

# *Lichenodiplis ochrolechia*, a new species of lichenicolous fungi from India

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A new species of lichenicolous fungi, *viz.* *Lichenodiplis ochrolechia* colonizing thallus and apothecial discs of the lichen genus *Ochrolechia* is described from Himachal Pradesh and Karnataka districts of India. The species is compared with other closely related species of *Lichenodiplis*, and a key to so far known lichenicolous fungi from India colonizing thallus and apothecial discs of *Ochrolechia* is also provided.

Keywords: coelomycetes, lichens, secondary fungi, taxonomy.

Lichenicolous fungi encompass a wide range of ecological and taxonomic groups of fungi associated with lichens, including specialized saprobes, parasymbionts and pathogens belonging to the Ascomycota as well as Basidiomycota (Lawrey & Diederich 2016). They are distributed worldwide, occur on all kinds of taxonomic groups of lichens and use all types of lichen thalli as well as fruiting bodies as their ecological niches. They have been well worked out across the globe, have received increasing attention within the last decades, and the number of known species is growing considerably (Etayo & Breuss 1998, Lawrey & Diederich 2003, 2016).

As far as India is concerned, the lichenicolous biota of India has only recently started to be studied in detail and remains scarcely known (Moreau 1951, Poelt 1961, Awasthi & Singh 1975, Sherwood et al. 1981, Hertel 1983, Pant & Awasthi 1989, Triebel 1989, Awasthi 1991, Hariharan et al. 1996, Coppins & Kondratyuk 1998, Alstrup & Ahti 2007, S. Joshi et al. 2013; Zhurbenko 2013, Joseph & Sinha 2015, Y. Joshi et al. 2015a, b; 2016a, b, c). So far, 107 species of lichenicolous fungi are reported from India (Joshi et al. 2016a, b, c). This led the authors to work on lichenicolous fungi of India, and in continuation of their studies on lichenicolous fungi of India, one of the authors (YJ) got the privilege to examine specimens of the lichen genus *Ochrolechia* A. Massal., lodged at the herbarium of CSIR–National Botanical Research Institute (LWG), where several in-

teresting species of lichenicolous fungi were discovered, *viz.* *Buelliella minimula* (Tuck.) Fink, *Caeruloconidia ochrolechia* Zhurb. & Diederich, *Sclerococcum simplex* D. Hawksw. and *Skyttea fusispora* Sherwood, D. Hawksw. & Coppins, along with one species that is treated here as new to science *viz.* *Lichenodiplis ochrolechia*. In addition, a key to the so far known lichenicolous species colonizing Indian *Ochrolechia* species is provided.

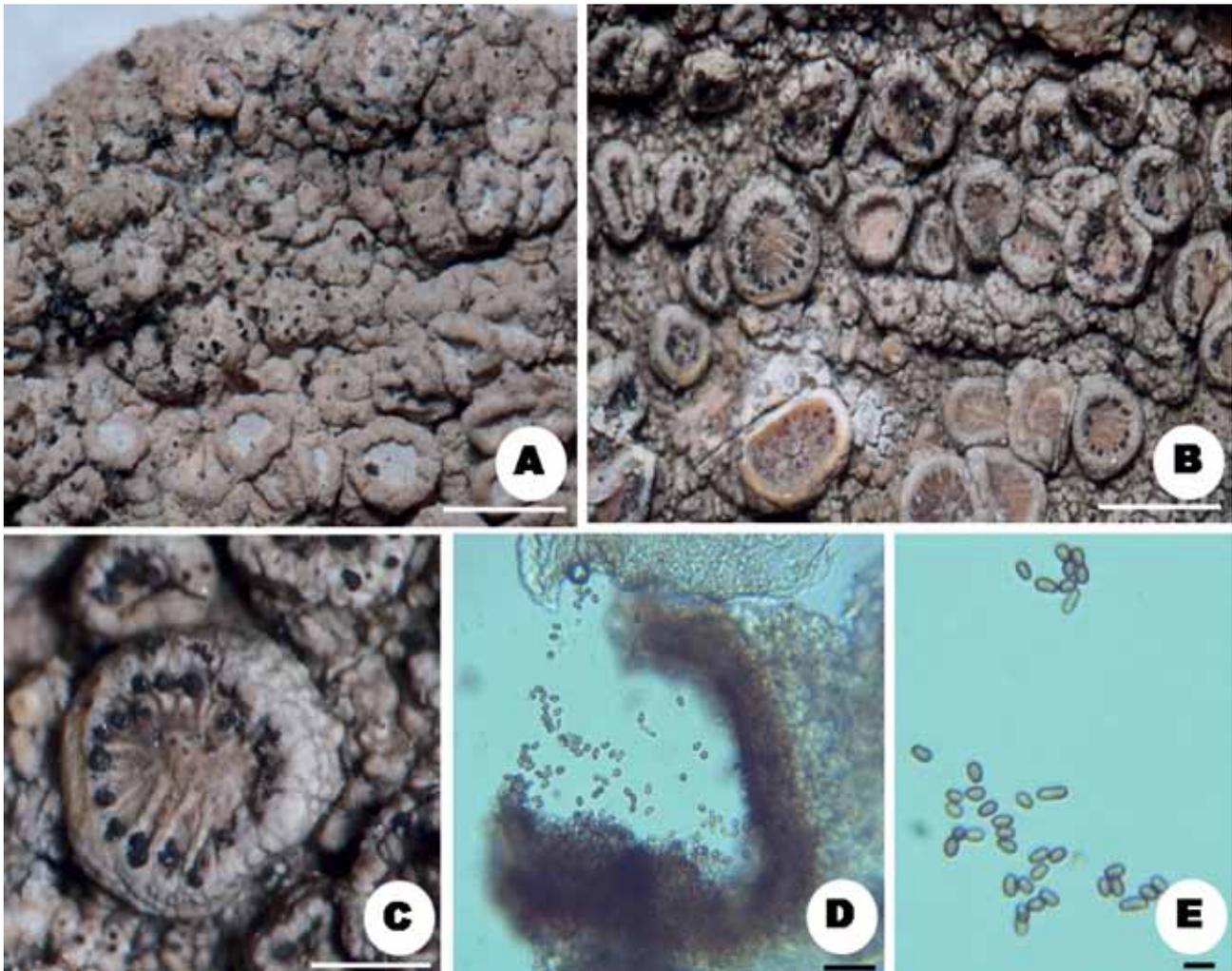
## Materials and methods

The type specimen of the new species along with its paratypes are deposited in LWG and were identified using standard microscopical techniques. Macroscopical examination was carried out using a dissecting microscope (OLYMPUS SZ2-ILST) and microscopical studies of handmade sections were made using a CX21iLeDFS1 microscope. Sections were prepared by hand and examined in water and 10 % KOH [K]. Measurements of conidia were made in water and are indicated as (minimum)mean minus SD – mean plus SD(maximum), followed by the number of samples measured (n).

## Taxonomy

*Lichenodiplis ochrolechia* Y. Joshi & M. Tripathi, **sp. nov.** – Fig. 1.

Mycobank no.: MB 817874



**Fig. 1.** *Lichenodiplis ochrolechiae* (holotype): **A.** *Lichenodiplis ochrolechiae* on *Ochrolechia* thallus (bar = 2 mm). **B, C.** *L. ochrolechiae* on thalline margin of *Ochrolechia* (bar = 2 mm and 1 mm, respectively). **D.** Cross section through pycnidia (bar = 15 µm). **E.** Conidia (bar = 5 µm).

**Holotypus.** – INDIA, Himachal Pradesh, Kullu district, Great Himalayan National Park, Dhela, alt. 3000 m, on *Ochrolechia rosella* colonizing tree bark, 08 September 1999, leg. D. K. Upreti, det. Y. Joshi 99-54014 (LWG 17676).

**Diagnosis.** – Similar to *Lichenodiplis anomala* Etayo & Pérez-Vargas but differs in lacking marginal conidiogenous cells and septate conidia.

**Etymology.** – Named after the host *Ochrolechia* on which the taxon is growing.

**Description.** – Conidiomata pycnidia, scattered, rarely on the host thallus (Fig. 1A), on the host ascomata, mainly on the thalline margin (Fig. 1 B, C), rarely on the disc, at first immersed, later erumpent (Fig. 1 C), arising singly, unilocular, blackish, 62.5–120.0 µm diam., subglobose or slightly obpyriform, opening by an irregular pore. – Pycnidial wall hyaline to brown (Fig. 1 D), 10.0–15.0 µm thick, composed of paraplectenchymatous cells, 4–5 µm in diam., irregular in thick-

ness and pigmentation. – Conidiophores absent. – Conidiogenous cells subcylindrical, pale brown, with annellations, 6.5–10 × 2–3(4) µm. – Conidia aseptate, pale brown to brown, K–, smooth, dry, ellipsoid or more rarely irregular in shape, with a truncate base, (4.5)5.0–6.0(6.5) × (2.0)2.1–2.5(3.0) µm (n = 40), with a rather thin, smooth wall, 0.25 µm thick (Fig. 1 D, E).

**Host lichen.** – On thallus and apothecial margin of *Ochrolechia* species.

**Distribution.** – So far, the species is known from two localities in India viz. Himachal Pradesh and Karnataka, colonizing thalli and apothecial discs of *Ochrolechia rosella* (Müll. Arg.) Versegghy and *O. africana* Vain., which are not visibly damaged.

**Material examined.** – INDIA, Himachal Pradesh, Kullu district, Great Himalayan National Park, Dhela, alt.

3000 m, on *Ochrolechia rosella* colonizing tree bark, 08 September 1999, leg. D. K. Upreti, det. Y. Joshi 99-54004 (LWG 17995); *ibid*, 99-54015 (LWG 17686). Karnataka, Bangalore district, Bannerhatta-Hazam-Kalu, alt. ca. 980 m, on thallus and apothecia of *Ochrolechia africana* colonizing bark of tree, 30 April 1979, leg. D. D. Awasthi, D. K. Upreti & U. C. Misra, det. Y. Joshi 78-152 (LWG-LWU).

### Key to the lichenicolous species colonizing Indian *Ochrolechia* species

1. Spores produced in asci ..... 2
- 1\*. Spores not produced in asci ..... 3
2. Ascospores simple, hyaline ..... *Skyttea fusispora*
- 2\*. Ascospores 1-septate, brown .....  
.....*Buelliella minimula*
3. Conidia not produced within pycnidia or similar structures (i.e. hyphomycetes) ..... 4
- 3\*. Conidia produced within pycnidia or similar structures (i.e. coelomycetes).....  
.....*Lichenodiplis ochrolechia*
4. Sporodochia bluish green to dark green. Conidia aseptate, bluish-green, (4.0)5.2–7.2(10.7) × (3.0)4.1–5.5(6.5) µm .....  
.....*Caeruleoconidia ochrolechia*
- 4\*. Sporodochia dark brown to black. Conidia 0(–1) septate, pale brown to brown, (3.5)4–7(8) µm. ....  
.....*Sclerococcum simplex*

### Discussion

The lichenicolous genus *Lichenodiplis* which currently includes 11 species (Lawrey & Diederich 2016) was introduced by Hawksworth and Dyko (1979) for fungal species having dark brown, 1-septate conidia with obtuse apex and truncated base. The species of this genus are generally found invading the apothecia of the hosts, but can also produce pycnidia on the thalli if the apothecia are heavily infected (Hawksworth & Dyko 1979). The genus was originally placed in the order Sphaeropsidales by Hawksworth and Dyko (1979), but recently Muggia et al. (2015) placed this genus within the subclass

Chaetothyriomycetidae of the order Chaetothyriales. Hawksworth (1981) described the genus *Laeviomyces* for two lichenicolous coelomycetes very similar to *Lichenodiplis*, that differ in having non-septate conidia. As conidial septation is not sufficient for distinguishing genera in modern taxonomy, Diederich (2003) treated both the genera as synonyms.

So far eleven species of *Lichenodiplis* are known across the world colonizing various hosts (Lawrey & Diederich 2016), and of these only *L. anomala* (as per lichenicolous.net checklist) is confined to *Ochrolechia* species and six (including *L. ochrolechia*) produce aseptate conidia. *Lichenodiplis anomala* differs from the new taxon in having monoseptate conidia, presence of marginal conidiogenous cells and broader conidia (2.5–3.5 vs. (2.0)2.1–2.5(3.0)). The species that produce aseptate conidia, *L. fallaciosa* (Hafellner & Kalb) Diederich, *L. dendrographae* Diederich & Van den Boom, *L. pertusariicola* (Nyl.) Diederich, *L. opegraphae* (D. Hawksw.) Diederich and *L. lecanoricola* (M.S. Cole & D. Hawksw.) Diederich, including the new taxon, can easily be distinguished based on host specificity, conidiomata diameter and conidial size (Tab. 1).

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**Tab. 1.** A comparative analysis of six *Lichenodiplis* species having aseptate conidia.

Characteristic features	<i>L. dendrographae</i>	<i>L. fallaciosa</i>	<i>L. lecanoricola</i>	<i>L. ochrolechia</i>	<i>L. opegraphae</i>	<i>L. pertusariicola</i>
Conidiomata size (µm)	40–80	50–70 × 30–50	(25)50–62(75)	62.5–120	40–60	100–250(300)
Conidia size (µm)	4.5–6.0 × 3.0–3.5	6.0–8.0 × 3.0–4.0	4.0–4.5 × 2.0–2.5	(4.5)5.0–6.0(6.5) × (2.0)2.1–2.5(3.0)	3.0–4.5 × 1.5–2.0	3.5–6.0 × 2.5–3.5
Host	<i>Dendrographa</i>	<i>Buelliella</i> , <i>Orcularia</i>	<i>Lecanora</i>	<i>Ochrolechia</i>	<i>Opegrapha</i>	<i>Pertusaria</i>

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