Journal of Chemical Ecology (2025) 51:32
https://doi.org/10.1007/s10886-025-01583-5

RESEARCH

# Growth-Promoting Endophytes as Immunity Booster for *Brassica juncea* against Insect Attack

**Kavita Verma[1] · Surbhi Agarwal[1] · Garima Sharma[1] · Apeksha Singhal[1] · Richa Mullick[1] · Vartika Mathur[1,2]**

Received: 1 November 2024 / Revised: 14 February 2025 / Accepted: 18 February 2025 / Published online: 11 March 2025


## Abstract

Endophytes play a pivotal role in plant growth, metabolism, and defense mechanisms. Many of these endophytes are known to promote plant growth and/or contribute in stress alleviation by producing an array of secondary metabolites and phytohormones. In agroecosystem, plants are continuously exposed to various biotic stressors which affect their growth and development as well as quality and quantity of the crop. This study for the first time, focuses on the growth promoting bacterial potential of endophytes in enhancing plant resistance against the polyphagous pest *Spodoptera litura* in *Brassica juncea* (Indian mustard). A total of the 30 bacterial and fungal endophytes were isolated from *B. juncea* and ten isolates namely, *Acinetobacter* sp. WEL105, *Acinetobacter* sp. WEL1051, *Acinetobacter* sp. WEL1052, *Acinetobacter* sp. WEL1072 and *Acinetobacter* sp. BJWEL1, *Zasmidium* sp. PWEL1031, *Cladosporium* sp. PWEL1032, *Cladosporium* sp. PWEL1033, *Cladosporium* sp. PWEL1034 and *Cladosporium* sp. PWEL104 were shortlisted based on their plant growth-promoting potential. Among these, *Acinetobacter* sp. WEL1072 and *Acinetobacter* sp. BJWEL1 supplementation showed significant increase in biomass, phytohormones production (indole acetic acid and gibberellic acid), phenol and condensed tannins concentrations. Endophyte-treated plants exhibited improved biomass and increased production of defence compounds, namely phenols, condensed tannins and serine protease inhibitors. Our study thus highlights the dual potential of endophytes in enhancing plant growth and strengthening defence mechanisms, thus offering a sustainable approach to agricultural pest management.

**Keywords** Biotic stress · Phytohormones · Induced resistance · Insect herbivory · *Spodoptera litura* · Indian mustard · *Acinetobacter*

Kavita Verma and Surbhi Agarwal have contributed equally to this work.

✉ Vartika Mathur
apiresearchlab@gmail.com; vmathur@svc.ac.in

Kavita Verma
kavitav282@gmail.com

Surbhi Agarwal
singer.surabhi@gmail.com

Garima Sharma
garima.biochem.1@gmail.com

Apeksha Singhal
singhalapeksha3@gmail.com

Richa Mullick
richam1303@gmail.com

[1] Animal-Plant Interactions Lab, Department of Zoology, Sri Venkateswara College, University of Delhi, Benito Juarez Marg, Dhaula Kuan, New Delhi 110021, India

[2] Fellow of Institute of Eminence, School of Climate Change and Sustainability, University of Delhi, Delhi 110007, India

## Introduction

Natural ecosystem comprises a diverse pool of microbes, some of which form microbial communities that colonize plants as either epi- or endophytes (Schulz and Boyle 2007). These microbes reside in the plant tissues without causing apparent disease symptoms. Some of them actively interact with the plant machinery, becoming an integral part of its metabolism (Jain and Pundir 2017; Mathur and Ulanova 2023). They support the plants in primary metabolism and promote priming effect against both abiotic and biotic stresses (Khare et al. 2018; Oukala et al. 2021; Li et al. 2023).

Endophytes such as plant growth-promoting microorganisms (PGPM) reside inside the plant tissues without causing any harm to them and improve host plant growth through production of primary metabolites and phytohormones as well as enhancement of nutrient and water uptake (Hallmann et al. 1997; Brader et al. 2014; Das et al. 2022; Srinivasan