SOME SOOTY MOULDS AND BLACK MILDEWS FROM SINGAPORE AND THE MALAY PENINSULA

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ABSTRACT

In Singapore and the Malay Peninsula sooty moulds and black mildews are common. Colonies of these fungi on plant foliage often consist of several species mixed together and each species may produce more than one type of conidia and other fruiting structures. The specimens collected and examined are described and listed under Ascomycetes (17 species) and Fungi Imperfecti (16 species). The most common species were those of Meliola and Microxyphium. A host list is provided.

INTRODUCTION

Sooty moulds and black mildews occur abundantly and prominently on a wide range of plants in this part of the world, where the temperature and humidity are high all the year around. Many are associated with aphids and scale insects, feeding on the honey dew excretions of these insects.

A sooty mould or black mildew colony on a leaf surface often comprises several species of fungi, and each may produce more than one type of conidia and other fruiting structures.
type of conidia and other fruiting bodies. The different species may fruit concurrently or otherwise. Therefore much difficulty arises in relating the conidial state to the correct sexual fruiting state of the same fungus. These factors have contributed considerably to the confusion in the study, identity and nomenclature of this group of fungi.

Much information and knowledge on these fungi occurring elsewhere have been published. These include Stevens (1917); Stevens & Tehon (1926) on species of Meliola and Irene from British Guiana and Trinidad; Mendoza (1932); Fraser (1933, 1934, 1935a, 1935b, 1937) on the sooty moulds of New South Wales; Fisher (1939) on Australian sooty moulds; and Miller & Bonar (1941) on the sooty moulds of California. Studies on the fungus flora of Uganda by Hansford (1937; 1945; 1946a), those on West African Meliolineae by Deighton (1944), and Hansford & Deighton (1948), Hansford's contribution (1946b) on foliicolous ascomycetes and his monograph on Meliolineae (1961) are valuable reference works. From North America, Barr (1955) described several species of sooty moulds. Batista and Ciferri's work on the Chaetothyriales (1962) and their taxonomic revision on the sooty moulds of Asbolisiaceae (1963) are well known. Farr (1969) reported on Dominican sooty moulds and Reynolds (1971) on the use of hyphal morphology in the taxonomy of sooty mould ascomycetes. Some sooty moulds from Indonesia have been described by Boedijn (1931) and Hansford (1954). Occurrences of these fungi in the Malay Peninsula have also been recorded by Thompson & Johnston (1953) and Johnston (1960). To add further to information on this group of interesting fungi occurring in this region, some collections and observations carried out are reported herein.

The specimens examined were grouped under the Ascomycetes or the form class Fungi Imperfecti depending on the presence or absence of the perfect state fruiting structures at the time of collection. It is recognised that those arranged under Fungi Imperfecti may never be associated with a sexual state. Identification of the fungi was based on comparisons with published descriptions. For most of those grouped under Fungi Imperfecti, Batista & Ciferri's (1963) nomenclature and descriptions were closely followed and compared.

In this paper, the fungi are described and presented for convenience in an alphabetical arrangement comprising 17 species under the Ascomycetes and 16 species under the Fungi Imperfecti. The most common ones were found to be species of Meliola and Microxyphium. A host list with localities is compiled for ease of reference.

ASCOMYCETES

   Colonies amphigenous, black; hyphae brown, hyphopodia 1-celled, globose to lobed, sessile, 5–6.5 x 6–7 µm. Thyriothecia of compact radiating hyphae, 90–130 µm diam. Ascospores 2-celled, brown with hyaline band, 11–14.5 X 6.5–9 µm (fig. 1).

2. **ASTERINA LAWSONIAE** P. Henn. & Nym. in Ann. Mycol. 9: 391. 1911.
   Colonies amphigenous, black; hyphae light brown, hyphopodia 1-celled, sessile, lobed 6.5–9.5 x 6.5 µm. Thyriothecia circular, flat, dark brown, 61–109 µm diam. Ascospores 2-celled, pale brown with central, hyaline band, 13–16 X 6.5–7 µm (fig. 2).
   On *Lawsonia inermis* L. (Lythraceae), at Changi, Singapore.

   Colonies epiphyllous, black; hyphae brown, hyphopodia 1-celled, 6.5–8 X 6.5 µm. Thyriothecia dark brown, circular, 53–140 µm diam. Ascospores 2-celled, dark brown, slightly constricted at septum, 16.5–20 X 10 µm.
   On *Trema orientalis* Bl. (Ulmaceae), at Gunong Panti, Johore, Malay Peninsula.

   Colonies epiphyllous, confluent, black; hyphae light brown, hyphopodia 1-celled, sessile, globose to lobed, 6–6.5 X 5–6.5 µm. Thyriothecia arise laterally from hyphae, 54–90 µm diam. Ascospores 2-celled, dark brown, slightly constricted at septum, 16.5–20 X 10 µm.
   On *Dillenia reticulata* King (Dilleniaceae), at Lombong Batu, Johore, Malay Peninsula.

   Colonies amphigenous, black; hyphae brown with black setae; hyphopodia numerous, sub-clavate to globose to lobed, 1-celled, 7–10 X 6.5–7 µm. Hyphal setae erect, black, apex obtuse, 100–250 x 3–6.5 µm at base. Ascostroma stipitate, globose to pyriform, arising laterally from hyphae, 46–57 X 30–52 µm. Ascospores olivaceous brown, 1-septate, 13–19 X 6.5–9.5 µm (fig. 4).
On *Gardenia jasminoides* Ellis (Rubiaceae), at Taman Negara, Pahang, and Fraser's Hill, Pahang, Malay Peninsula.

**Balladyna gardeniae** Rac. is a synonym.


Hyphae brown, of elliptical cells, thick-walled, some of the larger cells constricted slightly at the middle. Ascostroma dark brown, globose, 80—120 µm diam., ostiolate, setae brown, faintly septate. Ascii hyaline, 8-spored. Ascospores 3—4 celled, only immature ones observed (fig. 5).

On *Thunbergia laurifolia* Lindl. (Acanthaceae) and *Bridelia tomentosa* Bl. (Euphorbiaceae), at Cluny Road, Singapore.


Colonies black, hyphae with capitate 2-celled hyphopodia and a few mucronate hyphopodia. Ascostroma dark brown, globose, 160—190 µm diam., setose, setae black, tips dentate, 245—380 X 8—11 µm at base. Ascospores dark brown, 4-septate, constricted at septa, 45—53 X 21—26 µm (fig. 6).

On *Ficus pumila* L. (Moraceae), at Fraser's Hill, Pahang, Malay Peninsula.


Colonies black on upper surface of phyllodes. Hyphae mainly with 2-celled capitate hyphopodia, and very few mucronate hyphopodia. Hyphal setae numerous, dark brown with obtuse tips, septate, thick walled. Ascostroma setose, globose, 115—200 µm diam., non-ostiolate, setae much like hyphal setae. Ascospores brown, 5-celled, constricted at septa, 33—43 X 10—16 µm.

On *Acacia auriculiformis* A. Cunn. (Leguminosae), at University of Singapore campus, Bukit Timah, Singapore.


Colonies dark brown, hyphae with 2-celled capitae and mucronate hyphopodia, and with dark brown setae which are septate, attenuate or dentate. Ascostroma black, globose, 100—225 µm diam., glabrous. Ascospores brown, 4-septate, 38—43 X 16—19 µm, constricted at septa (fig. 7).

On *Citrus aurantifolia* Swingle (Rutaceae), at Kuala Sedili, Johore, Malay Peninsula.

Hyphae setose with 2-celled capitate and mucronate hyphopodia, setae dark brown with dentate tips. Ascostroma glabrous, globose, 195—225 µm diam. Ascospores 4-septate, brown, 41.5—48 X 16—19 µm.

On *Citrus grandis* Osbeck (Rutaceae) and *Symplocos* ep. (Symplocaceae), at Fraser's Hill, Pahang, Malay Peninsula.


Colonies brown, hyphae with 2-celled capitate and mucronate hyphopodia, hyphal setae black. Ascostroma globose, 80—180 µm diam. Ascospores 4-septate, 43—53 x 19—22 µm, constricted at septa (fig. 8).

On *Vitis* sp. (Vitaceae), at Fraser's Hill, Pahang, Malay Peninsula.


Colonies black, hyphae with 2-celled capitate and mucronate hyphopodia, numerous black hyphal setae with acute tips. Ascostroma glabrous, slightly pyriform, 140—180 X 140—170 µm. Ascospores brown, 4-septate, 42—54 X 14.5—19 µm, constricted at septa (fig. 9).

On *Macaranga heynei* Johnston (Euphorbiaceae), at Lombong Batu, Johore, Malay Peninsula.


Colonies brown, hyphae with 2-celled, capitate and mucronate hyphopodia, setose. Hyphal setae septate with obtuse tips. Ascostroma globose, 125—180 µm diam. Ascospores 4-septate, pale brown, 34—38 X 13 µm, constricted at septa (fig. 10).

On *Ipomoea carica* (L.) Sweet (Convolvulaceae), at Fraser's Hill, Pahang, Malay Peninsula.

14. **MELIOLA RIZALENSIS Syd. var. VITICIS (Hansf.) Hansf. & Deighton in C.M.I. Mycol. Pap. 23: 70. 1948.**

Colonies black, hyphae with 2-celled capitate hyphopodia and a few mucronate hyphopodia. Hyphal setae numerous, especially at the base of ascostroma, thick-walled, dark brown, septate with obtuse or slightly dentate tips. Ascostroma glabrous, globose, 80—160 µm diam., black. Ascospores pale brown, 4-septate, 29—40 X 11—14 µm, constricted at septa (fig. 11).

Fig. 10. *Meliola malacotricha* with hyphopodiate hyphae, setae with obtuse tips and ascostroma. 11. *Meliola rizalensis* with hyphopodiate hyphae, 4-septate ascospores and ascostroma. 12. *Meliola salaciae* with hyphopodiate hyphae, 4-septate ascospores, black seta and young ascostroma. 13. *Meliola themedae* with 4-septate ascospores and setae with dentate tips. 14. *Antennariella elegans* with hyphae, ostiolate pycnidia and pycnidiospores. 15. *Microxyphiella commista* with hyphae, pycnidia and 1-septate pycnidiospores.


Colonies black, hyphae setose, with 2-celled capitate and mucronate hyphopodia. Ascostroma globose, 56—100 µm diam. Ascospores 4-septate, constricted at septa, 36—43 X 13—16 µm (fig. 12).

On Citrus Union Burm. f. (Rutaceae), at Taman Negara, Pahang, Malay Peninsula.


Colonies black, hyphae with 2-celled capitate and mucronate hyphopodia. Hyphal setae short, numerous, light brown to black, with deeply dentate tips. Ascostroma glabrous, globose, 130—210 µm diam., brown to black. Ascospores light brown, 4-septate, 48—55 X 16—19 µm, constricted at septa (fig. 13).

On Themeda villosa Durand & Jackson (Gramineae), at Fraser’s Hill, Pahang, Malay Peninsula.

17. PHAEOCHAETIA SETOSA (Zimm.) Bat. & Cif. in Sydowia, Beiheft 3: 75. 1962.

Colonies black, pellicose; hyphae brown, slightly constricted at septa, exhyphopodi. Ascostroma setose, brown to dark brown, globose to elongate, seated on slightly raised hyphal base, 75—90 X 66—85 µm, setae on upper half of ascostroma stiff, septate to non-septate with obtuse ends, 5—6.5 µm wide at base. Ascospores hyaline 4—5 celled, with slight constrictions at septa, 16.5—20 X 5 µm.

On Acacia auriculiformis A. Cunn. (Leguminosae), associated with scale insects, at University of Singapore campus, Bukit Timah, Singapore. Also found on leaves of Murraya paniculata Jack (Rutaceae), Tabernaemontana divaricata R. Br. ex Bl. (Apocynaceae) and Coffea arabica L. (Rubiaceae), in Singapore.

Fungi Imperfecti

1. ANTENNARIELLA ELEGANS Bat. & Cif. in Quaderno 31: 28. 1963 (perfect state Capnodium elegans Fraser).

Hyphae epiphyllous, pycnidia brown, almost globose, 42—70 X 35—56 µm, ostiolate. Pycnidiospores hyaline, ovoid, 3 x 1.5 µm (fig. 14).

On Eugenia javanica Lam. (Myrtaceae), at Changi, Singapore.

Black colonies, forming encrustations on both surfaces of leaves. Hyphae light brown. Pycnidia abundant with upper and lower expanded portions joined by short narrower stipe. Upper end fimbriated and hyaline, lower portion brown. 95—210 X 22—58 µm wide at base and 22—35 µm at upper expanded portion, and 13—16 µm at stipe. Pycnidiospores hyaline, 1-septate, 6—8 X 3µm (fig. 15).

On *Nerium oleander* L. (Apocynaceae), at Kranji, Singapore. Associated with *Tripospermum myrti*.


Hyphae forming black encrustations which become flaky when dry. Pycnidia abundant, brownish-black, flask-shaped, occasionally branched, ostiole fimbriate, 210—420 X 22—35 µm wide at base and 8—13 µm wide at neck regions. Pycnidiospores bacillar, hyaline, about 4x1.5 µm (fig. 16).

On *Lantana camara* L. (Verbenaceae), associated with red ants, at University of Singapore campus, Bukit Timah, Singapore. Associated with *Podoxyphium ampullaceum*.


Hyphae in greyish patches on leaf surface. Hyphal cells oblong-cylindrical. Pycnidia abundant, pale to dark brown with hyaline fimbriae at ostiole, flask-shaped, 220—335 x 19—42 µm wide at base and 9.5—42 µm wide at tip. Pycnidiospores hyaline, bacillar 3—5 X 1.5 µm (fig. 17).

On *Eugenia javanica* Lam. (Myrtaceae), at Changi, Singapore. Pound associated with *Antennariella elegans*.

5. MICROXYPHIELLUM CESATII Bat. & Cif. *in Quaderno* 31: 120. 1963 (perfect state *Capnodium cesatii* Mont.).

Hyphae exhypophodiate. Pycnidia dark brown to black, cylindrical, 290—520 X 13—26 µm wide at base and 8—11 µm wide at tip. Pycnidiospores hyaline, 6 X 1.5 µm (fig. 18).

On *Aglaia odoratissima* Bl. (Meliaceae), at Fraser’s Hill, Pahang, Malay Peninsula. Associated with *Microxyphium coffeanum*.


Hyphae epiphyllous, pycnidia flask-shaped, brown, 140—300 X 13—26 µm wide at base and 6 µm wide at tip. Pycnidiospores hyaline, 3 X 1.5 µm (fig. 19).


Epiphyllous colonies. Pycnidia abundant, dark brown, ovoid to cylindrical 85—145 X 17.5—30 µm. Pycnidiospores 4 X 1.5-µm (fig. 20).

On *Plumeria rubra* L. (Apocynaceae), associated with scale insects, at Lornie Road, Singapore. Associated with *M. leptospermi* and *Tripospermum acerinum*.

8. MICROXYPHIELLUM LEPTOSPERMI Fischer *in Quaderno* 31: 133. 1963.

Hyphae forming thick mat on upper leaf surface and extending to petiole. Hyphal cells bead-like. Pycnidia abundant, brown, flask-shaped and sometimes fimbriate at ostiole, 280—450 X 26—42 µm at base, and 6.5—13 µm at tip. Pycnidiospores elliptic and hyaline, 5 X 1.5 µm (fig. 21).

On *Plumeria rubra* L. (Apocynaceae), at Lornie Road, Singapore. Associated with *M. columnatum*.


Hyphae forming black encrustations on upper leaf surface. Hyphal cells constricted at septa. Pycnidia in clusters, brown to black, some branching into two, 450—560 X 50—65 µm at widest part and 9.5—13 µm at tip. Pycnidiospores ovoid, hyaline, 4—5 X 1.5 µm (fig. 22).

On *Gardenia jasminoides* Ellis (Rubiaceae), at University of Singapore campus, Bukit Timah, Singapore.


Hyphae forming brown encrustations, constricted at septa. Pycnidia solitary or gregarious with definite hyphal base, dark brown to black, 280—520 X 22—32 µm wide at base and 6.5—11 µm wide at tip. Pycnidiospores ovoid, hyaline, 2 X 1 µm (fig. 23).

On *Memecylon acuminatum* Sm. (Melastomaceae), at Nee Soon, Singapore.


Colonies in thin, black patches. Hyphae beaded in appearance. Pycnidia non-fimbriate, 170—220 X 17.5—22 µm wide at base and 6.5—13 µm at apex. No pycnidiospores observed (fig. 24).

On *Diospyros scortechinii* King (Ebenaceae), at Fraser’s Hill, Pahang, Malay Peninsula.

Hyphae forming black encrustations on upper leaf surface. Hyphal cells globose to oblong. Pycnidia occasionally branched with inflated apex and fimbriate ostiole, dark brown to black in neck region, lighter colour in inflated region, 360—570 x 22—30 µm diam. in inflated area, 19—36 µm at base. Pycnidiospores hyaline, bacillar, 2—3 X 1.5 µm (fig. 25).

On *Eugenia polyantha* Wight (Myrtaceae), *Gardenia jasminoides*, *Lantana camara* and *Thunbergia laurifolia*, at University of Singapore campus, Bukit Timah, and Cluny Road, Singapore.


Hyphae light brown. Pycnidia abundant with narrow black stipe and light brown inflated apex, 210—360 X 13—16 µm wide at stipe region and 19—33 µm wide at inflated region. No pycnidiospores observed (fig. 26).

On *Stenolobium stans* Seem. (Bignoniaceae), at Fraser’s Hill, Pahang, Malay Peninsula.


Hyphae forming brown encrustations on upper leaf surface. Conidia 4-armed, pyriform stalk cell, arms pale brown, hyaline at apex, 20—50 x 6.5—9.5 µm wide at base, up to 7-septate. Two arms and stalk cell attached to one cell, while other two arms attached to another cell laterally to the first (fig. 27).

On *Coffea arabica* L. (Rubiaceae), *Achras zapota*, *Cinnamomum iners* and *Plumeria rubra*, at Fraser’s Hill, Pahang, Malay Peninsula; Upper Serangoon, Singapore; University of Singapore campus, Bukit Timah; and Lornie Road, Singapore, respectively. Associated with *T. gardneri* on *C. arabica* leaves.


Light brown hyphae and conidia. Latter with 3 to 4 arms, faintly septate and with obtuse tips, 45—83 x 9 µm wide at base (fig. 28).

On *Coffea arabica* L. (Rubiaceae), at Fraser’s Hill, Pahang, Malay Peninsula. Associated with *T. acerinum*.

Colonies black on upper surface of leaves. Hyphae brown, conidia subhyaline with stalk cell, 6.5—7 x 3—4 μm, 4 arms, each up to 4-septate, 17—26 x 3—4 μm wide at base (fig. 29).

On Citrus grandis Osbeck (Eutaceae) and Nerium oleander, associated with scale insects, at Kranji, Singapore.

**HOST LIST**

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<th>Locality</th>
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**LIM: Malayan sooty moulds**

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<td>Vitis sp.</td>
<td>Meliola fucata</td>
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REFERENCES


