

Diversity of endolichenic fungi isolated from the lichen *Usnea* from Malaysia and the Philippines

Krystle Angelique Santiago^{1,2}, Thomas Edison dela Cruz³, Adeline Su Yien Ting^{1,2}

¹School of Science, Monash University Malaysia, Malaysia

²Tropical Medicine & Biology Multidisciplinary Platform, Monash University Malaysia, Malaysia

³College of Science, University of Santo Tomas, Philippines

Purpose: Endolichenic fungi (ELF) are organisms residing inside healthy tissues of lichens. However, not much is known of their diversity and distribution in various lichen hosts. This study, therefore, serves as a preliminary survey of ELF present in the lichen *Usnea* collected from Malaysia and the Philippines.

Methods: *Usnea baileyi*, *U. bismolliuscula* and *U. pectinata* were collected from various altitudes in Bukit Larut, Malaysia and Sagada, Philippines and were surface-sterilized prior to ELF isolation. The isolated ELF were first categorized based on morphology. Molecular-typing was then performed via RAPD-PCR where similarity matrix was generated using UPGMA algorithm. Ecological indices were calculated to assess their diversity and evenness using Simpson's Index of Biodiversity (D') and Shannon's Equitability (EH).

Results: A total of 166 ELF was isolated from the three *Usnea* species. Of these, 70 were from Malaysia and 96 were from the Philippines. Morphological characterization indicated 24 presumptive genera. This was validated by molecular-typing revealing nine genera. The most common genera were *Nemania* sp. and *Xylaria* sp.. *Astrocystis bambusae* and *Pseudopestalotiopsis theae* were reported as ELF for the first time. Among the lichen hosts, *U. pectinata* had the highest ELF diversity ($D'=0.700$) and an even ELF distribution (EH=0.143).

Conclusion: *Usnea* harbor diverse species of ELF. Altitude affects ELF diversity more strongly than lichen host and geographic location. Although results are solely based on culturable isolates and may have excluded some fastidious species, this study has provided the first evaluation of ELF in *Usnea* from Malaysia and the Philippines.