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RESEARCH COMMUNICATION

Three species of lichenized fungi, new to Assam from Chirang district

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Abstract

This paper presents three species of lichen viz. *Herpothallon minutum*, *Lecanora andina* and *Phaeophyscia kairamoi,* from the Chirang District, Assam. The specimens were identified using morphological, anatomical and chemical characters. The three species are reported for the first time from Assam. Detailed descriptions of the species with photographs are provided.

Keywords: Assam; lichenized fungi; new records; taxonomy

Introduction

Assam is a region primarily composed of fertile river valleys, hills and forests and is characterised by a highly humid tropical climate. It falls within the Eastern Himalayas, a biodiversity hotspot known for its rich and diverse flora and fauna, which encompasses over half of India's documented phanerogams. The botanical significance of this area is highlighted by its remarkable diversity and abundance of plant species, such as *Alstonia scholaris* (L.) R. Br., *Bombax ceiba* L., *Cassia fistula* L. and *Lannea coromandelica* (Houtt.) Merr. (1). Owing to its favourable geographical conditions, the region harbours a rich diversity of lichens.

In India, a total of 3236 lichen taxa have been reported, comprising 3200 species, 29 varieties, 6 subspecies and 1 forma, distributed across 487 genera and 88 families. Of these, North-East India harbours the highest diversity, comprising 1842 taxa and the state Assam exhibits a remarkable increase in recorded lichen diversity, rising from 300 species in 2018 to 657 species in 2021 and currently recording 749 species of lichens (2). However, studies on lichens in Assam are still insufficient. The pioneering research on lichens in this state was conducted in 1881 by Stirton, a Scottish lichenologist (3). Subsequent contributions to the floristic study of lichen diversity in Assam have been made by various researchers (4–18). However, lichens have become an important cryptogamic group to study and document for their ecological significance. Thus, the present work aims to explore lichens growing in various localities within the Chirang District of Assam.

Materials and Methods

The collection of corticolous lichen specimens were conducted during 2022–2023 in the Chirang district of Assam, specifically in areas near Bongaigaon Refinery and Petrochemicals Limited (BRPL) (Fig. 1). The collected specimens were air dried and identified under the microscope.

Morphological characterisation of the lichen thallus was performed using a stereo zoom microscope (Leica EZ4). Anatomical observation was conducted under a compound microscope (Leica DM750). Chemical spot tests on the thallus, medulla and apothecium were carried out using standard laboratory reagents—aqueous potassium hydroxide solution (K), aqueous calcium hypochlorite solution (C), 0.5 g of para-phenylenediamine dissolved in 5 mL of ethanol (P) and iodine solution (I).

Thin-layer chromatography (TLC) was performed using solvent system A (toluene-dioxane-acetic acid, 180:45:5) to identify lichen compounds (19). The taxa were identified in the Department of Botany, Bodoland University, Kokrajhar, Assam using morphological, anatomical and chemical information, supported by relevant published literature and were deposited in the herbarium of the Department of Botany, Bodoland University, Kokrajhar, Assam (abbreviated here as BUBH) (20–22). The nomenclature and families of the identified lichen species were updated according to IndexFungorum.org and outline of fungi and fungus-like taxa (23).

Results

From the ongoing study, only the species representing new records for the state are considered here. Detailed descriptions of the three newly recorded species are provided below:

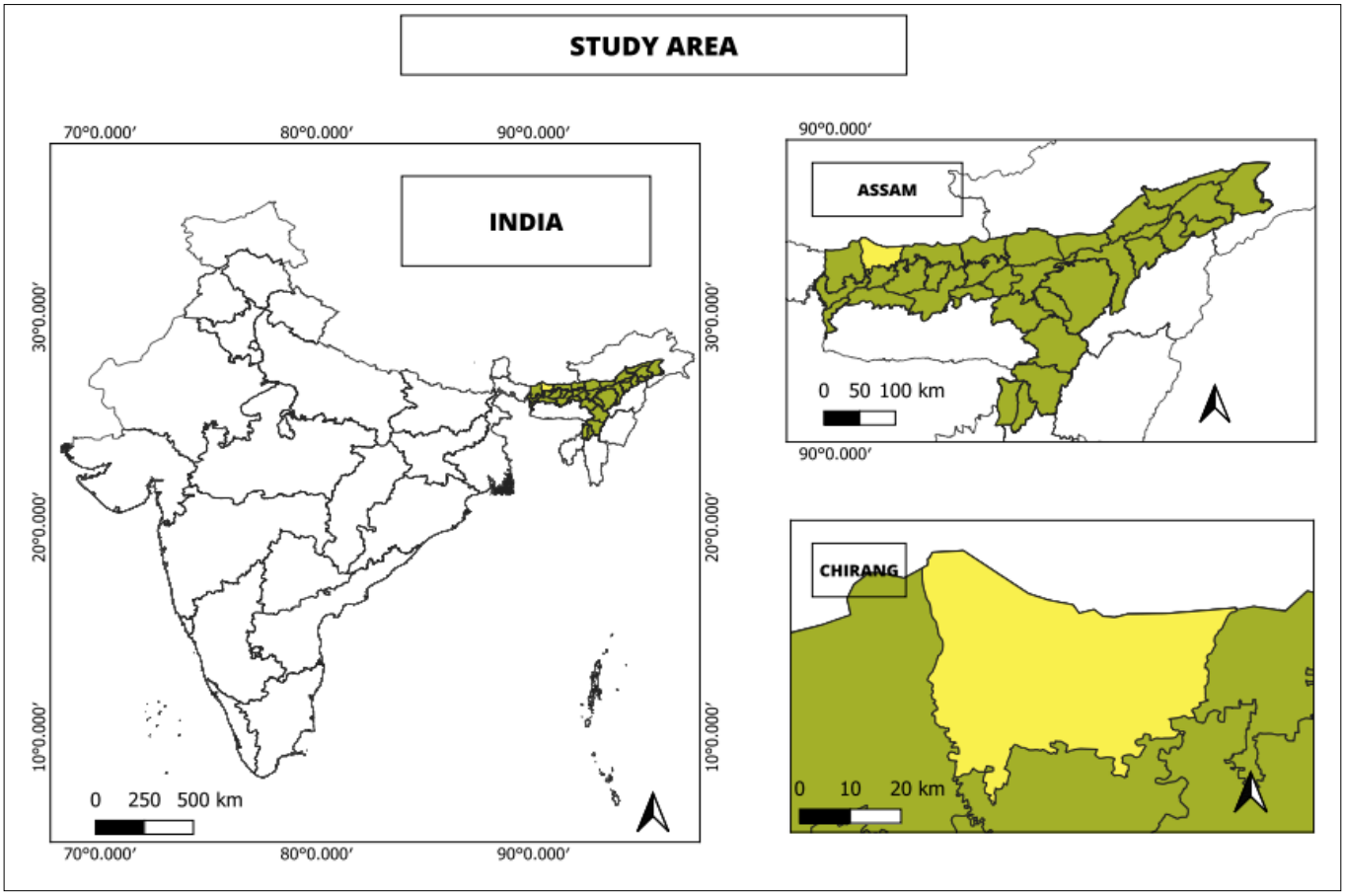

Fig. 1. Map showing the study site of the Chirang district (Image created using QGIS software (version 3.38)).

Taxonomic description

1. *Herpothallon minutum* Jagad. Ram, Lichenologist 46(1): 45 (2014)(Fig. 2A-C)

Family: Arthoniaceae

Thallus crustose, corticolous, white to grey, round patches, thallus up to 3–11 cm in diameter, hyphae in the upper part, hypothallus whitish grey, loosely to firmly attached. The prothallus is white up to 4.5 mm wide, whitish and interwoven, with radiating hyphae. Pseudoisidia minute, numerous, granular. Chemistry: thallus K –, C + red, KC + red, KI + blue, P –, UV –; TLC: gyrophoric acid.

Distribution: India (Andaman & Nicobar Islands, Arunachal Pradesh, Uttarakhand and West Bengal).

Species examined: India– Assam, Chirang district, 26.33.04" N, 90.33.09" E, elevation 84 m, on the bark of *Citrus maxima* (Burm.) Merr., 18/10/2022, 2022-1655 (BUBH); collector: Madhusmita Deka.

2. *Lecanora andina* Räsänen, Anal. Soc. cient. argent. 128(3): 139 (1939) (Fig. 2D-F)

Family: Lecanoraceae

Thallus crustose, rimose to areolate, brownish grey, epruinose, esorediate, shiny. Ascomata apothecia, many, immersed when young, sessile in mature, 0.5–0.7 mm in diameter, with well-developed thalline margin, lecanorine, disc pale brown, margin entire and thin. Hymenium hyaline, 60–73 µm high, hypothecium light yellow, amphithecium with large crystals (pulicaris type), epihymenial pigment not dissolving in K. Paraphyses simple, apical cell swollen, brown pigmented. Asci 8-spored, 51–57 µm, ascospore colourless, simple, ellipsoid, 10–11× 5–6 µm. Chemistry: thallus K+ yellow, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Goa, Himachal Pradesh, Maharashtra and Punjab), Argentina and Australia.

Species examined: India– Assam, Chirang district, 26.32.49" N, 90.29.12" E, elevation 85 m, on the bark of *Litchi chinensis* Sonn., 06/08/2022, 2022-1652 (BUBH); collector: Madhusmita Deka.

3. *Phaeophyscia kairamoi* (Vain.) Moberg, Symb. bot. upsal. 22(1): 40 (1977); *Physcia kairamoi* Vain., in Räsänen, Meddn Soc. Fauna Flora fenn. 46: 3 (1921) (Fig. 2G, H)

Family: Physciaceae

Thallus foliose, corticolous, irregularly branched, loosely adnate, corticated on both sides, lobes narrow, 1–1.5 mm wide, upper side grey, marginally isidiate, soredia absent, lacking both cyphellae and pseudocyphellae, lower side brown, rhizines black and simple, lower cortex paraplectenchymatous. Medulla is white and solid. Apothecia not seen. Chemistry: thallus K–, KC –, C –, P –, UV –; TLC: no substances detected.

Distribution: India (Jammu & Kashmir, Maharashtra and Uttarakhand), Canada, Finland, Italy, Kazakhstan, Kyrgyzstan, Mexico, Mongolia, Norway, Poland, Russian Federation, Sweden, Switzerland and USA.

Species examined: INDIA– Assam, Chirang district, 26.29.18.57" N, 90.36.46.41" E, elevation 74 m, on the bark of *Bombax ceiba* L.,

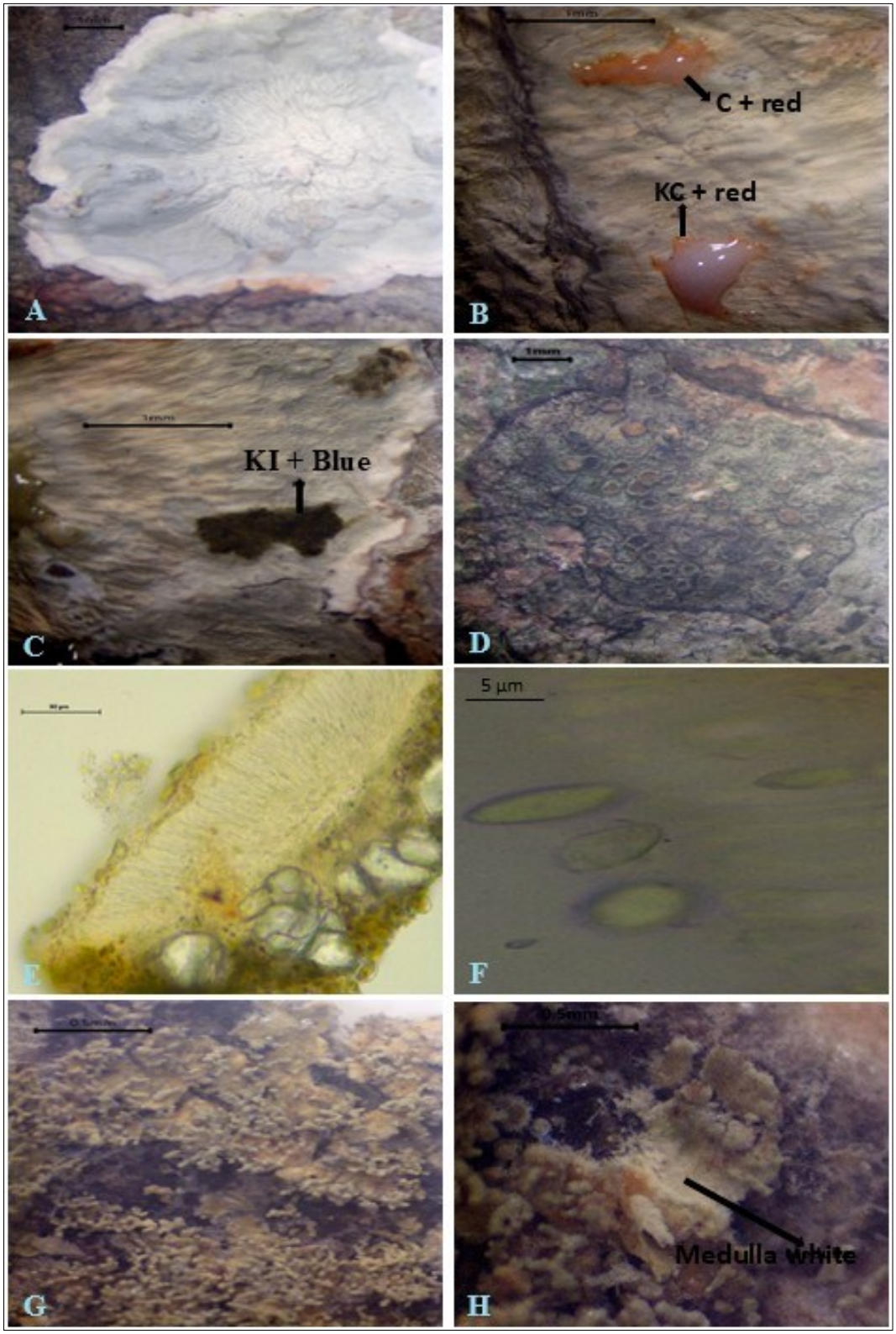

Fig. 2. A–C - *Herpothallon minutum*: A - thallus, B and C - thallus with chemical reagents K, KC and KI; D–F - *Lecanora andina*: D - thallus, E - hymenium with crystals, F - ascospores; G–H - *Phaeophyscia kairamoi*: G - thallus with isidia, H - medulla white and solid.

17/06/2023, 2023–1689 (BUBH); collector: Madhusmita Deka.

Discussion

The present work continues the ongoing research on lichens of Assam, which resulted in the discovery of three lichen species, *H. minutum*, *L. andina* and *P. kairamoi*, in the Chirang District, Assam, which represents a vital addition to the lichenological catalogue of Assam, as well as to Northeast India, a globally recognised biodiversity hotspot. It also emphasises the need for ongoing taxonomic exploration of lichen diversity in less-documented areas like Chirang. Employing morphological, anatomical and chemical approaches for species identification adheres to stringent taxonomic protocols, ensuring precise classification. Such methods are essential in lichenology, where phenotypic variability often complicates accurate identification. Comprehensive descriptions and photographic documentation of the recorded species serve as key resources for reliable identification and comparative studies by future researchers working in similar ecological contexts.

Conclusion

The identified lichen species are reported for the first time from Assam, extending their known distribution and adding to the lichen biota of the state. The state stands out for its remarkable year-to-year increase in the number of recorded lichen species. The finding highlights the richness and yet-to-be-explored lichen biota of Assam, underlining the need for further taxonomic and ecological research. These additions enhance our understanding of lichen diversity in India. Future research should focus on investigating their ecological roles, biogeographical significance and potential applications.

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Authors' contributions

The specimens were collected and identified by MD and PI. MD wrote the initial draft of the manuscript, while RD reviewed and edited it, supervised the entire project.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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