Notes on *Microdochium* and *Idriella*

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Abstract. — *Microdochium phragmitis* Sydow, the type species of the genus, and *Microdochium tripsaci* D. Mulder & v. Arx, spec. nov. are described from pure cultures. The remaining species of *Microdochium* and the species of *Idriella* are discussed, and the two genera are delimited.

The genus *Microdochium* was introduced by Sydow (1924) for a fungus observed on living, discoloured leaves of *Phragmites australis* and described as *Microdochium phragmitis* Sydow. The diagnosis was accompanied by a camera lucida drawing of the conidiogenous structures. Sutton et al. (1972) described and depicted the type specimen again and described three new species collected in tropical Africa, which however will have to be excluded. Two of these had been collected on litter (dead leaves) in Tanzania, while the third, *M. phyllanthi* Sutton et al., was collected in Sierra Leone. It causes lesions on leaves of the euphorbiaceous *Phyllanthus discoideus* and has reniform, at both ends rostrate conidia, rather similar to those of *Arxiella terrestris* Papendorf. The conidiogenous cells also are similar.

Two saprophytic species found in culture were described by Mouchacca & Samson (1973). De Hoog & Hermanides-Nijhof (1977) added three apparently saprophytic species, hitherto classified in *Aureobasidium*, *Humicola* and *Rhinocladiella*, respectively.

In this paper, *M. phragmitis*, *M. cf. intermedium* and *M. tripsaci* are described from pure culture. The other species of *Microdochium* are discussed and partly classified in *Idriella*. The genera *Microdochium* and *Idriella* are delimited, and the species of the latter genus are enumerated. A key to all treated species is given.

1. *Microdochium phragmitis* Sydow — Fig. 1, 2

The following description is based on CBS 285.71, isolated by W. Gams from *Phragmitis australis*, collected in the Bialowieża National Park (Poland) in 1971.

Colonies on malt agar with a daily growth rate at 24° C of 1.8—2 mm, velvety-floccose, white, reverse light orange; hyphae hyaline, septate, regularly branched, 2—4 µm broad; conidiogenous cells lateral on aerial hyphae, erect, cylindrical or slightly tapering, occasionally septate, 12—30×2—3.5 µm, forming apical conidia in

small sympodulae on often indistinct, 0.3—0.5 μm long and 0.7—1 μm broad denticles; conidia clavate or fusiform, apically attenuated and rounded, with an unthickened, 0.7—1 μm broad scar at the attenuated base, 1-celled or 1-septate, hyaline, 14—22×2—3 μm (Fig. 1).

No sporodochia are found in pure culture, but the conidiogenous cells may be aggregated in small clusters. The conidia are slightly smaller than those of the type specimen on the natural substrate, which measure 16—28×2.5—3.5 μm (SYDOW, Mycotheca germanica No. 2250).

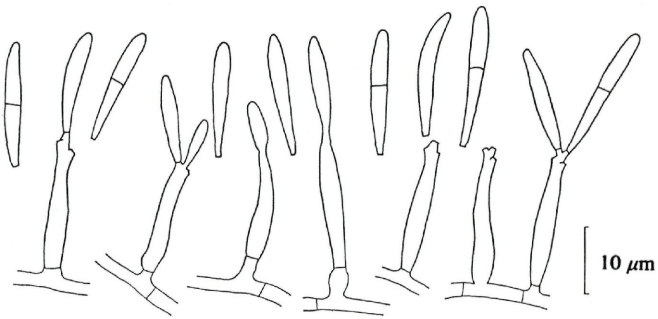

Fig. 1. *Microdochium phragmitis*: conidiogenous structures and conidia (from CBS 285.71)

A second culture, CBS 423.78, isolated by P. REINECKE from *Phragmites australis* collected near Nijkerk, the Netherlands, differs in several respects. The colonies show a daily growth rate of about 2.5 mm, are floccose, white, sometimes with dark patches; the conidiogenous cells are usually aggregated in sporodochial tufts, are flask-shaped and show an apparently sympodial elongation but no distinct denticles. The conidia are fusiform or slightly clavate, often falcate, have a truncate base, usually remain 1-celled, are subhyaline,

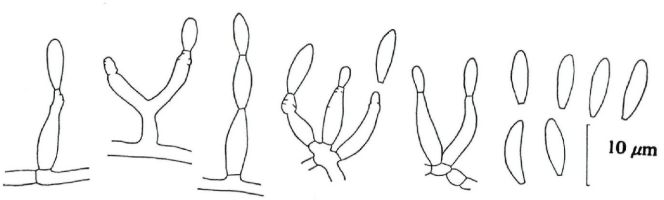

Fig. 2. *Microdochium* cf. *intermedium*: conidiogenous structures and conidia (from CBS 423.78)

rather thick-walled and measure 8—15 × 3—4.5 µm (Fig. 2). In older cultures slightly larger and 1-septate conidia have been observed.

This strain differs from *M. phragmitis* by the often partly pigmented colonies and by much shorter though broader conidia. It may be close or identical to *Rhinocladiella intermedia* MATSUSHIMA (1971) [= *Microdochium intermedium* (MATSUSHIMA) de HOOG (1977)], a species no longer available in pure culture. It may be maintained in *Microdochium*, but also shows some similarities to *Scopulariopsis*.

2. *Microdochium tripsaci* D. MULDER & v. ARX, spec. nov. — Fig. 3

Coloniae in agaro maltoso 25° C in dies 0.5—0.7 mm crescunt, albae, tomentosae, subinde saepe partim grisescentes, margine irregulari limitatae; hyphae ramosae, septatae, 1.5—5 µm latae; cellulae conidiogenae laterales ex hyphis aeriis oriundae, erectae vel suberectae, simplices, 30—120 µm longae, 1.5—2.5 µm latae, conidia capitata ad apicem paulo sympodialiter elongatum e denticulis (vel cicatricibus) brevibus, ca. 1 µm latis oriunda; conidia vermiformia ad subulata cel obclavata, apicem versus rostrata et curvata, hyalina, unicellularia, 18—25 × 1.2—1.8 µm.

Typus CBS 857.72, isolatus e foliis viventibus Tripsaci laxi collectis in Zeylania 1972, MULDER.

Colonies on malt agar at 25° C with a daily growth rate of 0.5—0.7 mm, white, tomentose, in age often with some greyish patches and with an irregular margin; hyphae branched, septate, 1.5—5 µm broad; conidiogenous cells lateral on aerial hyphae, erect or suberect, unbranched, 30—120 µm long, 1.5—2.5 µm broad, apically forming

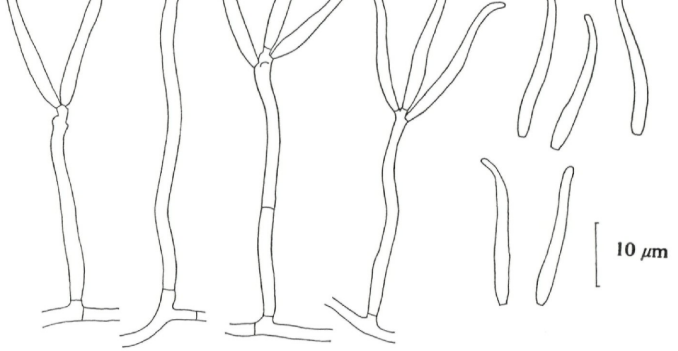

Fig. 3. *Microdochium tripsaci*: conidiogenous structures and conidia (from CBS 857.72)

conidia in short sympodulae on short, about 1 µm broad denticles (or scars); conidia in apical clusters, vermiform-subulate or obclavate, apically rostrate and curved, hyaline, 1-celled, 18—25×1.2—1.8 µm (Fig. 3).

The description is based on CBS 857.72, isolated by D. MULDER (Wageningen) from living leaves of Guatemala Grass (*Tripsacum laxum* NASH) collected in Sri Lanka and cultivated in a greenhouse. The grass was introduced in Sri Lanka in 1926 as a fodder crop and is also used as a "cover crop" in young plantations of the teaplant in mountain areas. The *Microdochium* disease was mainly observed at altitudes of about 2000 m. The fungus is perennial and was observed only on the lower part of sheathed leaves. In the host plant the fungus grows intercellularly and the conidiogenous structures emerge through the stomata. The attacked leaves show chlorotic discolouration, are stiff, erect and often show some deformation (MULDER, 1963).

3. *Microdochium sclerotiorum* and *Microdochium gracile*

Two further species described in *Microdochium* are *M. sclerotiorum* MOUCHACCA & SAMSON and *M. gracile* MOUCHACCA & SAMSON (1973). The first was received as a culture contaminant, the second was isolated from dung. Both form restricted, light colonies, the conidiogenous cells are rather broad, occasionally branched and the rhachis shows numerous, distinct denticles. The conidia are allantoid, filiform or fusiform and less than 1 µm broad. Both species may be retained in the genus as somewhat atypical representatives. The conidiogenous cells and the conidia resemble those of the genus *Selenosporella* ARNAUD ex MACGARVIE (1968). The species may represent cultural states of *Selenosporella*, which is characterized by erect, dark conidiophores with verticallately arranged conidiogenous cells. Species of this genus are only known from the natural habitat.

4. Comparison of *Microdochium* and *Idriella*

The close affinity of the genera *Microdochium* SYDOW and *Idriella* NELSON & WILHELM (1956) has been discussed by SUTTON et al. (1972) and by MOUCHACCA & SAMSON (1973). Comparison was difficult, because the species of *Microdochium* were only known from the host plant, whereas *Idriella* was mainly known from cultures. All species of the latter genus are soil-borne or have been collected on litter (plant debris). The genus has also been characterized by two types of spores: elongate, falcate or lunate, 1- or 2-celled blastoconidia formed in sympodulae, and dark, thick-walled chlamydospores, which may be 1-, 2- or 3-celled and occasionally form irregular chains of swollen cells (form genera *Humicola*, *Mycogone* and *Trichocladium*). Therefore the colonies of *Idriella* species are usually dematiaceous, whereas those of

Microthecium species are mucedinaceous and usually white. In *Idriella*, the conidiogenous cells are often formed on erect, septate, pigmented conidiophores and may be integrated or discrete (MATSUSHIMA 1971, 1975; MORGAN-JONES, 1979). The falcate or lunate conidia have narrower bases than those of typical *Microdochium* species, the denticles of the conidiogenous cells therefore usually being indistinct or small and narrow.

The two genera can be distinguished by the characters given in table 1.

Table 1. Distinguishing characters of *Microdochium* and *Idriella*

	Microdochium	*Idriella*
habitat	parasitic on plants	soil-borne or on litter
colonies	white or light	dark, dematiaceous
chlamydospores	absent	present, occasionally absent
sporodochia	present or absent	absent, occasionally present
erect conidiophores	absent	occasionally present, pigmented
conidiogenous cells	hyaline, denticulate	hyaline or pigmented, denticulate or apically nodose
conidia	narrow clavate, obclavate, fusiform or filiform	falcate or lunate

The two genera can be distinguished easily by the shape of the conidia and by the habitat. The formation of chlamydospores, the pigmentation of the conidiogenous cells and the presence or absence of denticles should not be used as distinguishing characters.

5. The species of the genus *Idriella* — Fig. 4, a—d

Within the genus *Idriella*, two groups of species can be distinguished, one with conidia usually shorter than 20 µm and one with longer, often 2-celled conidia.

In the taxa with short, lunate conidia, elongation of conidiogenous cells is often not sympodial, but the cells becoming nodose (calcariform sensu MATSUSHIMA, 1975) with indistinct or small denticles. *I. couratarii* RAM (1970) and *I. desertorum* NICOT & MOUCHACCA (1972) have an elongating, denticulate rhachis. The latter species has ochraceous colonies, *Humicola*—like chlamydospores and the conidiogenous cells develop on creeping hyphae. *I. couratarii* has blackish colonies, forms chains of dark, swollen cells and the pigmented conidiogenous cells develop discrete on erect conidiophores or on the creeping hyphae, but often are also intercalary, with a short, lateral rhachis.

I. lunata NELSON & WILHELM (1956), the type species of the genus, is characterized by 2- to 3-celled, dark chlamydospores of the

form genus *Trichocladium* (Fig. 4a). The conidiogenous cells slightly swell apically and usually show no or only indistinct denticles. *I. tainanensis* (WATANABE) v. ARX (1981) [= *Humicola tainanensis* WATANABE] differs by hyaline conidiogenous cells and by 1-celled, sphaerical or broadly clavate chlamydospores of the form genus *Humicola*.

I. variabilis MATSUSHIMA (1971) and *I. bolleyi* (SPRAGUE) v. ARX (1981) do not form typical chlamydospores, but hyphal cells become

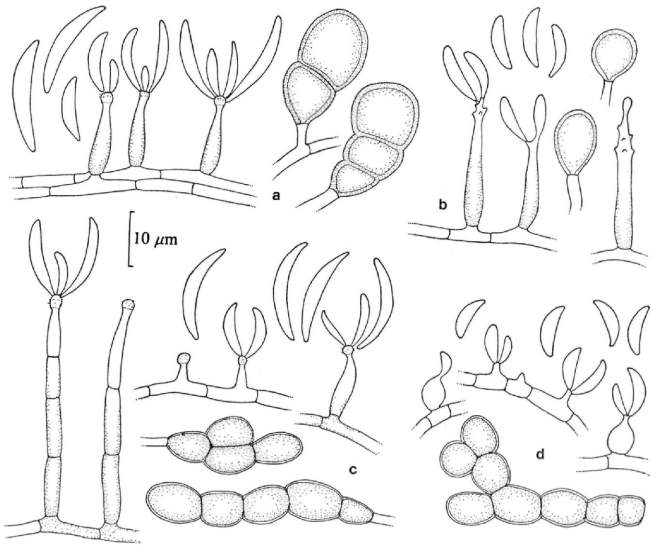

Fig. 4. a. *Idriella lunata*. — b. *Idriella desertorum* (CBS 985.72). — c. *Idriella variabilis*. — d. *Idriella bolleyi* (CBS 137.64): conidiogenous structures, conidia and chlamydospores

swollen, thick-walled, pigmented and are often aggregated in dark strands or complexes. In the first-mentoined species the conidiogenous cells are variable. Intercalary hyphal cells may form conidia on lateral pegs. Other conidiogenous cells develop directly on the hyphae or are integrated on erect, septate, dark conidiophores (Fig. 4c). *I. tropicalis* LUNGHINI & RAMBELLI (1978) also forms dark, erect conidiophores and integrated, lateral or intercalar conidiogenous cells with an apical swelling and is similar to *I. variabilis*.

I. vandalurensis VITTAL (1970) is only distinguishable from *I. variabilis* by the 2-celled conidia. No material of this species could

be studied. In *I. variabilis* and *I. lunata* the conidia are 1-celled and measure 11—20×1.5—2.5 µm.

I. bolleyi is rather similar to *I. variabilis*, but no conidiophores are formed and the smaller, 6—10×1.5—2.5 µm conidia more often develop on lateral pegs of hyaline hyphal cells. Lateral, ampulliform conidiogenous cells are usually also present, forming apical conidia without distinct denticles or swellings (Fig. 4d). De Hoog & Hermanides-Nijhof (1977) classified this species in the genus *Microdochium*.

Among the species with conidia usually longer than 20 µm, *I. mycogonoidea* Matsushima (1971) has denticulate conidiogenous cells and includes a state with unequally 2-celled, *Mycogone*-like chlamydospores. All other species do not develop characteristic chlamydospores, but often form dark, swollen, thick-walled hyphal cells. The species *I. bambusae* Morgan-Jones (1979), *I. angustispora* Morgan-Jones, *I. caespitosa* (Sutton et al.) v. Arx, comb. nov. and *I. grisea* (Sutton et al.) v. Arx, comb. nov. (basionyms: *Microdochium caespitosum* Sutton et al. and *Microdochium griseum* Sutton et al. — Can. J. Bot. **50**: 1904. 1972) are close to each other and mainly distinguished by the conidiogenous structures. *I. angustispora* forms distinct conidiophores and the conidiogenous cells are apically swollen but not denticulate. I. *falcata* (Sutton & Hodges) v. Arx, comb. nov. (basionym: *Microdochium falcatum* Sutton & Hodges — Nova Hedwigia **27**: 217. 1976) also has apically nodose conidiogenous cells. In the three other species the conidiogenous cells are denticulate and not nodose.

Kimbrough & Atkinson (1972) received in cultures of the discomycete *Hymenoscyphus caudatus* (Karsten) Dennis an *Idriella* anamorph forming sporodochia which may be close to I. *bambusae*; *I. couratarii* differs by broader conidia.

I. ramosa Matsushima (1971) differs from other species by erect, branched conidiophores, reminiscent to those of *Selenosporella*, and by 0- to 3-septate, 26—44×2—3 µm conidia.

6. Key to the species of *Microdochium* and *Idriella*

1. Colonies white or yellowish, in age occasionally partly pigmented; conidia cylindrical-clavate, obclavate-rostrate of filiform, with a truncate base; chlamydospores absent (*Microdochium*) 2
1*. Colonies pigmented; conidia lunate or falcate, with an attenuated base, chlamydospores or dark, swollen cells usually present (*Idriella*) 6
2. Conidia obclavate-rostrate, 18—25×1.2—1.8 µm .. *M. tripsaci*
2*. Conidia clavate, filiform or fusiform 3

3. Conidia cylindrical-clavate or indistinct fusiform 4
3*. Conidia filiform or narrow fusiform, less than 1 μm broad ... 5
4. Conidia 14—22(—30)×2—3 μm, 0- to 1-septate .. *M. phragmitis*
4*. Conidia 8—15×3—4.5 μm, rather thick-walled . *M. intermedium*
5. Conidia 11—17×0.4—0.8 μm ..... *M. gracile*
5*. Conidia 5—11×0.5—1.0 μm ..... *M. sclerotiorum*
6. Chlamydospores of the form genera *Humicola, Mycogone* or *Trichocladium* present, conidiophores absent 7
6*. Typical chlamydospores absent; dark, swollen hyphal cells usually present; conidiophores present or absent 10
7. Conidiogenous cells hyaline, flask-shaped, clustered; chlamydospores 1-celled..... *I. tainanensis*
7*. Conidiogenous cells usually at least at base pigmented and not in clusters 8
8. Chlamydospores 1- (to-2) celled, conidiogenous cells sympodially elongating, with distinct denticles, conidia 6—13×1.7—3 μm, apically attenuated and rounded ..... *I. desertorum*
8*. Above characters not combined, conidia lunate 9
9. Chlamydospores unequally 2-celled, conidia 20—28×2—2.5 μm ..... *I. mycogonoidea*
9*. Chlamydospores 2- to 3-celled, conidia 10—20×2.5—4 μm.. ..... *I. lunata*
10. Conidiogenous cells ampulliform, hyaline, conidia 6—10×1.5—2.5 μm..... *I. bolleyii*
10*. Conidiogenous cells not ampulliform, conidia longer 11
11. Conidiogenous cells apically not nodose 12
11*. Conidiogenous cells apically nodose 15
12. Conidia 2-celled, 25—30×1.5—2 μm ..... *I. caespitosa*
12*. Conidia 1-celled 13
13. Conidia 12—22×2.5—3.5 μm, conidiogenous cells pigmented, denticulate..... *I. couratarii*
13*. Conidia longer, conidiogenous cells hyaline or light 14
14. Conidia 17—22×1—1.5 μm ..... *I. bambusae*
14*. Conidia 20—30×2—2.5 μm ..... *I. grisea*
15. Conidiogenous cells integrated in erect, dark, septate conidiophores, but also formed intercalar or lateral ..... *I. variabilis*
15*. Conidiogenous cells not integrated in septate, setae-like conidiophores 16
16. Conidia 1-celled, 20—23×1.5—2.5 μm..... *I. falcata*
16*. Conidia usually septate and longer, conidiophores present ... 17
17. Conidia 1-septate, 29—32×1—1.5 μm ..... *I. angustispora*
17*. Conidia 0- to 3-septate, 26—44×2—3 μm..... *I. ramosa*

Matsushima (1975) described and depicted some collections as *Idriella* sp., which can not be classified in any described species.

The genus *Idriella* is remarkable, because the conidiogenous cells may be formed integrated or discrete on conidiophores or lateral or intercalar in hyphae; they can have an elongating rhachis or become apically nodose.

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