

Five new species of *Allographa* discovered in the Western Ghats

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A team of researchers has unveiled five new species of lichen-forming fungi belonging to the genus *Allographa* an important indicator of forest health and environmental quality because of their sensitivity to pollution and habitat changes, from the biodiversity-rich Western Ghats of India.

This can help identify ecologically sensitive areas, strengthen long-term environmental monitoring, and contribute to evidence-based conservation policies and sustainable management of forest ecosystems.

Allographa is a genus of script lichens or lichen-forming fungi (a fungus that teams up with algae or cyanobacteria to create a lichen). with elongated fruiting bodies in the family *Graphidaceae*. It has more than 200 species. Molecular knowledge of *Allographa* species from India, is limited, particularly from the Western Ghats, where many species had been identified primarily on morphological grounds. Scientists are trying to integrate molecular data with traditional taxonomy, to better understand species diversity, evolutionary relationships, and lichen symbiosis in this globally important biodiversity hotspot.

Researchers from the MACS Agharkar Research Institute, Pune, an autonomous institute of the Department of Science and Technology (DST) combined traditional taxonomic methods with modern molecular phylogenetics to reassess species diversity and evolutionary relationships within one of the most diverse genera of the lichen family *Graphidaceae*.

The research represents the first comprehensive molecular phylogenetic investigation of *Allographa* species from the Western Ghats.

The team led by Rajeshkumar K. C. Sci E (PI), doctoral student Ansil P. A., CSIR-SRF, and Technical Officer Dr Bharati Sharma (Co-PI) collected numerous specimens from tropical forest habitats through extensive field surveys conducted across the Western Ghats and examined them meticulously.

They integrated detailed morphological and chemical analyses with multi-locus DNA sequencing using three genetic markers, mtSSU, nrLSU, and RPB2, to evaluate species boundaries and reconstruct evolutionary relationships within the genus.

The study resulted in the discovery and description of five new species: *Allographa keralensis*, named after the state of Kerala; *A. nayakae*, honoring Indian lichenologist Dr. Sanjeeva Nayaka; *A. paraconsanguinea*; *A. persistinspersa* and *A. semicarbonisata*. In addition, the authors generated new molecular data for several previously known species, including *A. calcea*, *A. macella*, *A. aquilonia*, *A. rimulosa*, and *A. effusosoredica*.

Phylogenetic analyses revealed that several morphologically similar species are not necessarily closely related evolutionarily, underscoring the limitations of relying solely on external morphology for species identification. The molecular data helped clarify the placement of both newly discovered and previously known taxa, providing a more robust framework for understanding species relationships within *Allographa* and highlighted the need for additional molecular data and broader sampling in future studies.



Fig: Thallus of *Allographa* species. *a. A. aquilonia*, *b. A. calcea*, *c. A. effusosoredica*, *d. A. keralensis*, *e. A. macella*, *f. A. nayakae*, *g. A. paraconsanguinea*, *h. A. persistinspersa*, *i. A. rimulosa*, *j. A. semicarbonisata*.

The research published in the journal *Mycological Progress* significantly expands current knowledge of *Allographa* diversity in India and provides valuable molecular reference sequences for future taxonomic and evolutionary investigations. The findings also emphasize the Western Ghats as an important centre of lichen diversity, harboring numerous previously undocumented species. By integrating molecular evidence with classical taxonomy, the study contributes to a more accurate understanding of species boundaries and biodiversity within the *Graphidaceae*.

The authors also compiled an updated checklist of *Allographa* species reported from the Western Ghats, together with information on the availability of molecular sequence data. This work establishes an important baseline for future biodiversity assessments, conservation planning, and systematic studies of tropical lichens in India and elsewhere.

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