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Original Article

First report of pteridocolous discomycetes, *Lachnum lanariceps* and *L. oncospermatum*, on decayed tree fern in Bukit Bendera (Penang Hill), Pulau Pinang, Malaysia

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Abstract

Bukit Bendera is 833 m above sea level and situated in the Northern part of Penang Island, Malaysia. Generally an average temperature is between 20 to 27°C, which is about 5°C cooler than at the sea level. The hill dipterocarp forest dominates Bukit Bendera and tree fern scatteredly grows at higher altitude. Two *Lachnum* spp. were observed as pteridocolous cup fungi on decayed rachides of several tree fern species, *Cyathea contaminans*, *C. latebrosa*, and *C. hymenodes*. *Lachnum oncospermatum* is characterized by a wrinkled apothecium and branched stipe. The hairs contain brown colored resinous materials and are finely granulated. *Lachnum lanariceps* is characterized by a central and cylindrical stipe and hairs containing pale yellow pigment with red or garnet resinous matter. These two *Lachnum* species are new to Malaysia.

Keywords: *Cyathea*, *Lachnum*, pteridocolous, discomycetes, tree fern, Malaysia

1. Introduction

Lachnum is a genus of fungi belonging to Hyaloscyphaceae, Helotiales, Leotiomyetidae, Leotiomyetes, Pezizomycotina and Ascomycota. Twenty two genera have been treated in synonym with *Lachnum* Retz., which are, *Arenaea* Penz. & Sacc., *Belonidium* Mont. & Durieu, *Belonidium* sect. *Lasiobelonium* Sacc., *Capitotricha* (Raitv.) Baral, *Chaetoscypha* Syd., *Dasypezis* Clem., *Dasyscyphus* Nees ex Gray, *Dasyscyphus* subgen. *Capitotricha* Raitv., *Dyslachnum* Clem., *Erinella* Qué!, *Erinella* Sacc., *Erinellina* Seaver, *Erioscypha* Kirschst., *Erioscyphella* Kirschst., *Helolachnum* Torrend, *Hyphoscypha* Bres., *Lachnaster* Höhn., *Lachnella* Boud., *Lachnobelonium* Höhn., *Lasiobelonium* (Sacc.) Sacc. & P. Syd., *Pezizellaster* Höhn. and *Trichopezizella* Dennis & Raitv. (Spooner, 1987).

Lachnum is a very large genus with cosmopolitan distribution not only in the temperate zone such as UK, Europe (Dennis, 1949), U.S.A. (Seaver, 1951) and Japan (Nagao, 1996; 2008; Nagao and Doi, 1996), but also in the tropical zone such as Central and South America (Haines, 1980; 1992), Taiwan (Wu *et al.*, 1998; Wu and Wang, 2000) and in the Southeast Asia and Australasia (Dennis, 1958; Spooner, 1987), some new species were earlier recorded in Java (Penzig and Saccardo, 1904). *Lachnum* species live and grow on plants, with the substrate being dead and decaying leaves, stems or woody substrate, and herbaceous stems or leaves. The categories of plants are pteridophytes, angiosperms and gymnosperms (Spooner, 1987). *Lachnum* is characterized by the finely granulate hairs on apothecia, asci with a conical apex stained blue in Melzer's reagent, and an ectal excipulum composed of prismatic cells (Spooner, 1987). Among the species, longer ascospores are recognized on palm specific species, *L. pritzelianum* and *L. palmae* ranging from 53 to 60 µm and 62 to 77 µm, respectively (Spooner, 1987).

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Tree ferns are recognized as the fern with a tall trunk-like rhizome and they are distributed in the tropical lowland to submontane environments (Piggott, 1988; Large and Braggins, 2004). Decaying ferns are known as good substrates for a large number of microfungi, not only parasitic but also for saprophytic species (Böhler, 1974; Holm and Holm, 1978; Haines, 1980). Several tropical ferns, *Alsophila*, *Blechnum*, *Cyathea*, *Dicksonia*, *Gleichenia*, and *Papuapteris*, have been recognized as the host plant of several species of pteridocolous Hyaloscyphaceae (Dennis, 1958; Haines, 1980; 1992; Spooner, 1987; Nagao, 1996; 2008; Nagao and Doi, 1996; Wu *et al.*, 1998; Wu and Wang, 2000). In Southeast Asia, decaying rachides of tree ferns were specifically colonized by these pteridocolous species recorded in Java (Penzig and Saccardo, 1904) and the Philippine Islands (Dennis, 1958; Spooner, 1987). In Bukit Bendera, the tree fern species, *Cyathea contaminans* was found at the edge of the forest besides roads and *Cyathea latebrosa* was widely distributed at the hill areas and beside streams with good humidity condition. However, up until now there has not been recognition of pteridocolous fungus from Bukit Bendera. Two species of pteridocolous *Lachnum* were observed on decayed rachides of *Cyathea* spp. in Bukit Bendera. The objective of this research is to study the biodiversity of saprophytic microbes in Bukit Bendera.

2. Materials and Methods

2.1 Collection sites

Decayed rachides of tree fern were collected along the jeep road and beside a stream in Bukit Bendera between 600 m and 800 m elevation. Seven specimens on *Cyathea* spp. were obtained on 15 December 2011 and 11 January 2012.

2.2 Observations of micro-morphology

Fruiting bodies on the samples were immediately observed to determine the type of apothecia. Dried specimens were dehydrated and sectioned freehand using a razor-blade. Sections were mounted in distilled water or Shear's solution for light microscopic observation. 3% KOH-1% phloxine and Melzer's reagent were properly added to detect septa formation and positive iodine reaction in the ascus pore, respectively. A squashed section was used to observe asci, ascospores, paraphyses and the texture of apothecium and stipe in detail.

3. Results and Discussion

3.1 *Lachnum oncospermatum* (Berk. & Broome) M.L. Wu, J.H. Haines and Y.Z. Wang, Mycotaxon. 67: 346, 1998.

≡ *Peziza oncospermatis* Berk. & Broom, J. Linn. Soc. Bot. 14:105, 1875.

≡ *Dasyscyphus oncospermatis* Berk. & Broom, Syll. Fung. 8:465, 1889.

≡ *Atractobolus oncospermatis* (Berk. & Broom) O. Kuntze, Revis. Gen. Pl. 3(2):446, 1898.

≡ *Aranea oncospermatis* (Berk. & Broom) Petch, Ann. R. Bot. Gard. Peraduniya 6:164, 1917.

Apothecia lobed, branched stipes, centric, and scattered on the decayed rachides of *Cyathea* sp. Apothecia ranged in size between 0.4-0.7 mm in diameter. The apothecia are covered with hair containing pale yellow pigment. The hairs bearing brown colored resinous materials and are finely granulated. The sizes of asci ranged from 40.1-49.1 × 3.1-3.8 μm and cylindrical clavate with 8 ascospores, the apex stained blue in Melzer's reagent. Ascospores dimensions ranged from 11.4-17.6 × 1.4-2.0 μm, narrowly fusoid, acute at the ends, straight or slightly curved and non-septate. Paraphyses were range between 1.2-1.7 μm at the widest point, narrowly lanceolate, hyaline, straight, sometime branched and the length of paraphyses was longer than that of asci.

Morphology of the ascospores of pteridocolous discomycetes is known to be acute and aseptate. The length of ascospores of *L. oncospermatum* is shorter than *L. lanariceps*. Color of resinous matter on hairs of *L. oncospermatum* is also different from *L. lanariceps*. Color of

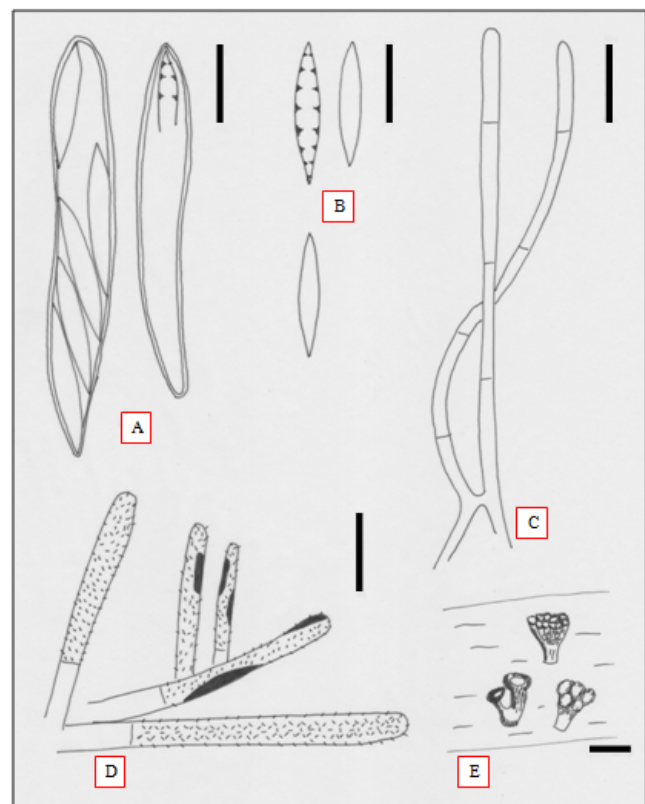


Figure 1. *Lachnum oncospermatum*: A Asci with ascospores. B Ascospores. C Paraphyses. D Hairs. E Apothecia. Bars A-D 10 μm; E 1 mm.

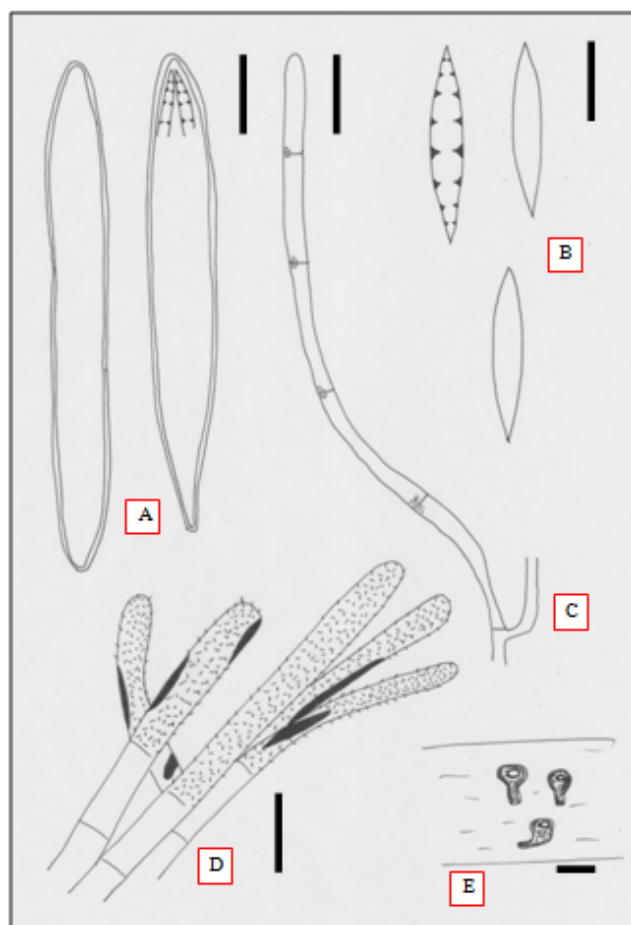


Figure 2. *Lachnum lanariceps*: **A** Asci with ascospores. **B** Ascospores. **C** Paraphyses. **D** Hairs. **E** Apothecia. Bars **A-D** 10 µm; **E** 1 mm.

resinous matter of *L. oncospermum* is brown in color while *L. lanariceps* is red or red-brown (Spooner, 1987; Wu *et al.*, 1998). Apothecia of *L. oncospermum* are branched whereas those of *L. lanariceps* single. The morphological differences between these two species are confirmed by this examination.

The ascospores of *Dasyscypha oncospermatis* and *Lachnum oncospermum* range from (17-) 18-28 (-31) × (1.5-) 2.0-3.0 (-3.5) (Haines, 1980) and (24-) 27-39 (-42) × 2.0-3.2 (Wu *et al.*, 1998), respectively. The ascospore sizes of *L. oncospermum* in this study range between 11.4-17.6 × 1.4-2.0 µm. Thus, our samples occupied the smaller size range cooperated to the other two descriptions. However,

ascospores of another synonym *Arenaea javanica* of *L. oncospermum* were reported to be 14-16 × 2 µm (Penzig and Saccardo, 1904). As we did not obtain the type specimen of *A. javanica*, we followed the present description. Therefore, our samples were identified as *L. oncospermum*.

Specimens examined: PP001, on the rachides of decayed tree fern, *Cyathea contaminans*, and PP002 *Cyathea hymenodes* along the jeep road and beside a stream in Bukit Bendera, Penang, Malaysia, December 15, 2011 and January 11, 2012.

3.2 *Lachnum lanariceps* (Cooke & Phillips) Spooner, *Bibliotheca Mycologica* 116:474, 1987.

≡ *Peziza lanariceps* Cooke & Phillips, *Grevillea* 8:62, 1879.

≡ *Dasyscypha lanariceps* (Cooke & Phillips) Sacc., *Syll. Fung.* 8:465, 1889.

≡ *Atractobolus lanariceps* (Cooke & Phillips) O. Kuntze, *Revisio Genera Plantarum* 3:446, 1898.

= *Dasyscypha javanica* Penz. & Sacc., *Malpighia* 15:209, 1902.

= *Dasyscypha cyatheae* Rehm, *Leafl., Philipp. Bot.* 6:2280, 1914.

The apothecia central come with cylindrical stipes. Apothecia ranged in size between 0.1-0.4 mm in diameter. The apothecia are covered with hair containing pale yellow pigment or hyaline. The hairs bearing red or garnet resinous matter and are finely granulated. The sizes of asci ranged from 51.1-66.8 × 3.3-5.2 µm, cylindrical clavate, 8-spored and the apex stained blue in Melzer's reagent. Ascospores dimensions ranged from 15.0-24.2 × 1.7-2.9 µm, narrowly fusoid, acute at the ends, straight or slightly curved and non-septate. Paraphyses were range between 1.5-1.9 µm at the widest point, subcylindric, straight, branched, hyaline, and the length of paraphyses was longer than that of asci.

The ascospores size of *Lachnum lanariceps* range between (17-) 21-24 (-26) × 2 µm (Spooner, 1987) while the ascospores size of *L. lanariceps* in this study range between 15.0-24.2 × 1.7-2.9 µm. Among the previously synonymized species, *Dasyscypha javanica* showed similar ascospores sizes ranging from 16-22 µm in length and 2-2.5 µm in width (Penzig and Saccardo, 1901). Ascospores of our samples are similar in size to those of *D. javanica*. We did not obtain the type specimen of *D. javanica*, but our samples were identi-

Table 1. Morphological characteristics of pteridocolous discomycetes.

| Species specimen number | Ascus (µm) | Ascospore (µm) | Paraphysis (µm) | Color of hair | Color of resinous matter |
|-----------------------------|---------------------|-----------------------------|-----------------|-------------------|--------------------------|
| <i>L. oncospermum</i> PP001 | 40.1-49.1 × 3.1-3.8 | 11.4-17.6 × 1.4-2.0 | 1.2-1.7 | Pale yellow | Brown |
| Wu <i>et al.</i> (1998) | (76-) 88-96 × 6-8 | (24-) 27-39 (-42) × 2.0-3.2 | 1.3-2.0 | Pale ochraceous | Brown |
| <i>L. lanariceps</i> PP008 | 51.1-66.8 × 3.3-5.2 | 15.0-24.2 × 1.7-2.9 | 1.5-1.9 | Pale yellow | Red |
| Spooner (1987) | 65-70 × 6-7 | (17-) 21-24 (-26) × 2 | 2.0-2.5 | Pale orange-brown | Red / Red brown |

fied as *L. lanariceps* on their similarity to the type description of *D. javanica*. Therefore, our samples were identified as *L. lanariceps*.

Lachnum oncospermatum (= *D. oncospermatis*) can be distinguished from other species on tropical ferns by the branched stipe characteristics. *Lachnum lanariceps* can be differentiated by having simple instead of compound apothecia and shorter spores ranging from 21 to 24 µm (Spooner, 1987).

Specimens examined: PP001, on the rachides of decayed tree fern, *Cyathea contaminans*, PP008 *Cyathea latebrosa*, PP012 *Cyathea borneensis*, and PP002 *Cyathea hymenodes* along the jeep road and beside a stream in Bukit Bendera, Penang, Malaysia, December 15, 2011 and January 11, 2012.

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