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EFFECT OF THE BACTERIAL STRAIN BACILLUS THURINGIENSIS BHC 2.4 ON PHYSIOLOGICAL PARAMETERS OF BARLEY GROWN UNDER GREENHOUSE CONDITIONS

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ABSTRACT

The increasing need for sustainable agricultural practices has driven interest in the application of plant growth-promoting rhizobacteria (PGPR), which can enhance crop performance by improving nutrient uptake, stimulating growth, and alleviating plant stress. Among PGPR, certain strains of *Bacillus thuringiensis*—known primarily for their insecticidal properties—have also shown potential for biostimulant activity in non-target plants. In this study, we evaluated the impact of the native bacterial strain *Bacillus thuringiensis* BHC 2.4 on the physiological status of barley (*Hordeum vulgare* L.) under semi-controlled conditions. A pot experiment was set up in a greenhouse using two treatments: (1) a non-treated control and (2) a bacterial treatment where barley seeds were inoculated with a suspension of BHC 2.4 culture. Plants were grown for a period of two months, after which key physiological parameters were assessed using a Dualex Scientific leaf-clip sensor. The following parameters were measured: nitrogen balance index (NBI), chlorophyll content (Chl), flavonoid content (Flav), and anthocyanin content (Anth). These indicators are commonly used to evaluate plant nutritional status and stress levels. Specifically, NBI reflects nitrogen assimilation and availability; chlorophyll content is directly related to photosynthetic efficiency; while flavonoids and anthocyanins are secondary metabolites whose accumulation is often induced by abiotic stress factors. Results showed that plants treated with BHC 2.4 exhibited a 22.9% increase in NBI and a 13.8% increase in chlorophyll content compared to the control, indicating enhanced nitrogen use efficiency and improved photosynthetic capacity. In contrast, flavonoid and anthocyanin levels were reduced by 9.3% and 36.4%, respectively, in treated plants. The reduction of these compounds suggests a lower stress burden in plants exposed to bacterial treatment, potentially due to improved nutrient status and microbial-mediated alleviation of stress. These findings highlight the potential of *Bacillus thuringiensis* BHC 2.4 as a multifunctional PGPR strain capable of improving crop quality and resilience. Its application could contribute to the development of environmentally friendly agricultural inputs that reduce reliance on synthetic fertilizers and enhance plant productivity through natural mechanisms. Future work will focus on field validation and elucidating the molecular mechanisms underlying the observed effects.

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Keywords: *Bacillus thuringiensis*, PGPR, barley, nitrogen balance index, chlorophyll, flavonoids, biostimulant, stress mitigation.