UDK 635.655:661.162.66
Honchar, L. M.*, Candidate of Agricultural Sciences, Associate Professor of the Department of Plant Production
Hnedov, K. K., PhD student
National University of Life and Environmental Sciences of Ukraine
*e-mail: ljubv09@gmail.com

RESPONSE OF SOYBEAN VARIETIES TO ANTI-STRESS GROWTH REGULATOR APPLICATION

Soybean is one of the key crops in Ukraine's agricultural production due to its high value as a protein-oil plant widely used in both food and industrial sectors. It is distinguished by strong adaptability to diverse environmental conditions, multifunctional utilization, a well-balanced amino acid composition, and high biological activity of proteins. These characteristics determine the considerable yield potential of soybean and ensure their leading position among annual leguminous, and oilseed crops worldwide in terms of cultivated areas and total production. Incorporation of soybean into crop rotations contributes to more sustainable farming systems, enhances soil fertility, increases the availability of nutrients for subsequent crops, and supports the production of environmentally friendly agricultural products.

Soybean productivity is shaped by a complex interaction of numerous factors. Achieving consistently high yields requires providing plants with essential nutrients in optimal amounts and balanced proportions. At the same time, meteorological conditions play a crucial role, with recent growing seasons characterized by rising average daily temperatures and uneven precipitation patterns. Under such circumstances, there is a growing need to develop optimized cultivation technologies for specific soybean varieties that consider regional agroclimatic conditions, biological traits of the cultivars, production capacities of farms, and the effectiveness of growth-stimulating substances.

The relevance of the study lies in the increasing role of soybean as a strategic protein-oil crop and the growing impact of abiotic stress factors associated with climate change, such as temperature fluctuations and irregular precipitation. Under these conditions, ensuring stable plant growth and productivity requires the introduction of effective technological solutions, including the use of anti-stress growth regulators. Different soybean cultivars may respond differently to such treatments due to their biological and physiological characteristics. Therefore, studying the response of soybean cultivars to anti-stress growth regulators is essential for optimizing cultivation technologies, improving plant survival, enhancing yield structure formation, and ensuring stable yields under specific soil and climatic conditions.

The aim of the study is to assess the response of different soybean cultivars to the application of anti-stress growth regulators and to determine their effect on plant survival, formation of yield structure components, and yield level under specific soil and climatic conditions.

Field experiments were carried out in 2024–2025 on the fields of the private agricultural enterprise «Lany Vinnychchyny» in accordance with standard field trial methodologies. The study involved three soybean cultivars: 'Diadema Podillia', 'Zlatopilska', and 'Merlin'. The experimental design included the following treatments: control (water application); Humifriend (350 mL/ha); Antistress 03 (350 mL/ha); and Organic Balance Monophosphorus (500 mL/ha). Crop treatments with anti-stress preparations were conducted according to the experimental scheme at growth stages BBCH 51 and BBCH 61. The seeding rate was 700,000 seeds per hectare. Sowing was performed when soil temperature at seed depth reached 10–12°C. Row spacing was set at 35 cm, and seeding depth ranged from 4 to 5 cm.

The formation of soybean plant density largely depends on plant survival throughout the growing season, which reflects their tolerance to adverse environmental conditions. This indicator is influenced by the physiological and biological characteristics of the plants, prevailing cultivation conditions, and the degree of optimization of technological practices. Plant survival was calculated as the ratio between the number of plants at full emergence and the number recorded at full maturity per unit area.

Observations indicated that soybean plant survival varied from 89.2% to 95.4%, depending on the cultivar and the applied growth stimulant. The highest average survival rate across the experiment was achieved with Antistress 03, reaching 93.6%. Under Humifriend application, survival rates were 90.5% for 'Diadema Podillia', 93.3% for 'Zlatopilska', and 92.9% for Merlin. In the Antistress 03 treatment, plant retention reached 92.3%, 95.4%, and 94.1% respectively. Application of Organic Balance Monophosphorus ensured survival rates of 90.9% for 'Diadema Podillia', 94.4% for 'Zlatopilska', and 93.8% for 'Merlin'.

The highest field emergence was recorded for the 'Zlatopilska' cultivar, amounting to 85.8%, which corresponded to a plant density of 60.2 plants per m². When treated with Antistress 03, plant survival of this cultivar during the growing season reached 95.4%, resulting in a final stand density of 57.3 plants per m².

Optimal yield structure parameters were formed mainly in the 'Zlatopilska' cultivar, where the average number of pods per plant amounted to 11.9, the number of seeds per plant reached 27.7, seed weight per plant was 5.66 g, and thousand-seed weight was 208.3 g. The most favorable height of the lowest pod attachment for mechanized harvesting was observed in the Merlin cultivar.

The research demonstrated that the application of anti-stress growth regulators has a positive effect on the growth, survival, and productivity of

soybean plants. Plant survival during the growing season was significantly influenced by both the soybean cultivar and the applied preparation, with the highest average values recorded under the use of Antistress 03.

Among the studied cultivars, 'Zlatopilska' showed the most favorable response to anti-stress treatments, ensuring optimal stand density, improved yield structure components, and the highest grain yield. The application of Antistress 03 and Organic Balance Monophosphorus contributed to an increase in the number of pods and seeds per plant, seed weight per plant, and overall yield.

The maximum soybean yield was obtained in the 'Zlatopilska' cultivar with the double application of Antistress 03, which provided a considerable increase compared to the control treatment. Therefore, the use of anti-stress growth regulators, particularly Antistress 03, can be recommended as an effective element of soybean cultivation technology to enhance yield stability under specific soil and climatic conditions.

UDK 635.655:661
Honchar L. M.*, Candidate of Agricultural Sciences, Associate Professor of the Department of Plant Production
Kushniy D. S., PhD student
National University of Life and Environmental Sciences of Ukraine
*e-mail: ljubv09@gmail.com

EFFECTS OF PRE-SOWING BIOLOGICAL SEED TREATMENT AND AMINO ACID FOLIAR APPLICATION ON BUCKWHEAT PRODUCTIVITY

Buckwheat is among the most important cereal and melliferous crops cultivated in Ukraine. The development of niche crops, particularly the production of buckwheat groats, represents a highly promising approach to strengthening national food security, decreasing reliance on imported agricultural products, enhancing the resilience of the agricultural sector, and supporting its sustainable development under current challenges. Buckwheat fully complies with the principles of organic farming, as its cultivation considerably reduces anthropogenic pressure on soil biota and contributes to the conservation of soil fertility.

Organic agriculture should not be viewed merely as a compromise between intensive and resource-saving land use systems. Instead, it is a comprehensive transformation of priorities, balancing economic viability with soil protection and restoration. The focus shifts from short-term profitability to the enhancement of natural soil fertility, responsible land management, and strict adherence to food quality and safety standards, which are especially relevant under modern conditions.

The relevance of this study is determined by the growing importance of buckwheat as a strategic food and melliferous crop, as well as by the need to increase its productivity under conditions of sustainable and environmentally friendly agriculture. In Ukraine and worldwide, there is increasing interest in niche crops that contribute to food security, reduce dependence on imported products, and ensure stable agricultural production under changing climatic conditions.

The use of biological preparations for seed treatment and foliar nutrition is a promising approach that meets the principles of organic farming, as it allows yield improvement while reducing anthropogenic pressure on agroecosystems. Buckwheat is characterized by high ecological plasticity and a low demand for mineral fertilizers, making it an ideal crop for the application of biological technologies.

At the same time, scientific data on the response of different buckwheat varieties to biological seed treatments remain limited. Therefore, studying the effectiveness of pre-sowing biological seed treatment and foliar application, as well as identifying varietal differences in yield response, is highly relevant. The obtained results can be used to improve cultivation technologies, enhance the phytoremediation potential of buckwheat, and increase the efficiency of its use in sustainable and organic farming systems.

The migration behavior of heavy metals is determined by their ability to adsorb onto organo-mineral soil complexes. Therefore, investigating the adsorption properties of soil minerals is essential for understanding phytoremediation mechanisms. Adsorption onto the soil matrix leads to the accumulation of heavy metals, whereas the formation of stable complexes with non-adsorbed organic matter enhances metal mobility and facilitates their transfer into plant root systems. Consequently, the evaluation of soils using plant-based test systems remains an important research direction requiring further investigation.

The aim of the study was to evaluate the effectiveness of pre-sowing seed treatment with biological preparations and foliar application in increasing buckwheat productivity and improving seed quality.

Field experiments were conducted during 2023–2025 at the facilities of the Educational and Scientific Laboratory «Demonstration Collection Plot of Agricultural Crops» in accordance with generally accepted field research methodologies. Four buckwheat varieties were selected for the study: 'Dykul', 'Syn 3/02', 'Kamianchanka', and 'Volodar'. Pre-sowing seed treatment was carried out using the preparations Bionorma Nitrogen and Bionorma Phosphorus at a rate of 1 L per tonne of seed.

The greatest increase in yield was observed in the 'Volodar' variety, where grain yield reached 2.02–2.25 t/ha following treatment with Bionorma Phosphorus and Bionorma Nitrogen preparations. In the 'Kamianchanka' variety, yield ranged from