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RESEARCH ARTICLE

Exploring the antibacterial potential and bioactive compounds of *Bacillus flexus*

■ Verinder Virk and Rishita Srivastava

SUMMARY

The rhizosphere, a soil region influenced by plant root exudates, is a hotspot for diverse microbial communities that play crucial roles in plant health. This study investigated the bacterial isolates from the rhizosphere of potato plants in Khankhal Haridwar, Uttarakhand, India, aiming to evaluate their antibacterial activity and identify bioactive compounds via Gas Chromatography-Mass Spectrometry (GC-MS). Six bacterial isolates (RB1-RB6) were assessed for their activity against *Staphylococcus aureus* and *Escherichiacoli* using the agar well diffusion method. Among these, *Bacillus flexus* RB4 exhibited the most pronounced antibacterial effect, displaying significant inhibition zones against both pathogens. GC-MS analysis of *Bacillusflexus* RB4 identified several bioactive compounds, including propanoic acid ethyl ester and acetic acid, known for their antimicrobial properties. Moreover, the isolates demonstrated various plant growth-promoting traits, such as Indole-3-acetic acid (IAA) production and phosphate solubilization, with RB1 showing the highest IAA concentration at 88.3 µg/ml. These findings underscore the potential of these bacterial isolates as biocontrol agents and plant growth promoters, contributing to the understanding of rhizosphere bacteria's functional roles in sustainable agriculture. Future studies should investigate the specific mechanisms underlying these activities and explore their applications in diverse agricultural systems.

Key Words : Rhizosphere microbiota, PGPB, Antimicrobial activity, GC-MS, Bioactive metabolites

Abbrivations: GC-MS - Gas Chromatography-Mass Spectrometry, **IAA** - Indole-3-acetic acid, **MTCC** - Microbial Type Culture Collections

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