

A Taxonomic Note on the Occurrence of Lichen Taxon *Chaenotheca phaeocephala* (Turner) Th. Fr. from India

Sunita Bisht^{1,2}, Yogesh Joshi^{2*}, Nirmala Pargaian¹ and Rajesh Bajpai³

¹Department of Botany, M.B. Govt. Post Graduate College, Haldwani – 263 139, Nainital, Uttarakhand, India.

²Department of Botany, University of Rajasthan, Jaipur – 302 004, Rajasthan, India.

³Department of Environmental Studies, North Eastern Hill University, Shillong, Meghalaya, India.

* Corresponding author Email: dryogeshcalo@gmail.com

(Submitted on August 14, 2025; Accepted on August 22, 2025)

ABSTRACT

The present study reports the occurrence of *Chaenotheca phaeocephala* (Turner) Th. Fr. on the bark of a tree from subalpine forests of Uttarakhand, India. Although previously recorded from Uttarakhand (as per GBIF database), the species has not been documented in any Indian lichen checklist or floristic account. The species is distinguished by its well-developed mazaedium covered with yellowish-green pruina and brown, globose to subglobose, single-celled ascospores. With this addition, the number of *Chaenotheca* species documented from India increases to four. A key to all known *Chaenotheca* species is also provided.

Keywords: Epiphytes, Lichenized fungi, Central Himalaya

INTRODUCTION

The lichenized genus *Chaenotheca* Th. Fr. belonging to family Coniocybaceae Rchb. (Reichenbach, 1837) within the order Coniocybales M. Prieto & Wedin (Prieto and Wedin, 2013), is characterized by stalked mazaediate apothecia arising from typically minute, crustose to granular often very inconspicuous or poorly developed thalli (Tibell, 1980, 1999; Selva and Tibell, 1999). The mazaediate apothecia bears evanescent asci containing 8 ascospores which are brown to pale brown, simple to rarely 1–5-septate and range in shape from globose to ellipsoid or cylindrical (Tibell, 1999).

Worldwide, the genus *Chaenotheca* comprises approximately 42 recognized species (Tibell and Ryan, 2004; Robert *et al.*, 2005; Prieto *et al.*, 2013; Lücking *et al.*, 2016), distributed across boreal, temperate, and montane zones, with highest diversity in old-growth forests of Europe and North America (Tibell, 1999; Lücking *et al.*, 2016; Selva, 2014). These lichens are generally epiphytic, occurring on decorticated wood, bark, and sometimes on rocks or anthropogenic substrates like weathered fences or timber and often prefer humid, shaded and undisturbed forest environments, especially old growth forests (Tibell, 1987).

In India, the occurrence of *Chaenotheca* is poorly documented, with only three species so far reported from temperate and montane forests viz.

Chaenotheca brunneola (Ach.) Müll. Arg. (from Punjab); *Chaenotheca chrysocephala* (Turner ex Ach.) Th. Fr. (from Himachal Pradesh, Jammu & Kashmir and Mizoram) and *Chaenotheca furfuracea* (L.) Tibell (from Uttarakhand) (Awasthi, 1991; Sinha *et al.*, 2024). Their apparent rarity may reflect under-sampling or taxonomic neglect, as the minute size and specific habitat requirements of these lichens make them easily overlooked in routine surveys.

In our continued exploration of lichens and lichenicolous fungi, we found a species *Chaenotheca* on bark in sub-alpine regions of Central Himalaya, Uttarakhand which on its identification revealed to be *C. phaeocephala* (Turner) Th. Fr., thus raising the tally of *Chaenotheca* to four.

MATERIAL AND METHODS

The specimen was studied macroscopically with an Olympus SZ61 stereozoom dissecting microscope and microscopically with an Olympus BX53 microscope equipped with Olympus differential interference contrast optics. Measurements were taken from thin hand cut sections of apothecia mounted in water. The chemistry was studied through spot tests following Orange *et al.* (2001). Voucher specimens were deposited at herbarium of Rajasthan University Botanical Laboratory (RUBL), Jaipur, India.

RESULTS AND DISCUSSION

Chaenotheca phaeocephala (Turner) Th. Fr., Nova Acta Regiae Soc. Sci. Upsal. ser. 3, 3: 351 (1861)

(Figure 1 A-C)

Description: *Thallus* corticolous, superficial, squamulose to verrucose, often forming extensive patches, green to grayish green. *Photobiont* *Trebouxia*. *Ascomata* apothecia, 0.5–1.3 mm long,

almost 10 times long as the width of the stalk, pale to dark brown, pruinose with yellowish green-pruina over the upper part. *Exciple* well developed formed a continuation of the stalk tissue. *Hamathecium* of paraphyses. *Asci* cylindrical, produced singly from branched ascogenous hyphae, $16.5\text{--}22 \times 3\text{--}4 \mu\text{m}$ in length. *Ascospores* pale brown to brown, simple, globose to spherical, $4.5\text{--}6 \times 4\text{--}5 \mu\text{m}$. *Pycnidia* not observed.

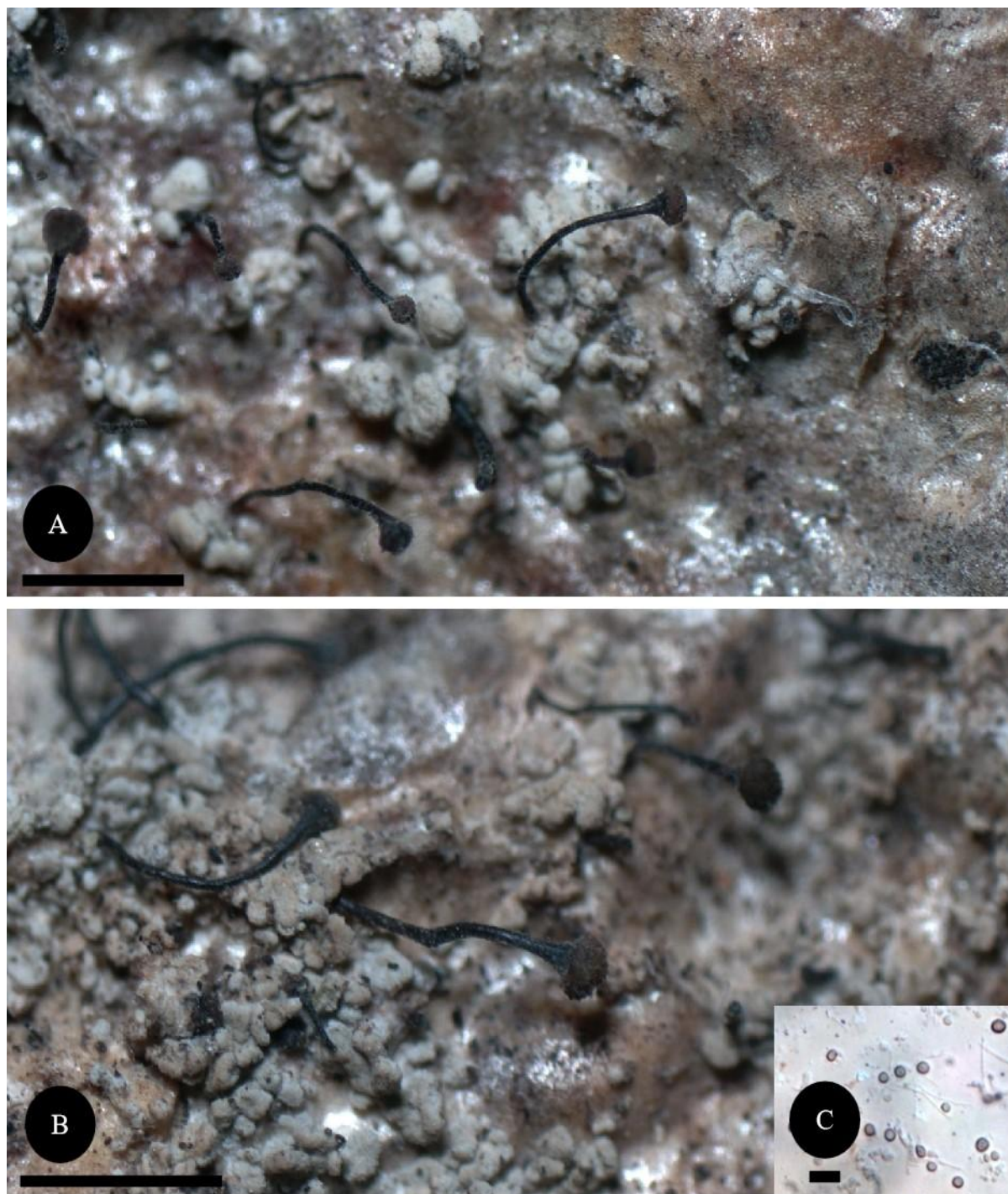


Figure 1: A, Habit of *Chaenotheca phaeocephala* (Scale bar = 1 mm); B, Magnified view (Scale bar = 1 mm); C, Ascospores (Scale bar = 10 μm).

Chemistry: Cortex and medulla K–, C–, KC–, P–. TLC: vulpinic acid in the pruina.

Distribution and ecology: The present collection, made from the bark of an old tree at an elevation of 3,266 m, represents the first verified and documented record of the species from India by any Indian worker. Although previous occurrence of this species from India and that too from Uttarakhand are listed in the GBIF database (see specimens examined; <https://www.gbif.org>) but it has not been cited in any published literature or included in any national or regional checklist of Indian lichens (Sinha *et al.*, 2024). Earlier, this species was known from Austria, Canada, Central European Russia, China, Czech Republic, Estonia, Finland, Germany, Iberian Peninsula, Latvia, Lithuania, Netherlands, North America, Norway, Poland, Spain, Sweden, Switzerland, Turkey, Ukraine. (Andrés *et al.*, 1998; Sarrion *et al.*, 1999; Palice *et al.*, 2003; Karabulut *et al.*, 2004; Boch and Sparrius, 2006; Konrad, 2007; Mies, 2014; Kubiak *et al.*, 2015; Muchnik *et al.*, 2019; Khodosovtsev, 2023; Morris and Stone, 2023; Myrdal, 2025; <https://www.gbif.org>).

Specimens examined: INDIA. Uttarakhand, Bageshwar district, Jhuni, Pakhwa top, BT-100, alt. 3266 m, 30°07'34.53"N, 79°59'07.84"E, on bark, 01 November 2022, *R. Bajpai s.n.* (RUBL 21810).

Additional specimens examined: Uttarkashi district, 20 km NNE of Uttarkashi, Dodi Tal, alt. 3250 m, 30.88333 N, 78.51667 E, at base of *Abies pindrow* close to an open pasture area, 22 May 1999, *Leif Tibell 21920* (UPS L-105781!), Yamunotri, 10 km NE of Hanuman Chatti, on track to Yamunotri Pass, 1 km NE of Yamunotri, alt. 3550 m, 31.01667 N, 78.46667 E, on flaking bark of *Betula* in *Q. semecarpifolia* forest on S-facing slope, 31 May 1999, *Leif Tibell 22101* (UPS L-105964!), on bark of deccorticated stump in *Q. semecarpifolia* forest on S-facing slope, 31 May 1999, *Leif Tibell 22113* (UPS L-105976!).

Notes: *Chaenotheca phaeocephala* resembles *C. chrysocephala* in having verrucose-squamulose type of thallus and trebouxoid photobiont with spherical cells measuring 7.0–14 µm in diameter. However, it is distinct in several key characters, including thallus colour. *C. chrysocephala* has a bright yellow thallus whereas *C. phaeocephala* has a greyish to greenish-brown thallus. Moreover, the ascospores in *C. chrysocephala* are ellipsoidal to cylindrical, 6–9 × 4–5 µm. In contrast, the

ascospores of *C. phaeocephala* are spherical, 4.5–6 × 4–5 µm in diameter. Likewise, the newly recorded species shows some morphological similarities with the other known species of *Chaenotheca* from India but differs in several diagnostic characters as mentioned in the key.

Key to lichen genus *Chaenotheca* in India

1. Apothecia pruinose, pruina yellow or yellow-green to greenish-brown; thallus superficial; photobiont *Stichococcus* or trebouxoid.....2
1. Apothecia epruinose; thallus typically immersed, rarely episubstratic, grey to greenish-grey and granular; photobiont *Dictyochloropsis*, ascospores small (3.5–4.5 µm).....*C. brunneola*
2. Photobiont *Trebouxoid*; thallus verrucose-squamulose.....3
2. Photobiont *Stichococcus*; thallus episubstratic, farinose, bright yellow-green; apothecia with yellow or yellow-green pruina; ascospores spherical, 2.5–3 µm.....*C. furfuracea*
3. Ascospores spherical, 4.5–6 × 4–5 µm; thallus greyish to greenish-brown, squamulose to verrucose.....*C. phaeocephala*
3. Ascospores ellipsoidal to cylindrical, 6–9 × 4–5 µm; thallus bright yellow, granular to verrucose.....*C. chrysocephala*

ACKNOWLEDGMENTS

The authors would like to thank The Head, Department of Botany, University of Rajasthan, Jaipur, Rajasthan for providing laboratory facilities and to Dr. Sanjeeva Nayaka for his valuable comments. Financial support for this research was provided by the Science and Engineering Research Board (Special Call for Proposals) [SCP/2022/000072].

REFERENCES

- Andrés, J.Á., Alfonso, A.T., Piñeiro, J.M. 1998. Biodiversidad líquénica epifítica de Los Ancares (León, Lugo) en el NO de España. *NACC: Nova acta científica compostelana Biología*, **9**:65–82.
- Awasthi, D.D. 1991. A key to the microlichens of India, Nepal and Sri Lanka. *Bibliotheca Lichenologica*, **40**:1–337.

- Boch, S. and Sparrius, L.B. 2006. Neue und interessante Flechtenfunde aus den Landkreisen Lüneburg und Lüchow-Dannenberg (Nordost-Niedersachsen, Deutschland). *Herzogia*, **19**:77–83.
- GBIF Secretariat 2023. GBIF Backbone Taxonomy. Checklist dataset; doi: 10.15468/39omei. Accessed on 2025-08-14.
- Karabulut, Ş.N., Özdemir Türk, A., John, V. 2004. Lichens to monitor afforestation effects in Çanakkale, Turkey. *Cryptogamie Mycologie*, **25**:333–346.
- Khodosovtsev, O.Ye. 2023. Lichen-forming, lichenicolous and lichen-related fungi of the Teremky woodland: experience of research in the Holiivskyi National Nature Park during blackout. *Chornomorski Botanical Journal*, **19**(3):306–323; doi: 0.32999/ksu19 90-553X/2023-19-3-4
- Konrad, P. 2007. Geo-Tag der Artenvielfalt 2007 in Tirol–Ötztal. *Veröffentlichungen des Tiroler Landesmuseum Ferdinandeum*, Innsbruck. **87**:73–170.
- Kubiak, D., Biedunkiewicz, A., Koźniewski, D. 2015. Porosty epifityczne parku przypałacowego w Opinogórze Górnej (północne Mazowsze). *Chrońmy Przyrodę Ojczystą*, **71**(4):257–265.
- Lücking, R., Hodkinson, B.P., Leavitt, S.D. 2016. The 2016 classification of lichenized fungi in the Ascomycota and Basidiomycota—Approaching one thousand genera. *The Bryologist*, **119**(4):361–416; doi: 10.1639/00 07-2745-119.4.361
- Mies, B.A. 2014. Neue und interessante Flechten (lichenisierte Ascomyceten) aus Eifel, Ardennen und Hunsrück. *Delatinnia*, **40**:161–175.
- Morris, C. and Stone, D. 2023. *Chaenotheca subroscida* and *C. phaeocephala* in the Pacific Northwest of North America. *Evansia*, **40**(1):3–10; doi: 10.1639/0747-98 59-40.1.3
- Muchnik, E.E., Konoreva, L.A., Chesnokov, S.V., et al., 2019. New and otherwise noteworthy records of lichenized and lichenicolous fungi from central European Russia. *Herzogia*, **32**(1):111–126; doi: 10.13158/he ia.32.1.2019.111
- Myrdal, M. 2025. Botany (UPS). Museum of Evolution, Uppsala University. Occurrence dataset; doi: 10.15468/ufmslw. Accessed via on 2025-08-13. <https://www.gbif.org/occurrence/351802282>.
- Orange, A., James, P.W., White, F.J. 2001. Microchemical methods for the identification of lichens. *British Lichen Society, London*, 101p; Doi: 10.1006/lich.2002.0376
- Palice Z., Czarnota P., Kukwa M., et al. 2003. Lišejníky zaznamenané během 9. jarního setkání bryologicko–lichenologické sekce v Hajnici u Mirochova (CHKO Třeboňsko, 11.–14.4.2002). *Bryonora*, **32**:7–17.
- Prieto, M., Baloch, E., Tehler, A., et al., 2013. Mazaedium evolution in the Ascomycota (Fungi) and the classification of mazaediate groups of formerly unclear relationship. *Cladistics*, **29**(3):296–308; doi: 10.1111/j.10 96-0031.2012.00429.x
- Prieto, M. and Wedin, M. 2013. Dating the diversification of the major lineages of Ascomycota (Fungi). *PLoS ONE*, **8**(6):e65576.
- Reichenbach, H.G.L. 1837. Handbuch des natürlichen Pflanzensystems. pp.1–346
- Robert, V., Stegehuis, G., Stalpers, J. 2005 The MycoBank engine and related databases. <http://www.mycobank.org>. [Accessed on 12/07/2025]
- Sarrion, F., Aragon, G., Burgaz, A.R. 1999. Studies on mazaediate lichens and calicioid fungi of the Iberian Peninsula. *Mycotaxon*, **71**:169–198.
- Selva, S.B. 2014. The calicioid lichens and fungi of the Acadian Forest ecoregion of northeastern North America, II. The rest of the story. *The Bryologist*, **117**:336–367; doi: 10.1639/0007-2745-117.4.336.
- Selva, S.B. and Tibell, L. 1999. Lichenized and non-lichenized calicioid fungi from North America. *The Bryologist*, **102**:377–397; doi: 10.2307/3244225.

- Sinha, G.P., Nayaka, S., Mishra, G.K. 2024. A comprehensive checklist of lichens from India-2024. *Cryptogam Biodiversity and Assessment*, **8(02)**:1–134.
- Tibell, L. 1980. The lichen genus *Chaenotheca* in the northern hemisphere. *Symbolae Botanicae Upsaliensis*, **33**:1–65.
- Tibell, L. 1987. Caliciales of boreal North America. *Symbolae Botanicae Upsalienses*, **27(2)**:1–95.
- Tibell, L. 1999. Morphology and evolution of the Caliciales. *The Lichenologist*, **31(4)**:301–323.
- Tibell, L. and Ryan, B.D. 2004. *Chaenotheca*. In: T.H. Nash III, Ryan, B.D., Diederich, P., Gries, C. and Bungartz F. (eds.). Lichen Flora of the Greater Sonoran Desert Region, Volume 2. Tempe, Arizona: Lichens Unlimited, Arizona State University, Tempe, Arizona, pp.57–61.