PGPR-Mediated Growth Enhancement and Antioxidant Properties in Bok Choy (Brassica rapa subsp. chinensis): A New Frontier in Plant Biotechnology

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Abstract

Bok choy (Brassica rapa subsp. chinensis) is a nutrient-rich leafy vegetable valued for its economic and nutritional importance. However, its growth and physiological performance can be adversely affected by various biotic and abiotic stressors. This study aimed to evaluate the potential of Plant Growth-Promoting Rhizobacteria (PGPR) isolates IZ01 and IZ02 in enhancing the growth and antioxidant defense mechanisms of bok choy. The application of PGPR significantly improved several physiological parameters. Fresh weight increased by 25% in IZ01-treated plants and by 45% in those treated with IZ02 compared to the control. Chlorophyll content also showed an increase of 8.33% (IZ01) and 16.67% (IZ02), indicating enhanced photosynthetic capacity. Total sugar content was likewise elevated, with increases of 25% and 33.33% in IZ01- and IZ02-treated plants, respectively, suggesting improved carbohydrate metabolism. Antioxidant enzyme activity was markedly enhanced in response to PGPR treatment. Catalase (CAT) activity increased by 50% in IZ01 and 30% in IZ02, while guaiacol peroxidase (GPX) activity was enhanced by 175% and 75%, respectively, compared to the control. These results demonstrate that PGPR isolates IZ01 and IZ02 effectively promote plant growth and physiological resilience by

enhancing photosynthesis, carbohydrate accumulation, and antioxidant enzyme activity, thereby strengthening stress tolerance in bok choy. © The Authors, published by EDP Sciences.

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