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AGROBIOLOGICAL FEATURES OF COMMON BEAN PRODUCTIVITY FORMATION IN THE RIGHT-BANK FOREST-STEPPE OF UKRAINE

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Common bean (*Phaseolus vulgaris* L.) is a valuable grain legume crop with a high seed protein content, the ability to perform symbiotic nitrogen fixation, and a positive effect on soil fertility. However, its productivity depends considerably on varietal characteristics, growing conditions, the activity of bean–rhizobial symbiosis, and weed infestation. Due to slow initial growth and delayed canopy closure, common bean is poorly competitive with weeds. Therefore, the optimization of biological and chemical elements of its cultivation technology is essential for obtaining stable yields.

The aim of the study was to determine the agrobiological features of growth, development, and productivity formation of common bean varieties depending on seed inoculation and selective herbicide application under the conditions of the Right-Bank Forest-Steppe of Ukraine.

Field experiments were conducted in 2025 at the State Enterprise Experimental Farm "Salyvonkivske" of the Institute of Bioenergy Crops and Sugar Beet of the National Academy of Agrarian Sciences of Ukraine, Bila Tserkva District, Kyiv Region. The soil was a deep medium-loamy chernozem containing 2.60% humus, 178 mg/kg of alkaline-hydrolysable nitrogen, 165 mg/kg of available phosphorus, and 96 mg/kg of exchangeable potassium, with a salt-extract pH of 6.76. The common bean varieties Bilosnizhka and Lastivka were studied. Seed treatments included no inoculation, Legume Fix at 225–250 g per hectare seed rate, and Bioinoculant-BTU at 2 kg/t. Weed control treatments included an untreated control, the soil-applied herbicide Gesagard 500 FW, SC at 3.0 L/ha, and the post-emergence herbicide Corum at 1.25–2.0 L/ha combined with the surfactant Metolat at 1.0 L/ha. The experiment was arranged in three replications with randomized treatment placement. Plant growth, leaf area, nodulation, weed infestation, yield components, and seed yield were determined.

Growth intensity, leaf area formation, nodulation, and seed productivity depended on varietal characteristics, seed inoculation, and weed control. In the untreated control without inoculation, the height and maximum leaf area of Bilosnizhka plants were 37 cm and 33.2 thousand m²/ha, respectively. With Bioinoculant-BTU combined with Corum and Metolat, these parameters increased to 59 cm and 49.1 thousand m²/ha. In Lastivka, plant height increased from 33 to 58 cm and leaf area from 35.1 to 49.7 thousand m²/ha. Lastivka generally formed a larger assimilating surface than Bilosnizhka.

Seed inoculation substantially enhanced bean–rhizobial symbiosis. With Bioinoculant-BTU, the number of nodules increased from 4 to 23 per plant in Bilosnizhka and from 2 to 25 per plant in Lastivka. Their weight increased from 72 to 415 mg per plant and from 36 to 452 mg per plant, respectively. The proportion of active nodules reached 78% in Bilosnizhka and 84% in Lastivka, indicating more intensive symbiotic nitrogen fixation in the latter variety.

More than 25 weed species belonging to 10 botanical families were identified. Dicotyledonous weeds accounted for 77.8% of the weed community. The predominant species were *Amaranthus retroflexus* L., *Chenopodium album* L., *Polygonum convolvulus* L., *Echinochloa crus-galli* (L.) P. Beauv., and *Setaria* spp. In untreated plots, weed density reached 138–141 plants/m², resulting in yield losses of 85–90%.

The highest seed yields were obtained after inoculation with Bioinoculant-BTU combined with Corum and Metolat. Bilosnizhka produced 1.9 t/ha, exceeding the control by 1.66 t/ha, while Lastivka produced 2.3 t/ha, exceeding the control by 2.08 t/ha and Bilosnizhka by 21%.

Thus, common bean productivity is determined by the interaction of varietal characteristics, symbiotic nitrogen fixation, and weed control. The most effective technological combination was seed inoculation with Bioinoculant-BTU followed by the application of Corum with Metolat, which enhanced growth, nodulation, photosynthetic activity, and seed yield of both varieties.

Keywords: common bean, seed inoculation, herbicides, weed infestation, leaf area.

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