot10^8$
1	$(9,0\pm0,7)\cdot10^7$	$(6,1\pm0,6)\cdot10^8$	$(3,1\pm0,3)\cdot10^8$	$(6,6\pm0,5)\cdot10^8$
3	$(5,1\pm0,3)\cdot10^6$	$5.1\pm0,5)\cdot10^8$	$(1,7\pm0,1)\cdot10^7$	$(5,6\pm0,4)\cdot10^8$
6	$(7,8\pm0,6)\cdot10^5$	$(1,1\pm0,1)\cdot10^8$	$(2,1\pm0,2)\cdot10^6$	$(4,1\pm0,6)\cdot10^8$

The use of the complex bacterial preparation Azogran in crop production has a significant effect on the growth and development of plants, improving their nitrogen and phosphorus nutrition, stimulating their growth with biologically active metabolites, including phytohormones [1].

The preparation improves the growth and development of a significant number of plant species, increases the yield of cereal, vegetable and technical crops by 18-37% (Table 2).

Table 2. Effect of granulated bacterial preparations of *Azotobacter vinelandii* IMV B-7076 and *Bacillus subtilis* IMV B-7023 on the yield of Chervona Strila tomato species.

Preparation	Yield, kg	Yield gain	
		kg	%
No preparation (kontrol)	2556,5	-	100,0
Azotobacter vinalandii IMV B-7076	3264,5	708,0	127,7
Azotobacter vinalandii IMV B-7076+ *Bacillus subtilis* IMV B-7023	3502,4	945,9	137,0

The are being shown that the use of the Azogran increases the resistance of plants to phytopathogenic microorganisms and viruses, as well as to phages.

The use of this preparation significantly reduces the infection of potato by phytoviruses. The Azogran significantly reduces the spread of the Colorado potato beetle in the potato phytocenosis and leads to the death of more than 65% of the larvae of this phytophage [2].

It was established that *Azotobacter vinelandii* IMV B-7076 bacteria are able to improve nitrogen nutrition of plants, synthesize a number of biologically active substances, and inhibit the growth of phytopathogenic micromycetes [3]. However, the synthesis of vitamins by this strain by interaction with bentonite nanoparticles was not investigated, which became the purpose of this work.

It was shown that during the cultivation of *Azotobacter vinelandii* IMV B-7076 bacteria in a medium containing 0.1% bentonite nanoparticles, the content of vitamin B1 was 1.96 μg/ml, while in a medium that did not contain these nanoparticles, its concentration was significantly lower-1.40 μg/ml. At the same time, the cultivation of *Azotobacter* in a medium with bentonite nanoparticles had a slight effect on the accumulation of vitamin PP (niacin).

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