PLANT GROWTH-PROMOTING POTENTIAL OF *Bacillus* sp. ISOLATED FROM VINEYARD SOIL

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Abstract

Conventional agrochemicals widely used in agronomic production raise serious environmental concerns, as their accumulation in soil, air, and water can lead to food chain contamination and adverse effects on animal and human health. These challenges have encouraged the search for alternative, eco-friendly approaches to sustainable agriculture. One promising strategy involves the application of microbial bioagents with plant growth-promoting (PGP) traits. This study aimed to evaluate the potential of *Bacillus* sp. 22/R isolated from vineyard soil as a candidate plant biostimulant by characterizing its PGP properties. Hydrolytic enzyme activities (cellulase, xylanase, pectinase, protease, gelatinase, and lipase) were assessed using semi-quantitative agar plate assays. The production of ACC deaminase was evaluated on DF minimal medium with ACC as the sole nitrogen source, while phosphate and zinc solubilization were determined on Pikovskaya and zinc-solubilizing agar, respectively. Indole-3-acetic acid (IAA) synthesis was determined spectrophotometrically after cultivation in nutrient broth supplemented with L-tryptophan. The isolate exhibited strong pectinolytic activity (EAI 4.28) and considerable xylanase activity (2.12), whereas cellulase, protease, gelatinase, and lipase activities were comparatively lower, with EAI values of 1.60, 1.29, 1.44, and 1.25, respectively. It demonstrated ACC deaminase activity with a growth diameter of 30.17 ± 0.29 mm, phosphate solubilization with an index of 1.06, and IAA synthesis at a concentration of 4.20 µg/mL. Overall, these results highlight that the *Bacillus* isolate combines relevant enzymatic activities with ACC deaminase production and IAA biosynthesis, traits that are highly desirable in the context of plant growth promotion. Further studies, especially in greenhouse and field trials, are needed to validate its potential and applicability as a microbial biostimulant.

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