

Armatellaceae, a new family segregated from the Meliolaceae

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The new family Armatellaceae is proposed to accommodate meliolaceous fungi having one to two septate ascospores and devoid of phialides. The genus *Armatella* is the type genus of the family.

Keywords: Meliolales, Armatellaceae, new family, taxonomy.

The genus *Meliola* and related genera of meliolaceous fungi are also known as black or dark mildews. These fungi grow well in the tropics, although their distribution is extended to sub-temperate to temperate regions of the world. As these fungi are no important pathogens on any crop plants producing staple food, much attention has not been paid to this group. Physiologically, these fungi increase leaf temperature in the areas infected by the black colonies, thereby increasing the rate of respiration and transpiration and reducing the efficiency of photosynthesis (Hosagoudar & al. 1997; Schmiedeknecht, 1970). Wellman (1972) stated that “nowhere are these black mildews being made a subject of major pathological study, although agriculturists who observe their crops well, know that at times these fungi are very damaging in their effects.”

Taxonomy

The genus *Meliola* was proposed by Fries (1825) and the description was emended by Bornet (1851). Gaillard (1892) was the first to give an account of 111 species of this genus. Arnaud (1918) doubted the typification of this genus. Toro (1952) proposed *M. trichostroma* (Kunze) Toro as its type. Hansford (1961) accepted Toro's view but now *M. psidii* Fries is the conserved name and is the type species of the genus *Meliola* (Crane & Jones, 2001).

Theissen (1913) proposed the genus *Amazonia* with the characters “mycelium superficial, hyphopodiate, *Meliola* like; perithecium radial, shield formed, circular, inverse; asci clavate, para-

physate, 2-spored; spores 5-celled". The type is *A. asterinoides* (Wint.) Theissen. Because of its radial, circular perithecia, this genus was placed in the family Microthyriaceae. Hoehnel (1918) showed the existence of thin-walled, completely closed perithecia under the brown shield of mycelia and hence this genus is now included in the family Meliolaceae.

Theissen & Sydow (1915) described a new genus, *Armatella*, based on *Dimerosporium litseae* P. Henn. with the type species, *A. litseae* (P. Henn.) Theissen & Sydow and they placed it in the family Polystigmellaceae, Dothideales. They described *Armatella* as having ectophytic and appressoriate mycelium, lacking phialides, having 4–8 spored asci and one septate and brown ascospores that often remain aseptate in immature condition. Hansford (1946), after re-examination of the type, transferred it to the family Meliolaceae.

After the re-examination of the materials, Hansford (1946) included this genus in the Meliolaceae. The original description of the genus *Armatella* is: "mycelium superficiale, ramosum, septatum, hyphopodiatum. Stromata superficialia, ex hyphostromate epidermali extenso oriunda, radiatocontexta, punctis pluribus affixa, unilocularia (as seper?). Asci paraphysati, octospori. Sporae didymae hyalinae".

Some species included by Theissen & Sydow (1917) in the genus *Irene* have a peculiar larviform perithecial appendages. To accommodate such species, Hoehnel (1919) proposed a new genus, *Appendiculella* with the type *A. calostroma* (Desm.) Hoehnel.

Stevens (1927, 1928) made a monographic study of the group Meliolineae and used the Beeli formula. He included the genera *Actinodothis* Sydow & Sydow, *Amazonia* Theissen, *Irene* Stevens, *Meliola* Fries and *Meliolina* Sydow & Sydow along with his newly proposed genera *Irenina* and *Irenopsis* in the Meliolaceae. The genus *Irenopsis* was proposed to accommodate the species of the genus *Irene* having perithecial setae, with the type *I. tortuosa* (Wint.) Stevens. The genus *Irenina* was proposed to accommodate the species of the genus *Irene* having no mycelial setae, no perithecial setae and no larviform appendages with the type *Irenina glabra* (Berk. & Curt.) Stevens. He treated the genus *Meliolaster* Doidge as synonymous to *Amazonia* Theissen, while he considered *Actinodothis* Sydow & Sydow to be distinct from *Amazonia*, having dimidiate perithecia with no free mycelium. His monograph comprised about 700 species and excluded 45 species.

Hansford (1961) rediscovered McAlpine's (1897) genus *Asteridiella* which was established with the characters "superficial and hyphopodiate mycelia, absence of perithecial and mycelial setae and lack of perithecial appendages with globose perithecia". Obviously, the true *Irene* Theissen & Sydow corresponds to this genus. Hence, McAlpine's (1897) genus *Asteridiella* antedates *Irene*.

Hansford (1961) published an up-to-date monograph of this group by including the 5 genera *Amazonia*, *Appendiculella*, *Asteridiella*, *Irenopsis* and *Meliola* with 1814 species and excluded 47 species. He considered the genera *Meliolaster* Doidge and *Actinodochis* Sydow & Sydow synonymous to the genus *Amazonia*; the genus *Irene sensu* Stevens (1927) became synonymous to *Appendiculella* Hoehnel. The genera *Irene* Theissen & Sydow, *Irenina* Stevens were considered synonymous to *Asteridiella* McAlpine. *Meliola* Fries, *Amphitrichum* Nees ex Spreng., *Sphaeria* Fries, *Myxothecium* Kunze ex Fries, *Couturea* Cast. and *Asteridium* Sacc. were included in the genus *Meliola* Fries *emend.* Bornet.

Later, Hansford (1963a) validated 47 species included in his monograph by providing Latin diagnoses; he described *Asteridiella cupaniae* Hansf., *Meliola symphorematis* Petrak var. *major* Hansf., provided a new name, *Meliola ichnocarpi-volubili* Hansf., for *M. ichnocarpi* Stevens & Rold. and added *Asteridiella fidalis* (Toro) Hansf. to the Monograph. He also corrected 8 taxa by making them either synonyms or new combinations; *Amazonia corozalensis* Batista & Nascimento was rejected from this group. Hansford (1963b) also supplemented his work by providing line drawings of the taxa dealt with in his monograph. Later, Deighton (1968) made nomenclatural corrections for some species included in Hansford's (1961) monograph and Stevenson (1968) supplied a host index to Hansford's monograph. Katumoto & Hosagoudar (1989) added a list of 169 taxa to Hansford's monograph with 5 doubtful ones, and also gave host and species indices.

Gordon & Shaw (1960) proposed a new genus *Diporothea* for a fungus found on the roots of *Solanum tuberosum* from Washington, U.S.A. This genus has been accommodated in a separate family, *Diporotheaceae* (Mibey & Hawksworth, 1995).

Some species having perithecial appendages and setae were accommodated in the genus *Prataprajella* Hosagoudar (Hosagoudar, 1992). Certain species with stromatic perithecia were included in the genus *Pauahia* Stevens (Stevens, 1925). This genus was studied by Hughes (1995) and placed in the family Meliolaceae.

The genus *Cryptomeliola* Hughes & Pirozynski was proposed by Hughes & Pirozynski in Mibey & Hawksworth (1997) to accommodate *Meliola orbicularis* Berkeley & Curtis. A subsequent study of the genus by Mibey & Cannon (1999) revealed that this is devoid of appressoria. Hence it cannot be included in the order Meliolales. Another interesting endophytic member of the group, *Endomeliola* Hughes & Pirozynski was proposed by Hughes & Pirozynski (1994) with the type, *E. dingleyae* Hughes & Pirozynski.

Two groups of meliolaceous fungi are now known. One group possesses 1-septate ascospores and is devoid of phialides, the other

group is characterised by 3–4-septate ascospores and produces phialides. This distinctiveness is very much evidenced in the works of Hansford (1961) and Hosagoudar (1996). The first group includes the single genus *Armatella*, while the second group includes the genera *Amazonia*, *Appendiculella*, *Asteridiella*, *Endomeliola*, *Irenopsis*, *Meliola*, *Pauahia* and *Prataprajella*. It seems appropriate to segregate these two groups at the family level and to retain both families in the order Meliolales.

Order Meliolales

Meliolales Gäumann ex Hawksworth & O. Eriksson. *Systema Ascomycetum* 5: 142, 1986.

Parasites on vascular plants, mycelium mostly superficial, appressoriolate, phialidic. – Ascomata flattened, globose to subglobose, \pm ostiolate; asci unitunicate, 2–8-spored, clavate to cylindrical, evanescent; ascospores, 1–4-septate, brown at maturity.

Type family: Meliolaceae

Key to the families of the order Meliolales

1. Hyphae with phialides; asci clavate, ascospores 3-4 septate
..... Meliolaceae
- 1*. Hyphae without phialides; asci cylindrical to subcylindrical, ascospores 1-septate Armatellaceae

Armatellaceae V.B. Hosagoudar, **fam. nov.**

Perithecia in myceliis superficialibus insita, globosa, verrucosa; asci unitunicati, 4–8 spori; ascospores 1-septatae, brunneae. Species foliicolae, parasiticae, ectophyticae; mycelia appressoriata, phialides nullae. Setae myceliales nullae.

Perithecia on superficial hyphae, globose, verrucose. – Asci 4–8 spored. Ascospores 1-septate, brown at maturity. – Leaf parasites, ectophytes, mycelium with appressoria, phialides absent, mycelial setae absent.

Type genus: *Armatella* Theissen & Sydow

This monogeneric family includes only the genus *Armatella* with 16 species (Hosagoudar & Abraham, 2001).

Meliolaceae Martin ex Hansf., *Mycol. Pap.* 15: 23, 1946.

Parasitic on vascular plants, mycelium mostly superficial, appressoriolate, phialidic. – Ascomata flattened-globose to glo-

bose, \pm ostiolate, peridium with conoid cells, larviform and striated appendages, or with repent or strong setae. – Asci unitunicate, 2–4-spored, clavate to cylindrical, evanescent. – Ascospores 3–4-septate, brown at maturity.

Type genus: *Meliola* Fries

The family Meliolaceae is unique in including genera having ectophytic mycelium with lateral appressoria and phialides. Generic delimitation is based on the setae and appendages. The asci are two spored and ascospores 3–4-septate. Hansford (1961) included the genera *Amazonia*, *Asteridiella*, *Appendiculella*, *Irenopsis* and *Meliola* in the family. Subsequently, *Endomeliola*, *Pauahia* and *Prataprajella* were added (Hosagoudar, 1992; Hu & al. 1996, 1999; Hughes, 1995; Hughes & Pirozynski, 1994).

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