Lichen genera *Brigantiaea* and *Letrouitia* from India

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**Abstract.** The paper deals with 4 species of *Brigantiaea* and 7 species of *Letrouitia* known from India. *Brigantiaea nigra* is a new species to science.

**Keywords.** Indian lichens; *Brigantiaea; Letrouitia*.

1. Introduction

The genus *Lopadium* Körber 'Lecideaceae' as circumscribed by Zahlbruckner (1926, 1926–27) was found to be a heterogeneous assemblage of unrelated species by Santesson (1952), and its certain foliicolous taxa had to be transferred to other genera. Santesson (1952) also noted that the taxa of genus *Brigantiaea* Trevisan are quite distinct from the typical species of *Lopadium*, with which the genus *Brigantiaea* had been synonymized. Poelt (1974) accepted *Brigantiaea* as an independent genus in the family Teloschistaceae. However, on the basis of ascus structure, Hafellner and Bellemere (1982a) proposed that the genus *Brigantiaea* be placed in an independent family Brigantiaeceae. Almost simultaneously, Hafellner and Bellemere (1982b) described a new genus *Letrouitia* Haf. and Bellem. (family Teloschistaceae) which was monographed by Hafellner (1983). To this genus were transferred certain taxa which had been previously placed in *Bombyliospora* De Not. (Teloschistaceae), a genus that was found to be a later synonym of *Megalospora* Meyen (Megalosporaceae).

Since *Brigantiaea* and *Letrouitia* exhibit similarity in appearance of the apothecia in possessing a prominent pale yellow to orange, K+ violet or purple (due to the presence of anthraquinone), biatorine exciple, in most of the taxa, the two genera have been taken together. In addition it has been observed that all the taxa of both the genera treated here have a yellow indeterminable spot in solvent A (thin-layer chromatography) at Rf value 0.72, which is UV—before or after charring. But they can be easily also distinguished by other characters. *Brigantiaea* is characterized by a crustose K− or K+ yellow thallus, asci usually 1-spored, spores multicelled muriform, thin walled and paraphyses simple and discrete. *Letrouitia* has a crustose, K+ purple or violet thallus, ascus 2–8-spored, spores either transversely septate with lens shaped locules or submuriform to multicelled muriform, and paraphyses branched and anastomosing.

2. Materials and methods

The investigations presented in this paper are primarily based on the specimens preserved in the herbarium of Botany Department, Lucknow University (LWU), as well as from the personal herbarium of D D Awasthi (Awas.). Other specimens have been borrowed from British Museum (Natural History), London (BM), Ajrekar
Herbarium, Maharashtra Association for Cultivation of Science, Pune (AMH),
National Botanical Research Institute, Lucknow (LWG) and Botanische Abteilung,
Naturhistorisches Museum, Wien (W).

The usual lichenological methods have been employed for the study. The colour
reactions on the thallus and apothecia were tested by a 10% aqueous solution of
potassium hydroxide (K): Steiner's stable paraphenylenediamine (P) solution, and
iodine (I) solution. Thin-layer chromatography (TLC) of thallus and apothecia
together was done in solvent A (toluene, 1, 4, dioxane and acetic acid) according
to the methods of Culberson (1972) and Walker and James (1980) on silica gel G
coated glass plates prepared in the laboratory.

3. Key to Indian species of Brigantiaea and Letrouitia

1a. Thallus isidiate or sorediate .............................................. 2
1b. Thallus lacking isidia and soredia ....................................... 3

2a. Thallus isidiate, isidia simple or coralloid, spores transversely septate with lens
shaped, 6(-8) locules, 19-46 x 7-14 μm .................... (5-4) Letrouitia leprolyta
2b. Thallus sorediate, soredia developing from pustules of verrucae, spores multi-
celled muriform, (44-) 52-88(-116) x (20-) 24-36 (-52) μm ..................
........................................................... (4.2) Brigantiaea leucoxantha

3a. Asci 8-spored ................................................................. 4
3b. Asci 1-4-spored ............................................................. 7

4a. Spores basically transversely septate with lens shaped locules becoming submuri-
form by 1-3(-4) vertical septa in some of the locules . . . . (5-6) Letrouitia transgressa
4b. Spores transversely septate with ovoid to lens shaped locules, lacking vertical
septa ................................................................. 5

5a. Spores narrowly ellipsoid, 6-8-loculed, locules ovoid to lens shaped, 19-23(-27) x
5-6 μm ................................................................. (5-1) Letrouitia aureola
5b. Spores broadly ellipsoid with lens shaped locules .......................... 6

6a. Spores 6-8-loculed, 17-25(-29) x 8-10-5 μm .................. (5-3) Letrouitia flavocrocea
6b. Spores 6-10-loculed, 20-48 x 8-12(-16) μm .................. (5-2) Letrouitia domingensis

7a. Thallus yellow or yellowish, K + violet-purple, asci 2-4-spored ........... 8
7b. Thallus grey, grey-white, K- or K + yellow, asci 1-spored ............... 10

8a. Spores multilocelled muriform, thin walled, 24-50(-56)x 10-20(-22) μm, asci
usually 2(-3)-spored ...................................................... (5-7) Letrouitia vulpina
8b. Spores submuriform, basically lens shaped, transverse locules with 1-4 vertical
septa in some or most of the locules ..................................... 9

9a. Asci 4-spored, spores with 1-3(-4) vertical septa in some locules, 20-52(-60)x
10-16 (-22) μm ...................................................... (5-6) Letrouitia transgressa
9b. Asci 2-3-spored, spores with 1-4 vertical septa in most of the locules, 36-72 x
16-22 μm ...................................................... (5-5) Letrouitia muralis

10a. Apothecial disc yellow, orange-brown or brown .................................. 11
10b. Apothecial disc brown-black to black ............................................. 12
11a. Apothecial disc orange-brown to brown, finely caesiopruinose or pruina evanescent, margin yellow to yellow-orange, hypothecium hyaline, yellow to pale brown, spores (44–)52–88(–116) × (20–)24–36(–52) μm ....................... (4.2) *Brigantiaea leucoxantha*

11b. Apothecial disc greenish-brown to brown, yellow-brown pruinose, margin brownish to brownish, hypothecium yellow to red-brown, spores (40–)62–96(–117) × (20–)28–48 (–60) μm ............ (4.4) *Brigantiaea pulchra*

12a. Apothecial disc black, smooth, epruinose, margin blackish, hypothecium greenish-black merging into black exciple, spores 60–104 × 22–36 μm ............. (4.1) *Brigantiaea ionoexcipula*

12b. Apothecial disc brown-black, pruinose, pruina granular, purple-black, hypothecium hyaline to yellow or orange-brown, spores 50–84(–120) × 20–32(–40) μm ............. (4.3) *Brigantiaea nigra*

4. *Brigantiaea* Trevisan


Thallus crustose, smooth, granular to sub verrucose or verrucose, whitish-grey to grey, usually limited by a brown-black hypothallus. Apothecia sessile, constricted at base, orange fulvus-brown to brown-black; margin prominent, paler than the disc; exciple biatorine (rarely lecideine), K+ violet-blue (anthraquinone present); epithecum usually with granular incrustations, K+ violet; hymenium hyaline. Asci without an external apical cap but with thick, I+ blue staining external wall layer, inner apical apparatus present and inner wall layers amyloid (I+ blue), usually 1-spored; spores hyaline, multicelled muriform (figure 1); paraphyses simple, rarely branched, compact or discrete.

4.1 *Brigantiaea ionoexcipula* (Patw. and Makh.) Awas. comb. nov.


Thallus corticolous, crustose, white to greyish-white, effuse, rimose and verrucose. Apothecia common, dense, sessile, constricted at base, up to 2 mm diam; disc plane to convex, black, shiny; margin prominent, slightly paler than the disc; exciple lecideine, 76–88 μm thick, violet in section, K+ violet-blue; epithecum violet-black, K+ violet-blue; hymenium 120–180 μm high, I+ blue turning vinose; hypothecium greenish-black, 36–60 μm thick, merging into black exciple. Asci 80–120 × 24–40 μm, 1-spored; spores oval ellipsoid, hyaline, multicelled muriform, 15–25 transverse and 5–8 longitudinal septa, 60–104 × 22–36 μm; paraphyses simple, unbranched to branched, capitate, compact. Thallus K+ yellow, P+ yellow.

Chemistry: Atranorin, zeorin and a yellow spot at Rf value 0.72 (TLC).

* B. ionoexcipula* is distinguished by its characteristic black, shiny apothecia in which the exciple though black is K+ violet-blue, a reaction which is characteristic of the pale yellow to brownish exciples of other species of *Brigantiaea*.

The taxon showed some resemblance to the protologue of *Lopadium*.
melanocardium Zahlbr. in the hymenium K+ subviolet reaction and hypotecium merging into black exciple. But on examination of the type specimen of L. melanocardium Zahlbr. borrowed from W, it was found to be distinctly different in several aspects. Its thallus is K-, P- and lacks lichen products, the apothecia though black are smaller (0.2-0.8 mm diam), exciple, epithecium and hymenium K-, and the spores are comparatively smaller (64-80 x 20-24 μm). It is thus not a Brigantiaea. The paraphyses are simple to branched, not capitate and without calyptra-like thickening of apices, so that it also is not a Lopadium s.s. The systematic position of Lopadium melanocardium Zahlbr. thus needs to be put correctly.
Specimens examined: India, Tamil Nadu, Kodaikanal, Pillar rocks, alt. 2300 m, Patwardhan, 79-162 (AMH); Kodaikanal-Berijam road, in Shola near 9th mile, alt. 2250 m, 1959, Foreau and Awasthi, 4189, 4196-B (Awas).

4.2 Brigantiaea leucoxantha (Sprengel) R Sant. and Haf. in Haf. and Bellem.


Thallus corticolous, crustose, whitish-grey, grey to bluish-grey, granulose to warty-verrucose, effuse or limited by a brown hypothyallus at the point of contact with the thallus of another crustose lichen, sometimes thallus sorediate, soredia granular, developing from verrucae or warts. Apothecia common, sessile, constricted at base, up to 1.5 mm diam; disc plane to rarely convex, orange-brown to dark brown, very finely caesio-pruinose to pale greenish pruinose in young condition, pruina persistent or evanescent in mature apothecia; margin prominent, raised above the disc, entire to wavy towards disc, orange-yellow, shiny; exciple K+ reddish-purple or bluish-purple to violet; epithecium K+ purple; hymenium 130–160 μm high; hypothecium hyaline to yellowish or pale brown. Asci 60–130 x 32–52 μm, 1-spored; spores hyaline, ellipsoid to oval, multicelled muriform with 10–24 transverse and up to 10 longitudinal septa, (44–) 52–88 (–116) x (20–) 24–36 (–52) μm; paraphyses simple to branched. Thallus K+ yellow, P+ yellow.

Chemistry: Atranorin, zeorin and a yellow spot at R_f value 0.72 (TLC).

B. leucoxantha is distinguished by shiny, prominent, orange-yellow apothecial margin, pruinose disc and hyaline to yellowish hypothecium. The thallus may sometimes develop soredia and therefore the taxon Lopadium granulosum Patw. and Makh. which is distinguished by the sorediate condition has been synonymized with B. leucoxantha. It does not differ otherwise. Lopadium palniensis does not differ in any other way from typical B. leucoxantha, except in denser orange pruinosity of disc.

Specimens examined: India, Tamil Nadu, Palni hills, Kodaikanal, Shembaganur, Tiger Shola, alt. ca. 1650 m, 1970, Awasthi and Singh 70-138 (LWU); Perumal to Palni road, alt. ca. 1500 m, 1970, Singh 70-995 (LWU); Nilgiri hills, Kodanad, alt. ca. 2000 m, 1970, Awasthi and Singh 70-1400 (LWU); Karnataka, Hassan district, near Sakleshpur Sambhalli, alt. 900 m, 1979, Awasthi, Uperti and Misra 79-373 (LWU); Kerala, Devicolon, Cardamom hills, 1976, Nagarkar and Gole 76-754 (AMH); Tamil Nadu, Kodaikanal, Pillar Rocks, 1979, Patwardhan and Makhija 79-35 (AMH).

Extra-Indian specimens examined: Sri Lanka (Ceylon), Thwaites (Leighton No. 116) (BM), Hawaii Island, Ramai Hanapepe Fall, 1909, Faurie (Awas).
4.3 *Brigantiaea nigra* Awas. sp. nov.

Thallus corticola, crustaceus, albocephalosius vel cinereus, verruculosus, K+ flavescens. Apothecia sessilia, basi constricta, brunneo-nigra, (0-5-)0-75-1(-1-5 mm diam; disco granulosus purpurei-brunneo pruinoso, K+ purpurascens; excipulo pallescens, brunneo vel nigro, crasso, K+ violascens; hymenium 100-180 μm; hypothecio hyalino, flavescente vel brunneo. Ascii 1-spore, 90-130×28-36 μm; sporae hyalinae muriformes, ovoideae, 50-84(-120)×20-32(-40) μm.

Type collection: India, Kerala, Idukki district, Thenmallay tea estate area near Munnar, along road side, alt. ca. 1800 m, on bark of Cinnamom tree, 26-3-1985, D D Awasthi, R Tewari and R Mathur 85-288 (Holotype: LWU) (figure 10).

Thallus corticolous, crustose, greyish-white to grey, thin, ± smooth to rugulose. Apothecia sessile, constricted at base, brown-black, (0-5-)0-75-1(-1-5 mm diam; disc concave to plane, usually granular, purple-brown pruinose; margin brown to brown-black, prominent; epithecium and exciple K+ bluish-purple to violet; hymenium 100-180 μm high, I+ blue-vinose; hypothecium hyaline to yellow-brown. Ascii (60-)90-130×28-40 μm, 1-spored; spores hyaline, multicelled muriform with 13-36 transverse and 4-12 longitudinal septa, ovoid, 50-84 (-120)×20-32(-40) μm; paraphyses simple to slightly branched.

Chemistry: Atranorin, zeorin and a yellow spot at Rf value 0.72 (TLC).

*B. nigra* is characterized by brown-black, granular purple-brown pruinose disc. The taxon is distributed in the subtropical parts of hills of Kerala and Tamil Nadu.

Additional specimens examined: India, Kerala, Idukki district, Munmar, Rajamallay area along the border of tea plantation, alt. ca. 1500-1600 m, 1985, Awasthi et al 85-156 (LWU); Karnataka, Mangalore district, Sakleshpur to Mangalore, Shiradighats, alt. ca. 770 m, 1979, Awasthi, Upreti and Misra 79-561, 79-595 (LWU); Tamil Nadu, Nilgiri hills, Kodanad, alt. ca. 1800 m, 1971, Singh 71-1001 (LWU).

4.4 *Brigantiaea pulchra* (Müll. Arg.) Haf.


Thallus corticolous, crustose, greyish-white to grey, thin, ± smooth to rugulose. Apothecia sessile, constricted at base, (0-5-)1-1-5 mm in diam; disc concave to plane, greenish-brown to brown, pruinose, pruina yellowish-brown; margin prominent, yellow-brown to brownish, shiny; excipule K+ blue or bluish-purple; epithecium K+ purple or violet-purple; hymenium hyaline, 120-160 μm high; hypothecium yellow to red-brown. Ascii clavate, 1-spored; spores hyaline, multicelled muriform, ellipsoid to ovoid, (40-)62-96 (-117)×(20-)28-48 (-60) μm; paraphyses simple to slightly branched, discrete.

Chemistry: Atranorin, zeorin and a yellow spot at Rf value 0.72 (TLC).

The taxon is distinguished by brown apothecia with prominent yellow-brown to
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brownish margin and yellow-brown to red-brown hypothecium. The taxon is distributed in Australia, Philippines and India.

Specimens examined: India, Kerala, Idukki district, Indian Cardamom Research Institute campus, Myladumpara, alt. 1200 m, 1984, D Awasthi and G Awasthi 84-141 (LWU); on way Myladumpara to Munnar, Santhampara area, alt. 1200 m, 1984, D Awasthi and G Awasthi 84-200 (LWU); Madhya Pradesh, Hoshangabad district, Panchmarhi, near Pancy Pool, alt. ca. 1050 m, 1973, S R Singh 73-25 (LWU); Tamil Nadu, Nilgiri hills, Ithallar, 1980, Patwardhan and Nagarkar 73-2980 (AMH) -det. Lopodium fuscoluteum (Dicks.) Mudd; Kodanad tea estate in Shola, alt. 1950 m, 1971, K P Singh 71-954 (LWU); Palni hills, Kodaikanal, Pillar rocks area, alt. ca. 2200 m, 1970, K P Singh 70-712 A (LWU).

5. Letrouitia Haf. and Bellem.


Thallus crustose, smooth to verrucose, pale yellow, greenish-yellow to orange-yellow, K+ violet-purple (anthraquinone present). Apothecia sessile to constricted at base; disc yellow-orange, darker orange to brownish; margin prominent, pale orange, usually lighter than the disc; exciple biatorine, exciple and epithecium K+ purple or blue-violet. Asci with inner apical apparatus and inner wall layers non amyloid, (I-) 2-8-spored; spores hyaline, transversely (or spirally septate) with lens shaped locules, submuriform by few vertical septa in some or more of such locules or thin walled multicelled muriform, (figures 2-6) usually up to 50 μm long; paraphyses slightly branched and anastomosing. None of the Indian taxa possess spirally septate spores.

5.1 Letrouitia aureola (Tuck.) Haf. and Bellem.


Taxon characterized by orange thallus, apothecia less than 1 mm diam, orange coloured, hymenium 60-80 μm, asci 50-60 × 9-13 μm, 8-spored, spores transversely septate, 6-8-locule, 19-23(-27) × 5-6 μm, locules ovoid to lens shaped, the end locules ± elongated, wall somewhat sculptured.

Reported by Hafellner (1981) from Kodaikanal though widely distributed in Africa and also known from tropical America. No specimen present in our collection.

5.2 Letrouitia domingensis (Pers.) Haf. and Bellem.


Thallus corticolous, crustose, smooth to usually verrucose, verrucae ± lamellate type, pale yellow, greenish-yellow to orange-yellow, effuse, K+ violet-purple.
Apothecia sessile, constricted at base, 0.5–1 mm diam; disc red-brown; brown-black to black, concave, plane to convex; margin yellow-orange, prominent, elevated above disc, becoming partially excluded in black apothecia; exciple biatorine, K+ violet-purple; epithecium red-brown, 16–22 μm thick; hymenium 96–144 μm high; hypothecium hyaline, 32–48 μm thick. Asci 60–80 × 16–30 μm, 8-spored; spores straight to curved, hyaline, 20–48 × 8–12(–16) μm, transversely septate, 6–10 locular, locules lens-shaped; paraphyses branched and anastomosing.

Chemistry: A yellow spot at Rf value 0.72 and in one specimen brownish spot (UV + bluish) at Rf value 0.5 (TLC).

*L. domingensis* is distinguished by the 8-spored asci and transversely 6–10-loculate spores with lens shaped locules. The apothecia show variability in colour of disc from red-brown to black, apparently dependent on the age of apothecia. The taxon is widely distributed in tropical parts of the world.

Specimens examined: India, Andhra Pradesh, Godavari Dist., Rampa Agency, Ethakonda, alt. ca. 750 m, 1947, Awasthi 301 (Awas.); Vishakhapatnam, near Tyada, on bark of *Pongamia glabra*, 1986, D Awasthi, G Awasthi, Mathur and Srivastava 86-293, 86-294 (LWU); Arunachal Pradesh, Dibang Valley, dist. Roing, Deopani, alt. 700 m, 1984, Upreti L 81733 (LGW); West Bengal, Jalpaiguri district, Jaigaon, 1987, Upreti and Ranjan 201670 (LGW); Bihar, Chhota Nagpur, Bamiabura, alt. ca. 750 m, 1947, Awasthi 302, 408 (Awas.); Madhya Pradesh, Shahdol dist., Amarkantak, Vankokhurkurudadar, alt. 1100 m, 1980, Upreti and Misra 80-483 (LWU); Dudhara, 2 km away from Kapildhara, on bark of *Shorea robusta*, 1987, Upreti 201761 (LGW); Kabirchabutara, on bark of *Shorea robusta*, 1987, Upreti 201738, 201739 (LGW); Orissa, Berhampur dist., Taptapanni, alt. 800 m, 1948, Awasthi 308 (Awas.); Tamil Nadu, Nilgiri hills, Kodanad, near tea estate, alt. ca. 2200 m, 1970, Awasthi and Singh 70-1470 (LWU).

**5.3 Letrouitia flavocrocea** (Nyl.) Haf. and Bellem.


The taxon is reported by Hafellner (1983) from Palni hills. It is characterized by orange-yellow thallus, 8-spored asci, and 6–8 locular, 17–25 (–29) × 8–10.5 μm spores, locules lens shaped. It is close to *L. domingensis*, differing in somewhat smaller, below 30 μm long, spores. It is widely distributed in Africa and also known from tropical America and Australia.

**5.4 Letrouitia leprolyta** (Nyl.) Haf.


Thallus corticolous, crustose, yellowish-grey to dirty grey, densely isidiate, isidia simple to coralloid. Apothecia sessile, constricted at base, 0.5–1 (–1.25) mm diam; disc brown to bluish-black, plane, smooth; margin yellow to orange-yellow, not
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projecting beyond disc; exciple biatorine, K+ violet; epithecium 9–15 μm, blackish; hymenium 76–90 μm high; hypothecium hyaline to darker, 65 μm thick. Asci clavate, 90 x 15 μm, 8-spored; spores hyaline, 19–46 x 7–14 μm, transversely septate, 6(–8) locular, locules lens shaped; paraphyses branched and anastomosing.

Chemistry: A yellow spot at Rf value 0·72 (TLC).

The taxon is distinguished by the isidiate thallus. It is the only species that is isidiate in this genus. It is distributed in eastern India, southeast Asia and also reported from Africa and Australia.

Specimens examined: India, Uttar Pradesh, Bahraich district, forest near Murtika Rly. station, 1965, Tewari s.n. (Awas.); Nepal, east Nepal, Barachhatra in Kosi valley, alt. 450 m, 1949, Awasthi and Chilkoti 531 (Awas.).

5.5 Letrouitia muralis Haf.


Thallus corticolous, crustose, thin, yellowish-grey, K+ violet-purple. Apothecia sessile, constricted at base, (0·5–) 1–2 mm in diam; disc brown-black to black, finely pruinose in young stages, plane; margin orange-yellow, shiny, prominent, elevated than disc in young stages, later partly excluded to make it at level with the disc; exciple biatorine, K+ purple; epithecium red-brown, K+ violet-purple, 16–20 μm thick; hymenium hyaline, 100–128 μm high; hypothecium pale brown, 24–52 μm thick. Asci clavate, 60–80 x 24–38 μm, 2–3 spored; spores hyaline, primarily transversely septate and 6–10 locular, secondarily almost all locules vertically 1–4 septate to make them submuriform, 36–72 x 16–22 μm; paraphyses branched and anastomosing.

Chemistry: Zeorin, and a yellow spot at Rf value 0·72 (TLC).

L. muralis is distinguished by 2–3-spored asci and submuriform condition of spores. The taxon is distributed in southeast Asia, Africa, Philippines and Australia.

Specimen examined: India, Tamil Nadu, Palni hills, Shembaganur to Periakulum, alt. ca. 1800 m, Singh 70-889 (LWU). Reported from Karnataka by Hafellner (1983).

5.6 Letrouitia transgressa (Malme) Haf. and Bellem. in Haf.


Thallus corticolous, crustose, greenish-yellow to yellow, smooth to verrucose, verrucae dense, lamellate type, K+ violet-purple. Apothecia sessile, constricted at base, up to 1·25 mm diam; disc reddish-brown to brown-black, plane; margin prominent, reddish-orange, elevated than the disc, shiny; exciple biatorine, K+ violet-purple; epithecium red-brown, 14–20 μm; hymenium hyaline, 112–148 μm high; hypothecium hyaline, 32–52 μm thick. Asci 76–100 (–116) x 24–32 μm, 8-spored; spores hyaline, primarily transversely septate, (6–) 8–10 (–12) loculate, some of the locules later vertically 1–3 (–4) septate, becoming submuriform, 20–52 (–60) x 10–16 (–22) μm.
Chemistry: A yellow spot at $R_f$ value 0.72, in some specimens a brown spot at $R_f$ value 0.66 and in one specimen purple spots at $R_f$ value 0.70 and 0.55 (TLC).

*L. transgressa* is easily distinguished by the 8-spored asci and submuriform spores. In the specimens examined the asci were all 8-spored. Since Hafellner (1983) has mentioned the asci to be rarely 4-spored, the taxon has been keyed out with a 4-spored condition of asci as well. The taxon is distributed in tropical India, southeast Asia, Africa, south America and Australia.

Specimens examined: India, Andhra Pradesh, Vishakhapatnam, near Tyada, 70 km from Vishakhapatnam, on Artocarpus tree trunk, 1986, Awasthi et al 86-285 (LWU); Arunachal Pradesh, Dibang Valley, district Roing near ITI, alt. 400 m, on bark of palm, 1984, Upreti L81619 (LWG); West Bengal, Darjeeling district, Oodlabari, Ghisbeet forest, 1966, Awasthi and Agarwal 66-4, 66-19, 66-32 (LWU); above Sukna, Awasthi and Agarwal, 66-80 (LWU); Rangit river valley, Rangit, near bridge, alt. ca. 600 m, 1967 Awasthi and Agarwal 67-188, 67-206 (LWG); Uttar Pradesh, Baharaich district, Chakiamotipur road, 1967, Sharma and Party 90268/B (LWG). Nepal, east Nepal, Kosi valley, Barachatra, 450 m, 1949, Awasthi and Chilkoti 527 (Awas.); west Nepal, Bherizone area, Bankey, Bardiya, alt. 200–250 m, Sharma 76-2A, 76-2B, 76-5, 76-6, 76-14, 76-23 (LWG).

5.7 *Letroutitia vulpina* (Tuck.) Haf. and Bellem.


Thallus corticolous, crustose, yellowish-brown, ± smooth to cracked, K + slowly purple. Apothecia sessile, constricted at base, 1–1.5 mm in diam; disc black, smooth, plane; margin yellowish-orange to brownish-orange, elevated than the disc, rather thin, inlexed; exciple biatorine, 88–100 μm, K + purple; epithecium red-brown, K + purple; hymenium hyaline, 100–108 μm high; hypothecium hyaline, yellow to pale brown, 32–52 μm thick. Asci 68–80 × 20–28 μm, 2 (rarely 3)-spored; spores hyaline, muriform, mature spores with 6–10 transverse and (1–) 2–5 vertical septa, 24–50 (– 56) × 10–20 (– 22) μm; paraphyses branched and anastomosing.

Chemistry: A yellow spot at $R_f$ value 0.72 and in two specimens brownish spot (UV + bluish) at $R_f$ value 0.59 (TLC).

*L. vulpina* is distinguished by 2(–3)-spored asci and muriform spores. It can be confused for *Brigantiaeae* on account of muriform spores but in this taxon the thallus is K + slowly purple. The taxon is widely distributed in the tropical parts of the world.

Specimens examined: India, Andaman Island, south Andaman group, between Nilambur Jarwa Creek, Baratang Island, ± 30 m, 1961, Singh 79723 (LWG); Karnataka, Chikmagalur district, Dattatryapeeta, alt. 1750 m, 1979, Awasthi, Upreti and Misra 79-516, 79-519 (LWU); Mangalore district, Sakleshpur to Mangalore, Shiradighats, alt. 770 m, 1979, Awasthi, Upreti and Misra 79-660 (LWU).
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