(019)

Comprehensive Study of Functional, Biochemical and Antibiotic Resistance Profile of Endophytic Bacteria in *Nymphaea stellata*

Ajini, M.L.S., Mataraarachchi, H.S., Jayamanna, P.S., Wijerathna, P.A.K.C.*
Spectrum Institute of Science and Technology, Colombo 06, Sri Lanka
**chamara@spectrumcampus.edu.lk*

Abstract

Nymphaea stellata, the blue water lily, is an ecologically and culturally significant aquatic macrophyte native to South and Southeast Asia. Despite its well documented medicinal and phytochemical properties, the endophytic bacterial communities within its root and stem tissues remain largely unexplored. Endophytes, nonpathogenic microorganisms inhabiting plant tissues, play crucial roles in promoting plant health, enhancing stress tolerance, and producing bioactive metabolites. This study aimed to isolate and characterize culturable endophytic bacteria from surface sterilized root and stem tissues of *N. stellata*. The isolates underwent morphological, gram staining, and biochemical characterizations, including enzymatic assays (cellulase, amylase, catalase, and urease) and antibiotic susceptibility testing against ciprofloxacin, erythromycin, and azithromycin. Based on results, thirteen bacterial strains were isolated and identified predominantly as members of the genera *Cytophaga, Cellulomonas, Bacillus, Clostridium, Enterococcus,* and *Curtobacterium*. Notably, *Cellulomonas* spp. showed the highest cellulolytic activity, with a cellulase halo diameter of (7.37±0.06 cm) and strong amylase production with (9.07±0.15 cm) halo diameter, alongside other potent amylase producers within the *Enterococcu*s and *Cytophaga* taxa. Catalase activity was weakly expressed, primarily among *Bacillus* related strains, whereas urease activity was negligible across all isolates. Conversely, *Cytophaga* spp. exhibited pronounced resistance, with minimal inhibition zone diameters of (0.75±0.01 cm) and (1.60±0.06 cm) against erythromycin and azithromycin, respectively, while *Bacillus subtilis* group isolates showed complete resistance to erythromycin. Comparatively root derived bacterial endophytes exhibited greater enzymatic diversity and stronger polysaccharide degrading capabilities than stem derived bacterial endophytes, which in turn displayed more pronounced antibiotic resistance patterns. These contrasting profiles suggest functional specialization driven by their respective microenvironments, the sediment exposed root versus the submerged stem. Overall, the results reveal that *N. stellata* hosts metabolically versatile bacterial endophytes capable of producing industrially relevant enzymes, such as cellulase and amylase, while simultaneously exhibiting significant resistance to commonly used antibiotics. The high cellulolytic and amylolytic activity of *Cellulomonas* spp. and the multidrug resistance of *Cytophaga* spp. and *Bacillus* spp. isolates highlight their dual potential as bioresource candidates for biotechnological applications and as important indicators in environmental antimicrobial resistance surveillance. These findings provide a valuable insight on the prevalence and ecological dynamics of endophytic bacterial communities in *N. stellata* along with their antibiotic resistance propagation in aquatic ecosystems.

Keywords: *Nymphaea stellata, Endophytic bacteria, Aquatic microbial community, Antibiotic susceptibility*