Cyanolichen guilds in montane cloud forests of East Africa

Ulla Kaasalainen[1], Veera Tuovinen[2], Jouko Rikkinen[2]

[1]University of Göttingen, Germany, [2]University of Helsinki, Finland

Most lichen-forming fungi are highly specific in their choice of symbiotic cyanobacterial strains. The availability of compatible strains can limit the establishment success of the spores, and it has been suggested that local assemblages of lichen species utilizing the same cyanobiont strain could improve their mutual success by sharing compatible cyanobionts. We studied fungal-cyanobacterial association patterns in approximately 450 cyanolichen specimens including representatives from over ten peltigeralean genera forming symbiosis with two nostocalean cyanobacterial genera, *Nostoc* and *Rhizonema*. The material is collected from the montane cloud forests of Taita Hills, Kenya, which are part of a well-known biodiversity hotspot. The results reveal the vast diversity of lichen forming fungi and associated cyanobionts, and demonstrate widespread sharing of symbiotic cyanobacteria across different fungal species, genera and families. The patterns of symbiont sharing are diverse but nonrandom. A majority of the studied lichen-forming fungi participate in photobiont-mediated guilds, involving complex interaction networks centered on shared cyanobiont genotypes. The superficially invisible guild structure has important implications for lichen community ecology and offers valuable insights into symbiotic processes that may steer the evolution of lichens.

Hidden diversity of sterile crustose lichens in the Neotropical forests of Bolivia, a hotspot of biodiversity

Martin Kukwa[1], Adam Flakus[2], Beata Guzow-Krzemińska[3]

[1]Faculty of Biology, University of Gdańsk, Poland [2]W. Szafer Institute of Botany, Polish Academy of Sciences, Krakow, Poland [3]Faculty of Biology, University of Gdańsk, Poland

Lichens, especially sterile crustose species, are a group of organisms, which in many cases can be easily overlooked as their diversity is not always accessible to naked eyes. As sterile lichens lost the ability to reproduce their systematic position is obscure and the identification of species is often difficult or even impossible. The main aim of the project is to explore the hidden diversity of usually or commonly sterile crustose lichen species in Bolivia as the model for the Neotropics. At present morphological and chemical analyses of specimens are conducted. So far 21 non-leprarioid and 22 leprarioid species have been identified, many being new to Bolivia. Also at least 8 undescribed species (5 belonging to the genus *Herpothallon*) have been found. Many of those species are particularly common in cloud forests (Tucumano-Boliviano forest, Yungas forest), but the species do not show clear preference for the habitat. In the next step ITS nu-rDNA barcodes will be developed to allow rapid determination of morphologically completely or nearly identical species. Also their phylogenetic position will be specified. Research is funded by National Science Centre (no DEC-2015/17/B/NZ8/02441).

Bioactivity of axenic cultures of mycobionts from the tropical lichen family Trypetheliaceae in Thailand

Theerapat Luangsuphabool[1], Montri Sanglarpcharoenkit[2], Jittra Piapukiew[3], Ek Sangvichien[4]

[1]Faculty of Science, Chulalongkorn University, Bangkok, Thailand, [2]Faculty of Veterinary Medicine, Mahanakorn University of Technology, Bangkok Thailand, [3]Faculty of Science, Chulalongkorn University, Bangkok, Thailand, [4]Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand

Lichens are a source of potentially bioactive secondary substances. Their secondary metabolites are mainly produced by the fungal partner and are specific and different from other organisms. Axenic cultures of lichen-forming fungi have only received limited attention and this is especially the case with tropical species. Trypetheliaceae is a pyrenocapous crustose lichen belonging to the Trypetheliales, which are a strictly tropical lichen family. Eight genera have been found in Thailand (*Astrothelium*, *Bathelium*, *Campylothelium*, *Marcelaria*, *Laurera*, *Polymeridium*, *Pseudopyrenula* and *Trypethelium*). Mycobionts of representative species of each genus were isolated by the ascospore discharge technique and cultivated on MYA medium. The mycobiont colonies were extracted by methanol and concentrated by a rotary evaporator. Crude extracts were investigated for antioxidant and antimicrobial activity by the bio-autography method. The crudes extracts of genera *Marcelaria*, *Laurera* and *Trypethelium* inhibited *Candida albicans*; *Staphylococcus aureus* was inhibited by crudes extracts of genera *Astrothelium*, *Campylothelium*, *Marcelaria*, *Laurera*, *Polymeridium*, *Pseudopyrenula* and *Trypethelium* respectively. None of the extracts were effective when tested against Gram-negative bacteria. Five genera of *Astrothelium*, *Bathelium*, *Marcelaria*, *Laurera* and *Trypethelium* exhibited antioxidant activity using 2, 2-diphenyl-1-picrylhydrazyl radical (DPPH) solution.

A preliminary study on photobiont algae isolated from tropical lichens in Thailand

Pakarapon Poonsukkho[1], Theerapat Luangsuphabool[2], Mongkol Phaengphech[1], Ek Sangvichien[1]

[1]Faculty of Science, Ramkhamhaeng University, Bangkok, Thailand, [2]Faculty of Science, Chulalongkorn University, Bangkok, Thailand

Photobionts are photosynthetic partners and produce primary metabolites in lichen symbiosis. Tropical photobionts have been poorly studied due to high contamination rate from the lichen thallus based on typical isolation methods and low growth rate. The protocol for photobiont isolation from tropical samples was modified from the lichen tissue culture technique. Four lichen species of *Dirinaria* sp., *Parmotrema tinctorum*, *P. presorideosum* and *Ramalina* sp. were used for photobiont isolation. Lichen thallus fragments were cleaned under running tap water and between 80 solution, and then the fragments were crushed in a mortar and filtrated through stainless steel sieves. After filtration serial dilution was using to select the photobiont cells and reduce the contamination. Dilutions of photobiont cells were cultivated in Bold's Basal medium (BBM) in 96 well plates and incubated at 27–32 °C, 30 µM. $m^{-1}.s^{-1}$ dark/light (12/12 h). Examination for contamination by microorganisms was observed every day. Four green-algal photobionts were successfully isolated and cultivated and their properties were observed using morphological characters and a molecular study based on ribosomal DNA to for confirm the species. The photobionts of tropical lichens should be studied in more detail in the future for diversity, phylogeny and species specification within lichens.