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HR EXCELLENCE IN RESEARCH

**XI KONFERENCJA NAUKOWA  
POLSKIEGO TOWARZYSTWA AGRONOMICZNEGO**

**WSPÓŁCZESNE WYZWANIA DLA ROLNICTWA  
PERSPEKTYWY I KIERUNKI ROZWOJU**

**STRESZCZENIA REFERATÓW I POSTERÓW**



**Puławy, 17–19 września 2025**

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**Współczesne wyzwania dla rolnictwa  
– perspektywy i kierunki rozwoju**

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## THE EFFECT OF BIOFERTILIZERS AND PLANT GROWTH BIOSTIMULANTS ON SOYBEAN PRODUCTIVITY

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Soybean (*Glycine max* L. (Merr.)) are considered the most valuable legume crop in terms of both human nutrition and animal feeding. Soybean seeds contain about 20% fat, rich in unsaturated fatty acids, making it the second largest producer of vegetable oil in the world. In addition, the high protein content (about 40% of the seeds), which is the source of all essential exogenous amino acids, makes soy a key protein crop.

Soybean have a positive effect on soil fertility, as they leave a lot of nitrogen-rich crop residues in the soil after cultivation, which creates excellent conditions for subsequent crops in the rotation. This is also due to the coexistence of soybean plants with rhizobia, and a well-developed root system that can absorb nutrients from deeper soil layers.

One of the crucial factors for soybean productivity is the soil nutrient regime. The perspective method for increasing soil fertility and plant growth could be the use of microbial-based biofertilizers. Such biofertilizers play an important role in increasing yields through the natural processes of nitrogen fixation, phosphorus solubilization, and stimulation of plant growth by synthesizing substances that promote growth processes, improving soil structure, pH and other soil properties.

Another factor in increasing crop yields under the influence of numerous biotic and abiotic stresses can be application of biostimulants, which are defined as substances that support plant physiological processes, promoting their growth and development under optimal or suboptimal conditions. Their use can affect the metabolism of plants, enhance biochemical, morphological and physiological processes.

The aim of the study was to determine the effect of biofertilizers based on nitrogen-fixing and phosphorus-mobilizing microorganisms combined with the use of plant growth regulators on the soybean productivity formation.

The research was conducted on the field of the State Enterprise “Research Farm Stepne of the Institute of Pig Breeding and Agro-Industrial Production of NAAS” during 2023-2024 years. The main factors studied in research were: seed inoculation with biofertilizers based on nitrogen-fixing (HiStikSoya, 2 t<sup>-1</sup>) and phosphorus-mobilizing (Binorma Phosphorus, 1 t<sup>-1</sup>) microorganisms; crops treatment with a biostimulant in the budding phase based on amino acids (Aminorost 1.5 l ha<sup>-1</sup>) (AR), in the flowering phase with a biostimulant based on humic acids Humate potassium (0.7 l ha<sup>-1</sup>) (GK). The soybean variety studied in the experiment was Bilosnizhka.

The results of the experiment showed a positive effect of the studied factors and their combination on the soybean leaf surface formation during the growing season. In crops with use of AR, the increase in the leaf area of soybean crops in the phase of bean formation was 2.6 thousand m<sup>2</sup> ha<sup>-1</sup> compared to the control. In the variant of application of GK, the value of the leaf surface area of soybean crops was 30.3 thousand m<sup>2</sup> ha<sup>-1</sup> against 27.6 thousand m<sup>2</sup> ha<sup>-1</sup> in the control. The combination of AR and GK improved the conditions of leaf surface formation, which was expressed in an increase in the studied parameter by 4.1 thousand m<sup>2</sup> ha<sup>-1</sup> compared to the control. In the variants with the use of biofertilizer based on nitrogen-fixing bacteria, the leaf surface area of soybean crops exceeded the control variant by 3.62%. The use of a complex of plant grows biostimulants and biofertilizer based on nitrogen-fixing bacteria contributed to an increase in the value of this indicator by 5.1 thousand m<sup>2</sup> ha<sup>-1</sup> compared to the control. In the variant of seed inoculation with a complex

of biofertilizers based on nitrogen-fixing and phosphorus-mobilizing microorganisms, the leaf surface area of soybean crops exceeded the control variant by 7.97%. The highest values of this indicator were observed with the integrated use of biofertilizers and plant growth regulators.

The intensive growth of the aboveground part and root system of plants, sufficient development of the photosynthetic surface of plants and enhancement of its photosynthetic activity contributed, in turn, to an increase in the amount of synthesized metabolites and accumulation of dry matter by plants, as well as an increase in the average number of beans and seeds formed on plants and the weight of 1000 seeds. The values of all these elements of individual plant productivity led to an increase in seed yield. The highest values of this indicator were recorded in the variant of complex use of biofertilizers based on nitrogen-fixing and phosphorus-mobilizing microorganisms and plant growth regulators.