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Notice for the PhD Viva-Voce Examination

Ms Indhu Philip (Registration Number: 1981602), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend her PhD thesis at the public viva-voce examination on Wednesday, 14 May 2025 at 9.00 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Isolation and Characterisation of Endophytes and Aquatic Microbes of Bellandur Lake for Sustainable Use in Bioremediation and Plant Growth Promotion**
Discipline	:	**Biotechnology**
External Examiner - I	:	**Dr Manohar Vithalrao Padul** Professor and Head Department of Biochemistry The Institute of Science Dr Homi Bhabha State University Mumbai, Maharashtra - 400032
External Examiner - II	:	**Dr Aswati Nair** Associate Professor Department of Biochemistry and Molecular Biology Central University of Kerala Periye Post, Kasaragod Kerala - 671320
Supervisor	:	**Dr Suma S** Associate Professor Department of Life Sciences School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru
Date: 07 May 2025

ABSTRACT

The coexistence of diverse species on the planet Earth is very much dependent on the thrust humankind gives to sustainable practices. With a huge increase in the rate of industrialization required to meet the demands of the growing global population, there was crumbling of several ecosystems. In the past few decades, there has been a lot of importance given to the revamping of the ecosystem by adopting sustainable practices, using more biomaterials than chemically synthesized materials for meeting various needs. The present study was launched to investigate bacterial strains isolated from aquatic plants (*Alternanthera philoxeroides* and *Eichhornia crassipes*) and water samples from Bellandur lake, one of India's most polluted lakes, and to investigate their potential for biotechnological and environmental applications. The bacterial isolates thus identified and characterized showed good promise for applications in bioremediation, sustainable agriculture and eco-friendly industrial practices, contributing directly to Sustainable Development Goals (SDGs) such as Clean Water and Sanitation (SDG 6), Zero Hunger (SDG 2) and Responsible Consumption and Production (SDG 12).

The primary isolates consisted of endophytic bacteria such as *Acinetobacter soli* and *Bacillus licheniformis*, which exhibited notable plant growth-promoting properties. These included the production of IAA and ammonia, nitrogen fixation, and the solubilization of phosphate and potassium, all crucial for enhancing soil health. These bacteria also exhibited enzyme production capabilities, such as lipase, cellulase, and ACC deaminase, which aid plants in coping with environmental stresses. Greenhouse experiments with *Amaranthus viridis* revealed notable improvements in growth parameters with bacterial treatment, with *A. soli* showing particular effectiveness as a potential bioinoculant for enhanced crop yield and resilience.

The study also highlights the bioremediation potential of bacteria isolated from Bellandur lake for detoxifying heavy metals like chromium (Cr) and lead (Pb), prevalent in industrial pollution. Among the isolates, *Flavobacterium chungangense* and *Bacillus paramycoides* demonstrated high tolerance to these metals and efficient removal capabilities, with *F. chungangense* reducing toxic hexavalent chromium to a less toxic form, underscoring its potential for remediation of contaminated sites. Additionally, *Bacillus velezensis* displayed dye-degradation capacity, effectively decolorizing Congo red, a pollutant from the textile industry. The study further discovered bacteria with notable enzyme production, specifically *Bacillus aerius*, which exhibited high protease activity applicable in industries like detergents and leather processing. Optimizing protease production enhanced enzyme activity significantly, and application tests demonstrated its practical utility for tasks like blood stain removal, leather dehairing, and feather degradation.

Overall, this research emphasizes the importance of leveraging microbial diversity to address environmental challenges, suggesting scalable microbial solutions for bioremediation, sustainable agriculture, and industrial applications, with implications for achieving ecological balance and sustainable development.

Keywords: endophytes; Bellandur lake; enzymes; plant growth promotion; bioremediation

Publications:

1. **Philip I**, Sarojini S, Biswas S, Jayaram S (2023) Insights into the Plant Growth Promotion Properties of Bacterial Endophytes Isolated from Alternanthera philoxeroides and Eichhornia crassipes from Bellandur Lake, India, South African Journal of Botany, 162(2023): 588-603. https://doi.org/10.1016/j.sajb.2023.09.028
2. **Philip I**, Sarojini S, Biswas S, Jayaram S (2023) Exploring the Potential of *Bacillus velezensis*, an Endophytic Bacteria Isolated from Alternanthera philoxeroides for Plant Growth Promotion and Bioremediation Properties, Journal of Pure and Applied Microbiology, 17(3): 1748-1763. https://doi.org/10.22207/JPAM.17.3.40
3. **Philip I**, Sarojini S, Biswas S, Jayaram S (2024) Unveiling the potential of *Bacillus paramycoides*, a Halotolerant Endophytic Bacterium with Heavy Metal Tolerance and Plant Growth Promotion Properties, Research Journal of Biotechnology, 19(3), 120-126. doi: https://doi.org/10.25303/1903rjbt1200126