

A NEW SPECIES OF LABROCARPON (ASTERINALES), A LICHENICOLOUS ASCOMYCOTA WITH SUBMURIFORM ASCOSPORES FROM INDIA

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During lichenicolous fungal studies in India, lichen genus *Ochrolechia* was found infected with a black lirellate fungus. Critical microscopical examination of the fungus revealed that it is a new species of *Labrocarpon*, which differs from *L. canariense* in having narrow exciple (15.0–20.0 μm vs 20.0–50.0 μm thick), 4-spored asci, 1-septate to submuriform, constricted ascospores with larger l/w value [(2.5–)2.9–3.4–3.9(–4.5) vs (1.9–)2.1–2.5(–2.8)], habitat preference (corticolous vs saxicolous) and host selection (*Ochrolechia* vs *Pertusaria*). The new species *Labrocarpon submuriforme* is described in detail.

Key words: Himalaya, *Melaspilea*, *Pertusaria*, submuriform

INTRODUCTION

The genus *Labrocarpon* Etayo et Pérez-Ortega belonging to the class Dothi-deomycetes O. E. Erikss. et Winka and order Asterinales M. E. Barr ex D. Hawksw. et O.E. Erikss. was introduced for the lichenicolous *Melaspilea canariensis* D. Hawksw. based on the presence of excipular periphyses (Pérez-Ortega and Etayo 2010). The genus is mainly characterised by a lichenicolous lifestyle; black, simple to shortly branched lirelliform, sometimes almost rounded ascocmata; partly immersed to superficial apothecia with slit-like or rarely largely exposed discs; a well-developed, brownish black, K– exciple, which is continuous below the hymenium, without basal stalk-like extension; excipular cells densely interspersed with dark brown granules; a hyaline hymenium which is I– (sensu Hawksworth 1982) or I+ blurry blue (sensu Zhurbenko and Zhdanov 2013); a brownish epihymenium; sparsely branched or anastomosed paraphyses, apically distinctly swollen and brownish; periphyses developing from the inner excipular layer; clavate, thick-walled, asci with a distinct ocular chamber, I–, K/I–; and 1-septate, hyaline then brown ascospores (Calatayud *et al.* 1995, Ertz and Diederich 2015, Hawksworth 1982, Pérez-Ortega and Etayo 2010, Zhurbenko and Zhdanov 2013).

To date, the genus is represented by a single species, viz. *Labrocarpon canariense* (D. Hawksw.) Etayo et Pérez-Ortega, reported from Brazil (Diederich 2003), Canary Islands (Hawksworth 1982), Italy (Nimis 1993), Madeira

(Hafellner 1995), Portugal (Pérez-Ortega and Etayo 2010), Spain (Calatayud *et al.* 1995, Etayo 1996, 2000), colonising lichen genus *Pertusaria* DC. However, except for the specimen from Brazil, which was growing on corticolous *Pertusaria*, specimens from other countries were colonising unidentified, sterile, saxicolous *Pertusaria* with a yellowish thallus. Whether corticolous and saxicolous specimens belong to the same species needs to be resolved (Ertz and Diederich 2015).

In continuation with my studies on lichenicolous fungi, I found a specimen of *Ochrolechia* A. Massal. infected by a fungus, which on its identification revealed to be a *Labrocarpon*. The species is morphologically and anatomically similar to *L. canariense*, but differs in having narrow exciple, 4-spored asci, 1-septate to submuriform ascospores with larger l/w value [(2.5–)2.9–3.4–3.9(–4.5)], habitat preference, and host selection. This led me to depict a new species of *Labrocarpon* from India, viz. *L. submuriforme*, which is described here in detail.

MATERIAL AND METHODS

The study is based on specimens deposited in the herbarium of CSIR-National Botanical Research Institute (LWG) including the personal herbarium of D. D. Awasthi (AWAS) and Lucknow University (LWU). The macroscopical examination was carried out using a stereo-zoom dissecting microscope (Olympus SZ61). Microscopical studies of hand-made sections were carried out in water, 10% KOH (K), lactophenol cotton blue (LCB), Lugol's iodine, directly (I) or after 10% KOH pre-treatment (K/I) and Congo red (CR) solution using an Olympus BX53 compound microscope equipped with Olympus differential interference contrast optics. Measurements were taken from water mounts and are indicated as (minimum–)(X–SD)–X–(X+SD)(–maximum), where X is the arithmetic mean and SD the corresponding standard deviation, followed by the number of measurements in parentheses (n), and the length/width ratio (l/w) is presented in the same way, followed by the number of measurements (n). Values in italics (e.g., –3.4–) are arithmetic means.

RESULTS AND DISCUSSION

Labrocarpon submuriforme Y. Joshi, *spec. nova* (Figs 1–2)

Mycobank no.: MB 845101

Similar to Labrocarpon canariense in morphology, apothecial anatomy, ascospore shape, size and ornamentation, but differs in narrow exciple (15.0–20.0 µm vs 20.0–50.0 µm thick), 4-spored asci, 1-septate to submuriform constricted ascospores

with larger l/w value [(2.5–)2.9–3.4–3.9(–4.5) vs (1.9–)2.1–2.5(–2.8)], habitat preference (corticolous vs saxicolous) and host selection (*Ochrolechia* vs *Pertusaria*).

Type: India. Himachal Pradesh, Kullu District, in route to Jalori lake, alt. 3160 m, on thallus and apothecial disc of *Ochrolechia* sp. colonising bark, 03 May 2008, D. K. Upreti and Y. Joshi, 08-009007 (Holotype: LWG-17716; Isotype: RUBL).

Ascomata lichenicolous, on thallus and apothecial disc of *Ochrolechia*, lirelliform, elongate-fusiform to broadly fusiform, unbranched, arising singly or rarely almost confluent, with a narrow slit, black, the margins convex and sometimes uneven, (100.0–)105.0–115.0–125.0(–140.0) × (130.0–)150.0–200.0–250.0(–300.0) μm (Fig. 1a, b); excipulum carbonaceous, dark brown to black, well-developed, continuous below the thecial layers, 15.0–20.0(–25.0) μm,

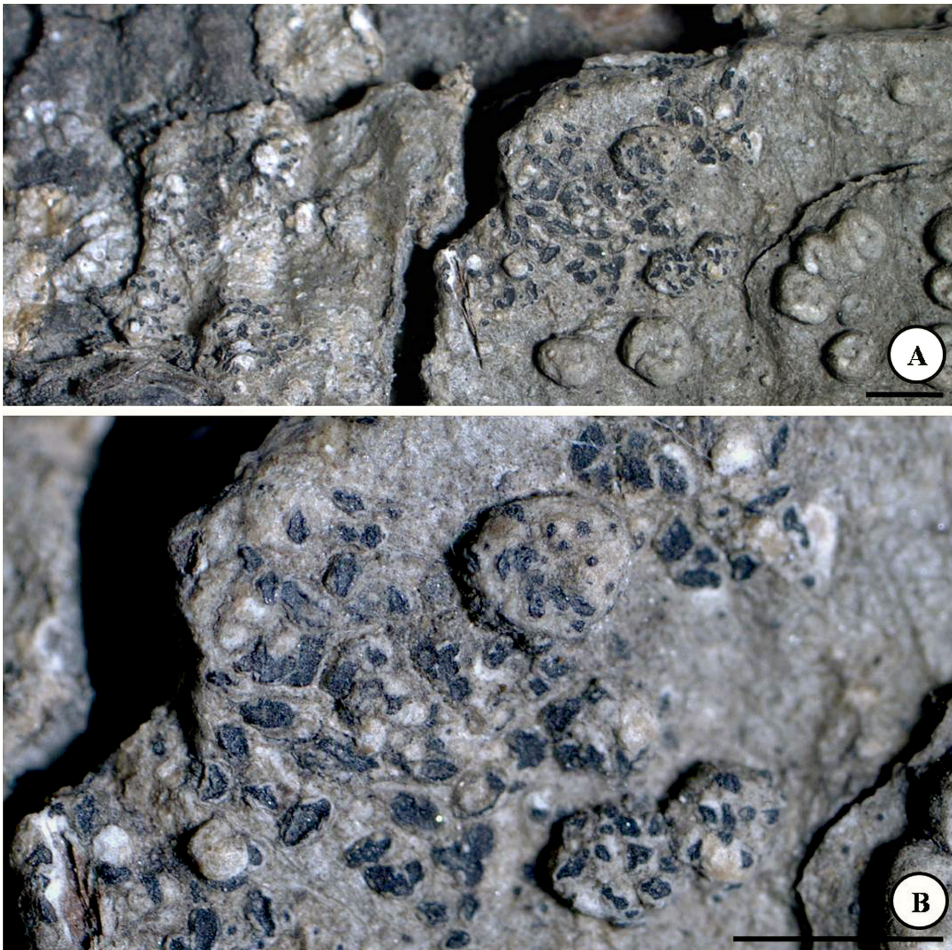


Fig. 1. *Labrocarpon submuriforme*. A = habit; B = magnified view. Scale bars = 1 mm

K- (Fig. 2a); subhymenium hyaline, about 20.0–35.0 μm tall; hymenium 55.0–60.0 μm tall, hyaline; epihymenium pale to dark brown, *ca* 15 μm thick; all ascomatal tissues I-. Periphyses not observed. Paraphyses cellular, sparsely branched from the base, hyaline, thick-walled, mainly 2.5–3.5 μm wide but up to 4 μm thick apically. Asci subglobose to shortly clavate, bitunicate, thickened at the apex and with a distinct internal apical beak when young, short-stalked, not turning blue in iodine, (35.0–)40.0–50.0(–55.0) \times 10.0–15.0 μm , 4-spored ($n = 30$), (Fig. 2c). Ascospores broadly ellipsoid to soleiform, one-septate to submuriform, constricted at the septum, cells \pm equal in size, upper cell more or less roundish, lower cell similar in shape or more often attenuated, rounded at the apices, hyaline at first, but brown at maturity, with a thin sheath, distinct verruculose sculpture visible in light microscopy, (14.0–)15.8–17.1–18.4(–20.0) \times (4.0–)4.3–5.0–5.7(–6.0) μm ($n = 50$), $l/w = (2.5\text{--})2.9\text{--}3.4\text{--}3.9(4.5)$ ($n = 50$), (Fig. 2b–d). *Conidiomata* not seen.

Host: On thallus of *Ochrolechia* species.

Etymology: Named after the submuriform ascospores.

Ecology and distribution: To date, the species is known from type locality, where it is colonising the thallus of *Ochrolechia* species. Since the present specimen does not have any pathogenic effects on the host, hence it can be considered as a commensalistic species.

Taxonomic remarks: The taxonomic details of the present fungal specimen are closely related to *Labrocarpon canariense* in having simple to shortly branched lirellae, with slit-like or rarely largely exposed discs; brownish black exciple, which is continuous below the hymenium; a hyaline hymenium, a brownish epihymenium; sparsely branched or anastomosed paraphyses, which are apically swollen; asci clavate, I-, K/I-; and 1-septate, hyaline then brown ascospores measuring (13.8–)15.4–19.8(–21.0) \times (6.0–)6.8–8.6(–9.5) μm , $l/w = (1.9\text{--})2.1\text{--}2.5(2.8)$ (sensu Zhurbenko and Zhdanov 2013) or 17.0–20.0 \times 6.5–8.0 μm (sensu Hawksworth 1982), which is reported on lichen genus *Pertusaria* from Brazil, Canary Islands, Italy, Madeira, Portugal, Spain. However, the new species differs from *L. canariense* in having narrow exciple (15.0–20.0 μm *vs* 20.0–50.0 μm thick), I- hymenium, 4-spored asci, 1-septate to submuriform constricted ascospores with larger l/w value [(2.5–)2.9–3.4–3.9(–4.5)], habitat preference (corticolous *vs* saxicolous) and host selection (*Ochrolechia vs Pertusaria*) (sensu Zhurbenko and Zhdanov 2013).

It is worth mentioning, that in the examined specimen I have not found distinct periphyses developing from the inner part of exciple, which not only discriminates *Labrocarpon* from *Melaspilea* Nyl., but is also reported in many species and genera of Eremithallales Lücking et Lumbsch and Asterinales, including *Melaspilea* (Ertz and Diederich 2015). These periphyses were considered as being poorly developed paraphyses in *M. canariense* by Zhurbenko

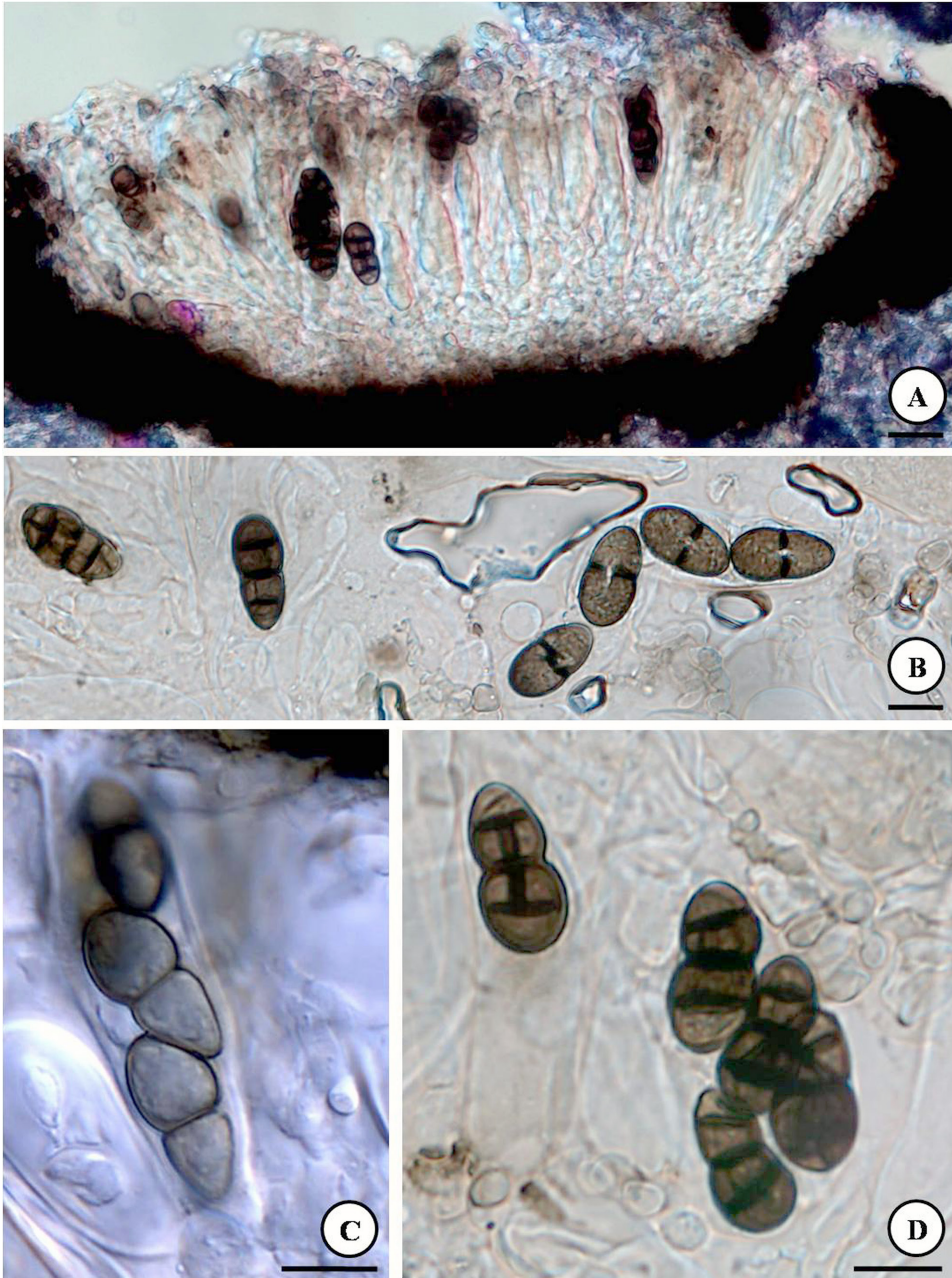


Fig. 2. A = Transverse section through ascomata 40× (Scale bar = 15 μ m); B = one septate and submuriform ascospores 60× (Scale bar = 10 μ m); C = ascus with hyaline to pale brown 1-septate ascospores 60× (Scale bar = 10 μ m); D = submuriform ascospores 60× (scale bar = 10 μ m)

and Zhdanov (2013) and recently, Ertz and Diederich (2015) and Diederich *et al.* (2017) also have confirmed that these periphyses can only be observed in well-developed rather young ascomata, whilst in mature ascomata, older herbarium specimens or specimens in a poor condition, including *Labrocarpon canariense*, they cannot be visualised.

The ascospore dimensions of *M. arenacea* Redinger are closer to those of *L. canariensis*, but in that species, the lirellae are usually about 1 mm long, branched, with a hymenium turning dark greenish blue in iodine, and more soleiform ascospores (Redinger 1938).

The genus *Stictographa* Mudd encompasses two species, viz. *Stictographa dirinariicola* Diederich et Ertz and *S. lentiginosa* (Lyell ex Leight.) Mudd, is morphologically very similar and close to *Labrocarpon*. Ertz and Diederich (2015) even wondered if *Labrocarpon* might represent a synonym of *Stictographa*, although these species did not cluster in their phylogenetic tree. *S. lentiginosa* differs from *Labrocarpon submuriforme* in having larger ascomata, 100.0–500.0 × 100.0–200.0 µm, hymenium I+ and K/I+ blue then turning orange, smaller asci (25.0–35.0 × 8.0–12.5 µm), smaller 1-septate ascospores (10.0–13.5(–16.0) × 5.0–7.5 µm), and a different host selection (*Phaeographis dendritica* (Ach.) Müll. Arg.) (Sanderson *et al.* 2009). *S. dirinariicola* in having a somewhat similar shape and size of ascospores [(14.3–)15.0–17.8(–18.7) × (5.5–)6.3–7.8(–9.0) µm] and non-amyloid ascus differs from the new species in having 1-septate ascospores and host selection (*Dirinaria picta* (Sw.) Clem. et Shear *vs Ochrolechia*) (Diederich *et al.* 2017).

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REFERENCES

- Calatayud, V., Atienza, V. and Barreno, E. (1995): Lichenicolous fungi from the Iberian Peninsula and the Canary Islands. – *Mycotaxon* **55**: 363–382.
- Diederich, P. (2003): New species and new records of American lichenicolous fungi. – *Herzogia* **16**: 41–90.
- Diederich, P., Lücking, R., Aptroot, A., Sipman, H. J. M., Braun, U., Ahti, T. and Ertz, D. (2017): New species and new records of lichens and lichenicolous fungi from the Seychelles. – *Herzogia* **30**: 182–236. <https://doi.org/10.13158/heia.30.1.2017.182>
- Ertz, D. and Diederich, P. (2015): Dismantling Melaspileaceae: a first phylogenetic study of *Buellia*, *Hemigrapha*, *Karschia*, *Labrocarpon* and *Melaspilea*. – *Fungal Diversity* **71**: 141–164. <https://doi.org/10.1007/s13225-015-0321-1>

- Etayo, J. (1996): Aportación a la flora líquénica de las Islas Canarias. I. Hongos liquenícolas de Gomera. – *Bull. Soc. linn. Provence* **47**: 93–110.
- Etayo, J. (2000): Aportación a la flora líquénica de las Islas Canarias. VI. Hongos liquenícolas de La Palma. – *Bull. Soc. linn. Provence* **51**: 153–162.
- Hafellner, J. (1995): A new checklist of lichens and lichenicolous fungi of insular Laurimacaronesia including a lichenological bibliography for the area. – *Fritschiana* **5**: 1–132.
- Hawksworth, D. L. (1982): *Melaspilea canariensis* sp. nov. and other lichenicolous fungi from Tenerife. – *Lichenologist* **14**: 83–86. <https://doi.org/10.1017/S0024282982000127>
- Nimis, P. L. (1993): *The lichens of Italy. An annotated catalogue*. [Monografia XII]. – Museo Regionale di Scienze Naturali Torino, Turin.
- Pérez-Ortega, S. and Etayo, J. (2010): *Labrocarpon* gen. nov. for *Melaspilea canariensis*, with the description of *Buelliella protoparmeliopsis* sp. nov. from South America. – *Lichenologist* **42**: 271–276. <https://doi.org/10.1017/S0024282909990624>
- Redinger, K. (1938): *Familie Graphidaceae*. – In: Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. 9 (2/1/2). Akad. Verlagsges. M.B.H., Leipzig, pp. 181–404.
- Sanderson, N. A., Hawksworth, D. L. and Aptroot, A. (2009): *Melaspilea* Nyl. – In: Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. and Wolseley, P. A. (eds): *The lichens of Great Britain and Ireland*. The Natural History Museum, London, pp. 576–579.
- Zhurbenko, M. P. and Zhdanov, I. S. (2013): *Melaspilea galligena* sp. nov. and some other lichenicolous fungi from Russia. – *Folia Cryptog. Estonica* **50**: 89–99. <https://doi.org/10.12697/fce.2013.50.12>