

D. Dushenkovskiy, T. Filipova

THE FORMATION OF NODULES ON THE ROOTS OF SOYBEAN PLANTS
UNDER THE ACTION OF A BIOLOGICAL PRODUCT ECOVITAL

Odessa National I. I. Mechnikov University,
Dvoryanskaya street, 2, Odessa, 65082, Ukraine,
phone. : +38 (095)9396938 , e-mail: 9396938@ukr.net

The purpose of the work: was to determine the effectiveness of the formation of tubers on the roots of soybean plants with the help of the drug Ecovital. **Materials and methods.** The study used soy plants Annushka. Inoculated seeds on the day of sowing with a complex microbial preparation Ecovital Bacterial load was 10^7 cells/seed. Repeat experiment 4-time. Investigation of symbiotic activity under the condition of seed treatment Ecovital. **Results.** Soybean culture studies show that the

use of the drug Ekovital positively affects the formation of bulbous bacteria. The largest number of tuber bacteria formed the phase of pouring seeds - 47.1 pounds per plant.

Key words: nodules, soybean, Ecovital

One of the decisive factors for the development of plants is the level of phosphorus availability. However, due to the low solubility of soil phosphorus compounds, cultivated plants do not receive a sufficient amount of this element [1]. Therefore, the optimization of phosphorus nutrition of agricultural crops plays a significant role in increasing their productivity. The provision of plants with phosphorus has an extremely important value for their growth, development and yield formation [2].

The effectiveness of phosphatability bacteria in crop cultivation technologies is largely determined by their ability to absorb in the root zone of plants. Basically, the survival of bacteria in the root zone of plants depends on their ability to colonize a certain area of the root system and successfully compete with it with other microorganisms [7].

Therefore, the activity and orientation of plant-microbial interactions can only be influenced by the study of bacterial competitiveness when introduced into the root zone of plants, their influence on the functioning of the existing microbial group, and the action of the environment conditions on its activity.

The ontogenesis of plants occurs in their close interaction with microorganisms of the soil, which inhabit the rhizosphere and form associations "microorganisms - the root system of plants" [4]. In the process of life, this system is influenced by various external biotic and abiotic factors, including unfavorable to living organisms. Therefore, increasing the sustainability of ecosystems to stress conditions, strengthening the protective functions of organisms with the help of certain biological methods could significantly reduce the impact or prevent the action of negative factors. Thus, the research of many authors established the multi-lateral action of rhizospheric microorganisms that are part of the bio-inoculants [3-6].

Successful cultivation of any agricultural crop should take into account both the aspects of the economic efficiency of production and the methods of realization of the produced products, as well as the rational use of production means for creating the optimal conditions for the functioning of agrocenoses. Thus, the growing technology should include a complex of successive operations aimed at obtaining high yields taking into account the biological characteristics of the plants during the development phases. Recently, in many countries, despite the wide use of agrochemicals in the cultivation of crops, priority is given to the use of microbial drugs.

The deficiency of vegetable protein, the orientation of agriculture to environmentally appropriate production, as well as the high cost of mineral and organic fertilizers cause increased interest in legumes. Crop data is an inexhaustible source of soil enrichment with nitrogen compounds due to fixation of nitrogen by nodule bacteria in symbiosis with plants, and therefore have an important agricultural value. Their cultivation can reduce the cost of crop production due to the inclusion in the process of agricultural production of atmospheric nitrogen, improve the phytosanitary state of crops and significantly increase the productivity of arable land [2].

Since the crop area in Ukraine grows annually, crops are grown in new places where it has never been cultivated. In these conditions it is necessary to ensure the presence of active strains of nodule bacteria in the soil due to pre-sowing inoculation of soy. Currently, the biological product "Ecovital" is widely used for this purpose. It consists of complementary strains of nitrogen fixing rhizobia (*Rhizobium* or *Bradyrhizobium*) and a strain of phosphate mobilizing bacteria *Bacillus megaterium*. The drug causes a positive effect on the soil fertility

Materials and methods

The objects of research were soybean herbs of Annaushka. The seeds were inoculated on the day of sowing with a complex microbial preparation product Ekovital based on nodules (*Rhizobium* or *Bradyrhizobium*) and phosphate mobilisation (*Bacillus megaterium*) bacteria. The bacterial load was 10^7 cells/ seed. In the control

variant, the seeds were not treated in any way. In addition to controlling and treating seeds, Ekovital also had a variant of seed treatment with sterile water. The seeds were cultivated in pots with soil for 30 days.

The research was conducted on the basis of the Biotechnological Research and Training Center in the laboratory. Repeat experiment four times. Investigation of symbiotic activity under the condition of seed treatment product Ecovital. In all phases of organogenesis of soybean plants, an increase in the number of tubers in variants with the use of the product Ecovital was noted. Statistical processing of the results was performed using the Microsoft Office Excel 2007 computer program.

Results and their discussion

From the results of the experiment shows that the greatest number of nodules on soybean roots was obtained when using the product Ecovital.

Table.

The number of nodules formed on the roots of soybeans, depending on the seed treatment before planting

Version	Number of tubers, pieces / plant		
	Phase flowering	phase of formation beans	the infusion phase seed
Control	26,8 ± 1,3	34,7 ± 1,7	37,0 ± 1,9
Seed treatment with water	28,5 ± 1,4	37,4 ± 1,9	41,5 ± 2
Processing of seed Ecovital	31,7 ± 1,6	41,9 ± 2,1	47,1 ± 2,3

Also it should be noted that the number of nodules in the treatment of seeds with sterile water was more than in the control. Soybean plants whose seeds were treated with sterile water had more nodules on the roots in comparison with the control: in the flowering phase - by 6%, in the bean formation phase - by 17%, in the seed pouring phase - by 12%. The soybean seeds that was processed by the product

Ecovital had the best results. In comparison with the control of plants that were treated with Ecovital, there were more than just nodules on the roots: in the flowering phase – by 18%, in the phase of bean formation – by 20%, in the phase of seed pouring – by 27%.

Conclusions. A sufficient amount of nutrients during the growth and development of soy plants is a prerequisite for effective nitrogen fixation. The results of studies on soybean culture show that the use of the product Ecovital positively affects the formation of bulbous bacteria. These results show the effectiveness and practical importance of the application of product Ecovital to obtain a greater number of nodules on soybean roots.

LIST OF CITED LITERATURE

1. Glazunova N. M. Indices of Availability of Soil Phosphates N.M. Glazunova, L.P. Pohlebkin // Agrochemicals. - 1989. - No. 10. - P. 118-127.
2. Gulyayev B.I. Phosphorus as an energy base for processes of photosynthesis, growth and development of plants / B.I. Gulyayev VP Patch // Agroecol. journ - 2004 - 2. - pp. 3-9.
3. Kurdish IK, Bega Z.T., Gordienko AS, Dyrenko D.I. Influence of *Azotobacter vinelandii* on germination of plant seeds and adhesion of these bacteria to the roots of cucumbers // Prikl. biochemistry and microbial. - 2008. - T. 44, No. 4. - P. 442-447.
4. Kurdish I.K. Granulated Microbial Drugs / Kurdish I.K. // Science and practice. - K. : KVIT, 2001. - 141 pp.
5. Melentiev AI Aerobic spore-forming bacteria *Bacillus* Cohn in agroecosystems / A.I. Melentiev - M. : Nauka, 2007. - 120 p.
6. Vayshlya O. B. , Vedernikova AA, Kin A.I., Minaeva O.M. Biological Activators of Soil Fertility // Mat. VI Conf. Young Scientists "Science and Innovation of the XXI Century". - Surgut, 2006. - P. 175-177.
7. *Lugtenberg B.J.J.* What makes *Pseudomonas* bacteria rhizosphere competent /B.J.J. Lugtenberg, L.C. Dekkers //Environ. Microbiol. – 1999. – № 1 (1). – P. 9–13.