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Novel dematiaceous hyphomycetes

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Abstract: Novel taxa are described as *Alternaria simsimi* isolated from *Sesamum indicum*, distinguishing it from *Alternaria sesami*; *Embellisia lolii* from *Lolium perenne*; *Nimbya perpunctulata* from *Alternanthera philoxeroides*; *Ulocladium arborescens* from *Pistacia vera*; and *Stemphylium symphyti* from *Symphytum* × *uplandicum*.

Taxonomic novelties: *Alternaria simsimi* E.G. Simmons sp. nov., *Embellisia lolii* E.G. Simmons & C.F. Hill sp. nov., *Nimbya perpunctulata* E.G. Simmons sp. nov., *Stemphylium symphyti* E.G. Simmons sp. nov., *Ulocladium arborescens* E.G. Simmons sp. nov.
Key words: *Alternaria*, *Embellisia*, *Nimbya*, *Ulocladium*, *Stemphylium,* anamorphs*, Sesamum*, *Lolium*, *Alternanthera*, *Pistacia*, *Symphytum.*

INTRODUCTION

It is a pleasure to be able to offer several new taxa in honour of the centenary observances of the Centraalbureau voor Schimmelcultures. These are dedicated to mycologist colleagues who were among my first associates during my earliest visits to CBS in Baarn, beginning in the late 1950s: Agathe van Beverwijk, Gerharda Bunschoten, G.A. de Vries, Amelia Stolk, Beatrice Schol-Schwarz, Maria Schipper, and Annie van der Plaats-Niterink. A novel taxon is presented for each of the five hyphomycetous genera that have been the major focus of my taxonomic work over the past 50+ years. These are intended to expand our knowledge of isolates in axenic culture and, therefore, of the biodiversity of *Alternaria* Nees (1816–1817)*, Embellisia* E.G. Simmons (1971)*, Nimbya* E.G. Simmons (1989)*, Stemphylium* Wallroth (1833), and *Ulocladium* Preuss (1851).

MATERIALS AND METHODS

Isolates discussed here have reached me for opinions from several international sources. The source of each is noted in the text. Each isolate has been grown under the system of standardized conditions used in most of my related studies: inoculated PCA, V-8, and Hay-decoction agars (Simmons & Roberts 1993, p. 136–137) in separate sections of a 90 mm diam Y-plate (Petri dish with three compartments); maintained at moderate temperatures (*ca*. 22 °C), without humidity control (a gradually drying atmosphere in unsealed plates, thus avoiding condensation); under a daily fluorescent light/dark cycle of 8/16 h. Each isolate is described and discussed on the basis of examination of colonies at 50× magnification and, at higher magnifications, of sporulation elements sampled at 5–7 d after inoculation. Each isolate or specimen discussed is identified by a unique record/research number in the format E.G.S. 00.000.

TAXONOMIC PART

Alternaria: three species on sesame, two as pathogens

Alternaria isolates from invaded tissues of *Sesamum indicum* L. are susceptible to misidentification. One reason is that published attempts to interpret their morphology sometimes give good guidance (Leppik & Sowell 1964, Ellis & Holliday 1970, Ellis 1971), but sometimes do not (Berry 1960, Joly 1964, Yu *et al.* 1982). Most of the isolates from sesame that I have studied came from seed samples contributed by S. Z. Berry (1960, Maryland, U.S.A.) and E.E. Leppik (1960, Iowa, U.S.A.). In addition, I have been fortunate to be able to examine the type specimens that support the validity of the two names most commonly used for ex-sesame isolates: *Alternaria sesamicola* E. Kawamura (1931) and *Macrosporium sesami* E. Kawamura (1931), the latter epithet combined as *Alternaria sesami* (E. Kawam.) Mohanty & Behera (1958). The three taxa pertinent to this discussion are *Alternaria sesami* (E. Kawam.) Mohanty & Behera (1958), *Alternaria sesamicola* E. Kawam. (1931), and *Alternaria simsimi* E. G. Simmons, which is presented formally below as novel.

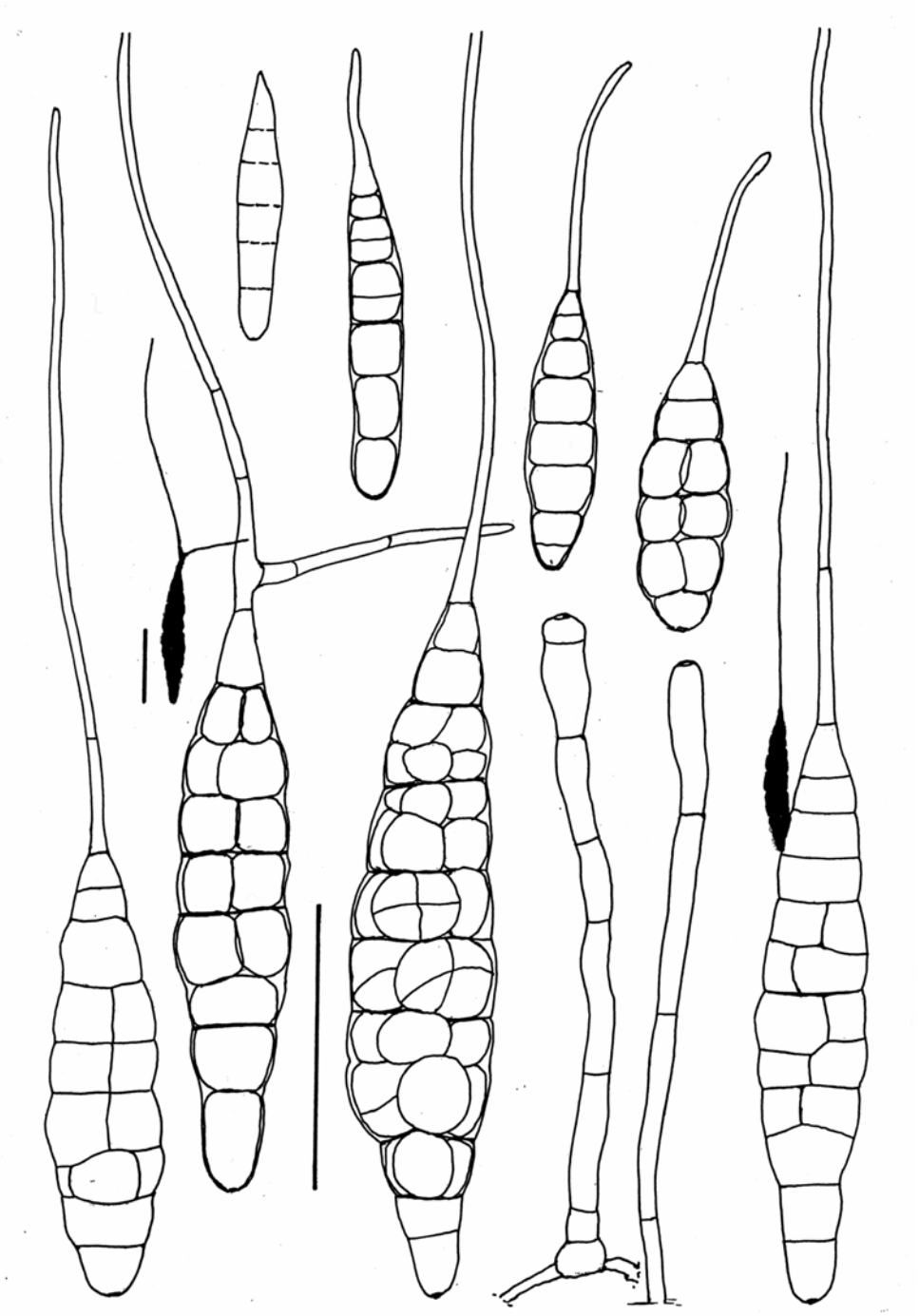

Fig. 1. *Alternaria sesami*. Conidia and conidiophores ex representative isolate E.G.S. 13.027; from a colony developed on V-8 agar. Total lengths of partially drawn filamentous beaks of largest conidia are 100–200µm. Bars = 50 µm.

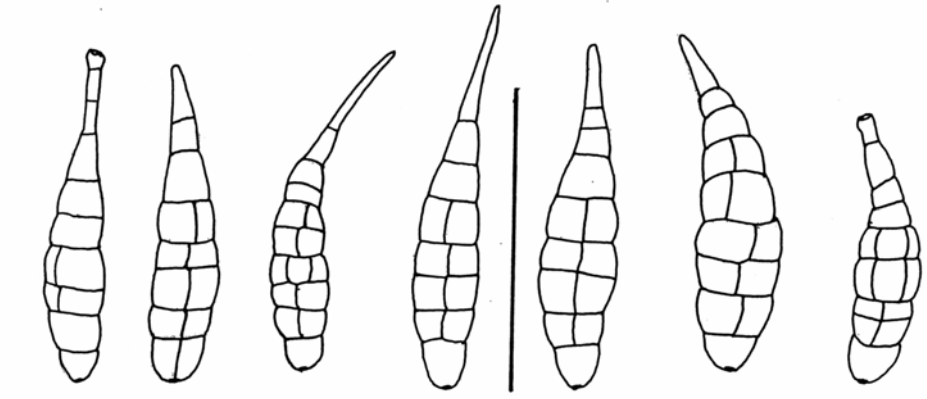

Fig. 2. *Alternaria sesamicola*. Conidia ex Kawamura holotype specimen; E.G.S. 08.166. Bar = 50 µm.

Alternaria sesami (E. Kawam.) Mohanty & Behera, Curr. Sci. 27: 493. 1958. Fig. 1.
Basionym: *Macrosporium sesami* E. Kawam., Kin-rui [Fungi] 1(2): 27. 1931. *Holotype*: Kawamura, 24 Sept., 1931; Lab. Pl. Path., Kyushu Univ., Fukuoka, Japan (E.G.S. 08.165).

The following description and observations are based primarily on a culturally stable, heavily sporulating isolate E.G.S. 13.027, which was derived from infected seedlings of *Sesamum indicum* L. developed from seeds produced in India. They were from material used by E.E. Leppik in 1959 during his studies that evolved into his publication with G. Sowell (Leppik & Sowell 1964) (Repr. culture CBS 115264).

Colonies of *A. sesami* on V-8, PCA, and Hay agars have moderately rapid growth, *ca*. 2.5 cm. in radius in 7 d. Colonies are composed almost entirely of conidiophores and conidia; non-sporulating hyphae are not seen at 50× magnification. Sporulation is densely crowded on V-8, abundant on PCA and Hay. Concentric rings of growth and sporulation are evident in V-8 colonies.

Conidiophores are simple or sparingly branched; they arise directly from hyphae on or beneath the agar surface. They become *ca*. 60–225 × 5.0–6.5 µm, and gradually enlarge near the apex into a clavate conidiogenous cell that produces a single conidium. Juvenile conidia are narrow-ellipsoid, tapering to a pointed apex; transverse distoseptation is evident in young conidia before they are as large as *ca*. 45 × 8 µm. Young conidia may remain ellipsoid or widen to become ovoid. Generation of a long, flexuous, filamentous beak begins during these early stages. Transverse and longitudinal distoseptum formation is abundant and remains obvious throughout enlargement of conidia; transverse eusepta are inserted in less than half of the distosepta. Large numbers of conidium bodies reach a size range of 100–130 × 19–32 µm and have 10–12 transverse septa and 1–3 longisepta in several of the largest median transverse sections. Conidium colour is a dilute dull brown with darker major septa. Walls appear smooth. The apical beak may reach sizes of 200–325 × 2.5 µm; it rarely produces a single lateral branch near the body apex. Secondary conidium production at the tip of a beak is uncommon.

Alternaria sesami is a comparatively large-spored, filament-beaked species whose conidia remain solitary under conditions of artificial culture. The species probably occurs wherever sesame is grown (Leppik & Sowell 1964, Ellis & Holliday 1970). *A. sesami* is presented correctly in treatments by Ellis & Holliday (1970) and Ellis (1971). Leppik & Sowell surveyed seed samples of *Sesamum* cultivars from circumglobal sources; their illustration of a conidium is of *A. sesami* and most of the cultures examined for them by E.G.S. at the time of their study were of this species.

In contrast, Berry's report (1960) of extensive comparisons of ex-sesame isolates in culture presents conidium measurements and illustrations that are not of *A. sesami* but of another taxon, *A. simsimi* (described below). In addition, a culture received from Berry in 1960 is *A. simsimi*. Joly (1964) illustrated conidia of what probably is large-spored *A. sesami* but introduced misguidance by identifying it as *A. sesamicola*, which, however, is an unremarkable taxon of the *A. tenuissima* species-group. Yu *et al.* (1982) introduced further confusion by illustrating *A. sesami* correctly, but then by illustrating as *A. sesamicola* a second taxon whose description and illustration appear to be of *A. simsimi*, but in any case are not of *A. sesamicola*.

Alternaria sesamicola E. Kawamura, Kin-rui [Fungi] 1(2): 29. 1931. Fig. 2.

Holotype: Kawamura, 16 Sept. 1931; Lab. Pl. Path., Kyushu Univ., Fukuoka, Japan (E.G.S. 08.166).

Kawamura described and illustrated *A. sesamicola* as having catenate, obclavate, yellowish brown conidia 26–80 × 7–14 µm, with 2–10 transepta and a few longitudinal septa. Conidia observed in his type material fit within this description, except that no conidium as long as 80 µm was found. The description can be expanded slightly from re-examination of the type, as follows.

Conidia are long ellipsoid or obclavate, tapering in the upper half into a narrow beak extension or ending abruptly as a short 1–2-celled secondary conidiophore, thus furnishing evidence of catenulation. Conidia seen in the type are 45–60 × 10–13 µm, with 7–10 transverse septa and 1–2 longisepta in some of the widest transverse sections. Some of the conidia are distinctly constricted at the median transeptum.

The morphology of *A. sesamicola* conidia is characteristic of species in the *A. tenuissima* species-group. On the basis of its type specimen, and in the absence of a representative isolate, *A. sesamicola* cannot be differentiated as a distinguishable taxon within its species-group. Within the genus *Alternaria*, it does not resemble either *A. sesami* or *A. simsimi.*

Alternaria simsimi E.G. Simmons, **sp. nov.** MycoBank MB500027. Fig. 3.

Etymology: Semitic, *simsim* (sesame; rel. Arabic slang *simsima* = cute).

Ex cultura in agaro V-8 descripta. Conidiophora abundantia, congesta, ad *ca.* 80 × 3–5 µm, ad apicem geniculata, conidiogena. Conidia catenulata, erostrata vel rostro filamentoso ad 30–325 × 2.5 µm; corpora conidiorum anguste ellipsoidea, ad 45–90 × 12–18 µm; 7–10 constricte

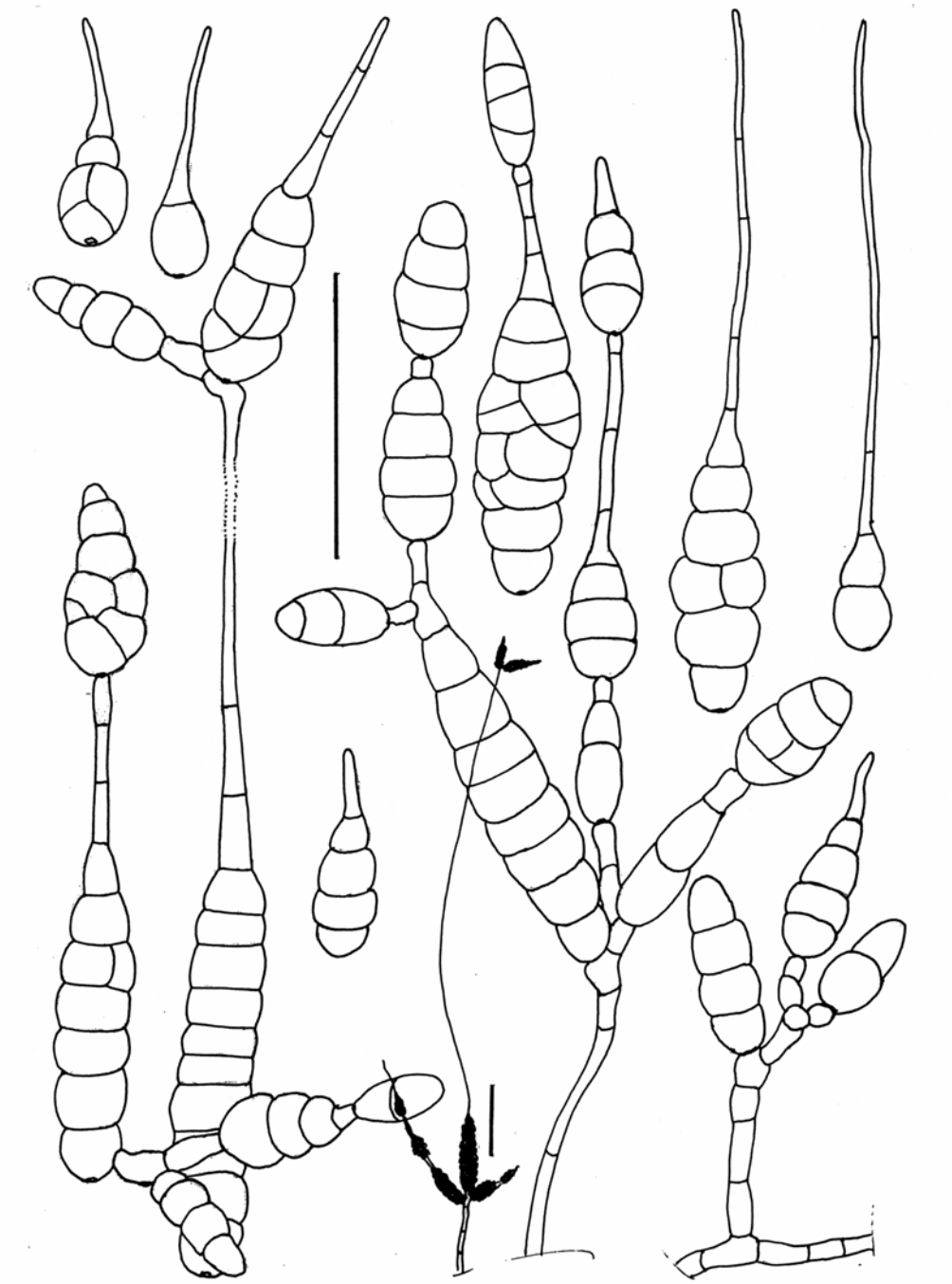

Fig. 3. *Alternaria simsimi*. Conidia, conidiophores, and sporulation habit, ex-type isolate E.G.S. 13.110; from a colony developed on V-8 agar. Two conidia at upper right are from Hay-decoction agar. The disjunct, dotted-line portion of the long filamentous beak represents an additional length of 200 µm. Bars = 50 µm.

transversaliter septata, 1(–2) longiseptata in segmentis 1–4 transversaliter; color modice brunneolus, eusepta fuscata; paries externus laevis. Habitatio typi in semine *Sesami indici* L., **Argentina**; E.G. Simmons iii.1961 sejuncta, E.G.S. 13.110. **Holotypus**: pars ex cultura E.G.S. 13.110 desiccata et in BPI 842293 conservanda (Cult. ex-typ. = CBS 115265).

Description and observations on the ex-type culture are based on an isolate E.G.S. 13.110, which was derived from infected germinated seeds of *Sesamum indicum* L. The material was received from E. E. Leppik in 1961 as a portion of a USDA seed sample PI 229673 introduced from Argentina. Colony growth on V-8, PCA, and Hay agars is rapid, completely covering individual sectors of 90 mm diam Y-plates within 5 d. Sporulation is dense on V-8, only slightly less so on PCA. There are no non-sporulating aerial hyphal elements. Concentric rings of sporulation are evident.

Primary conidiophores arise directly from hyphae at the agar surface; they may be simple or branched, and usually have a few geniculate apical growth extensions, reaching a size range up to *ca*. 80 × 3–5 µm. Primary conidia rarely remain solitary; instead they produce a single secondary conidium or straight or branched chains of a few conidia. Crowded clumps

of sporulation form a dense turf over the agar surface. Emerging from many of these clumps are isolated, extremely long conidium beaks which often produce small clusters of secondary conidia at their tips. The small surface clumps contain 8–10+ conidia.

Juvenile primary conidia usually are narrow-ellipsoid; they may produce an apical secondary conidiophore while still only 2–3-celled, or they may initiate production of a narrow apical beak at this stage. The spore body commonly retains a narrowly ellipsoid form throughout development to full size. However, some conidia increase in width, yielding an ovoid spore body. The narrow apical beak may remain short, particularly if it is basal to a chain of conidia; but often the beak extends to lengths of 275–325 µm. Conidium bodies reach a size range of 45–90 × 12–18 µm, with 7–10 constricting transepta and only 1 longiseptum in 1–2 transverse sections of narrow conidia, or in 2–4 segments of widest spores. The narrow beak is *ca*. 2.5 µm wide; even at maximum length it remains nearly straight and stiff in contrast to the flexuous nature of the *A. sesami* conidium beak. Conidium body colour is a medium brown with eusepta in darker contrast. The wall surface appears to lack ornamentation.

Although *Alternaria* sporulation from a hay-decoction medium seldom is used for descriptive work, the appearance of *A. simsimi* conidia from colonies on Hay is distinctive almost to the extent of meriting the term *simsima* (see etymology above). Size of conidia from Hay tends to remain in a lower range than that found from V-8. Most conidium bodies produced on Hay are longitudinally symmetrical, with cells well rounded and quite smooth between constricting septa. More to the point, conidia of this sort are a close match for those illustrated in Berry's 1960 study of this taxon (misidentified as *A. sesami*). This taxon has been studied in culture and discussed in the literature at least by Berry (1960, phytopathology) and by Yu *et al.* (1982, morphotaxonomy). Berry misidentified his material as *A. sesami*; authors Yu *et al.* misidentified theirs as *A. sesamicola*.

Pertinent to this entry on *Alternaria*, but not considered further here, is the likelihood that isolates of *Alternaria* from sesame plant parts can be expected to yield diverse representatives of at least the *A. alternata* spp.-group and the *A. tenuissima* spp.-group. Yu *et al.* (1982), in their consideration of ex-sesame isolates, discussed the pathogenic properties of *A. longissima* Deighton & MacGarvie (1968), which, if correctly identified, broadens the concept of a species reported as occurring on a wide range of plants in warm climates (Ellis & Holliday 1970).

***Embellisia*: a new species from perennial ryegrass**

Subsequent to the proposal of the phaeodictyosporic genus *Embellisia* E.G. Simmons (1971), typified by *E. allii* (Campanile) E.G. Simmons, nineteen names for other taxa have been added to the genus. Some of these are misplaced in the genus, for reasons of misinterpreted morphology. Indeed, the original characterization of the genus, based primarily on septum structure, deserves reappraisal. However, good examples of the genus continue to appear as isolates from a variety of plant substrates and soils. One isolated from perennial rye grass in New Zealand is described here.

Embellisia lolii E.G. Simmons & C.F. Hill, **sp. nov.** MycoBank MB500028. Fig. 4.

Ex cultura in agaro PCA descripta. Auctus mycelialis in substrato conspicue radialis, caespitibus fuscatis ramorum rhizoidialium. Auctus aerius arachnoideus, abunde conidiophorogenus. Conidiophora curta vel ad 25–150 × 3–5 µm, ad apicem geniculata, conidiogena. Conidia vulgo secundarie conidiophorogena, catenulata, caespites efferentes; ellipsoidea vel ovoidea, ad *ca.* 45–60 × 10–18 µm, 6–13 transverse septata, raro unilongiseptata in segmentis 2–3 transversalibus. Color conidiorum modice brunneolus, transeptis fuscatis et incrassatis. Paries externus conidiorum laevis. Habitatio typi in folio Lolium perenne L., **New Zealand**; C.F. Hill xi.1995 sejuncta, Lynfield CS/296.3. **Holotypus**: pars ex cultura E.G.S. 43.054 desiccata et in BPI 842294 conservanda (Cult. ex-typ. = CBS 115266).

Colonies on PCA, V-8, and Hay agars spread rapidly, *ca*. 2.5 cm. in radius in 5 d. Growth is strikingly radial on PCA; submerged radial hyphal elements are made conspicuous (50×) by the development of clusters of dark rhizoidal branches emerging from a central knot of cells. Most of the branches remain somewhat parallel to the agar surface, but a single, very strong branch often emerges from the central knot and becomes erect above the agar surface. The rhizoidal growths do not appear to function here as a sporulation apparatus.

A loose arachnoid layer of hyphae develops aerially above the agar surface. Very abundant sporulation is produced from conidiophores that arise as lateral branches of these interwoven hyphae. The primary conidiophore branches frequently develop from hyphal coils formed in the arachnoid layer. Primary conidiophores usually become geniculate at multiple extensions; primary conidia produced at the geniculate loci commonly produce secondary conidiophores apically and basally. Further geniculate extensions and abundant conidium production yield branching clusters of sporulation. Conidiophores may remain a short few cells, but usually lengthen into a range of *ca*. 25–150 × 3–5 µm.

Conidia are ellipsoid to ovoid throughout most stages of development. When terminal, a conidium has a smoothly rounded apex; otherwise a secondary conidiophore, sometimes of a tight or angular complexity, is produced.

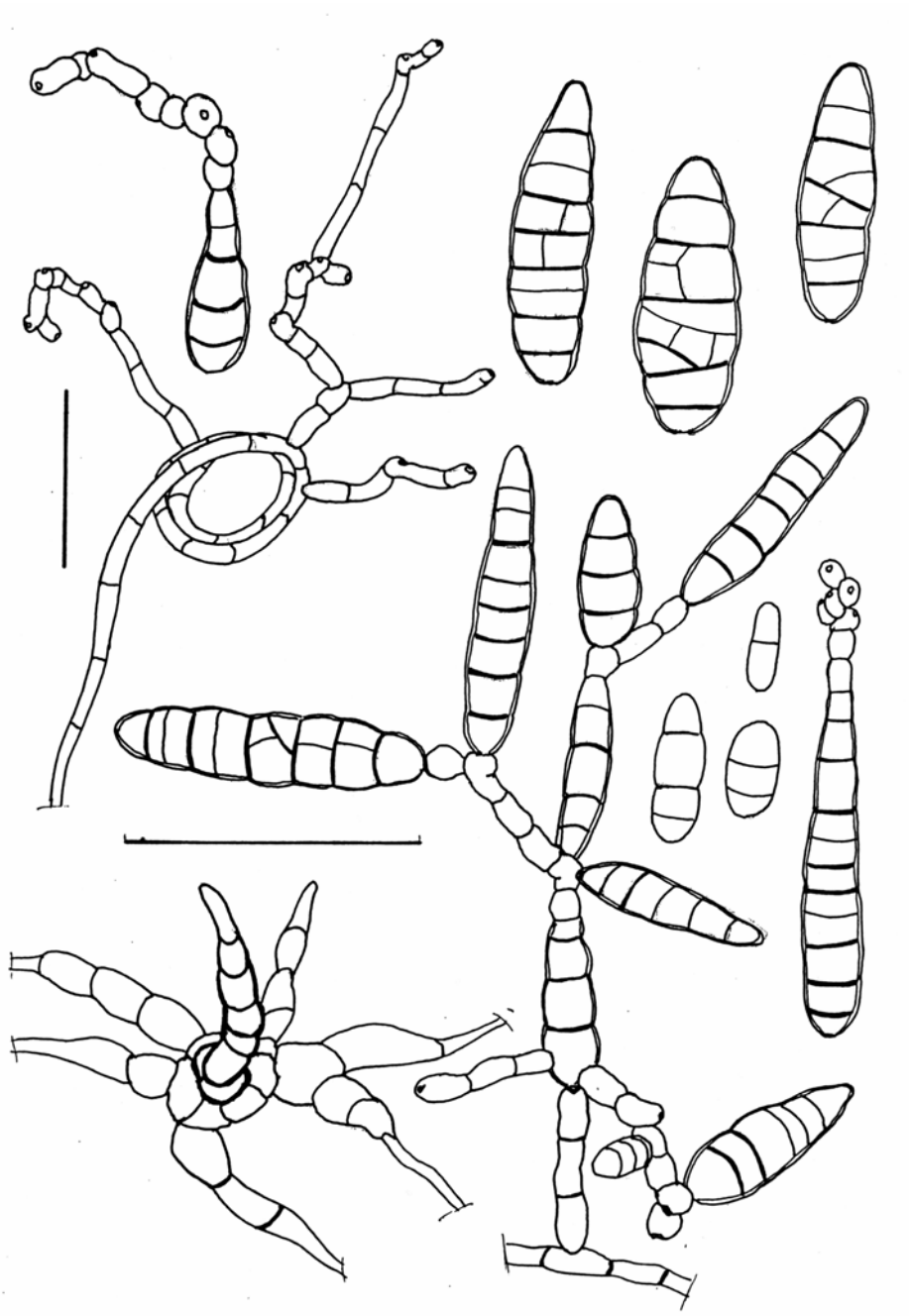

Fig. 4. *Embellisia lolii*. Conidia, conidiophores, sporulation pattern, an aerial conidiophorogenous coil, and one of the distinctive submerged knots of hyphal cells and emergent rhizoidal branches, ex-type isolate E.G.S. 43.054; from a colony developed on PCA agar. Bars = 50 µm.

Apical secondary conidiophores dominate, but basal generation of these sporulation elements is common. Conidia reach a dominant size range of *ca*. 45–60 × 10–18 µm, with 6–13 major thickened transverse septa and only 1 thinner longitudinal septum in 2–3 cells of a very minor portion of the conidium population. Conidium colour before full maturity is a dilute tan which deepens to a medium dull brown, against which the dark colour and thickness of major transepta contrast strongly. The spore wall appears to be smooth.

Nimbya*: another species on *Alternanthera

Several species of *Alternanthera* Forsk. (*Amaranthaceae*) are believed to be hosts of *Nimbya* species. Attention has centered on the weedy aquatic perennial *A. philoxeroides* (Mart.) Griseb. *A. denticulata* R. Br. and *A. sessilis* (L.) R. Br. also are recognized as *Nimbya* hosts (Australia and New Zealand; pers. comm. C.F. Hill 2000, R. Gilbert 2004). Among isolates at hand from the Louisiana, U.S.A., type locale of *N. alternantherae* (Holcomb & Antonopoulos) E.G. Simmons & Alcorn (Simmons 1995) is a second species of *Nimbya* whose conidium morphology permits its segregation from *N. alternantherae* as well as from other *Nimbya* taxa described from *Celosia cristata* L. (also *Amaranthaceae*) and from species

of *Cyperaceae* and *Juncaceae* (Simmons 1989, Johnson *et al.* 2002).

Nimbya perpunctulata E.G. Simmons, **sp. nov.** MycoBank MB500029. Fig. 5.

Ex cultura in agaro PCA descripta. Coloniae pallidae, laxe gossypinae. Sporulatio abundans, congesta, in conidiophoris 70–125 × 4–5 µm. Conidia anguste ellipsoidea vel subcylindrica, 80–100 × 10–14 µm, rostro 100–210 × 2 µm, distoseptis transversalibus 10–15, infrequenter 1–2 euseptis. Paries externus conidiorum dilute luteobrunneus, conspicue dense punctulatus. Habitatio typi in folio *Alternantherae philoxeroidis*, Louisiana, **U.S.A.**, G.E. Holcomb sejuncta. **Holotypus**: pars ex cultura E.G.S. 51.130 desiccata et in BPI 842297 conservanda (cult. ex-typ. = CBS 115267).

Colony growth of *N. perpunctulata* is moderately rapid, *ca*. 2 cm diam in 7 d. Colonies on PCA are subhyaline with sparse aerial hyphae. Sporulation is abundant on a turf of short conidiophores that arise directly from surface hyphae. Conidiophores usually produce a single apical conidium in young active colonies; they commonly reach a size range of 70–125 × 4–5 µm, with the conidiogenous tip enlarging to *ca*. 7 µm. Sporulation on V-8 is even more abundant than on PCA; the mass of slightly darker conidia on V-8 gives a medium brown colour to the colony.

Juvenile conidia are narrow-ellipsoid, *ca*. 40 × 7 µm when the first median transverse distoseptum becomes visible. Production of a narrow beak begins at this very early stage. The spore body remains narrow-ellipsoid, sometimes subcylindrical, as it enlarges; additional transverse distoseptum divisions are formed; and distinctive subangular locules become evident. Transverse eusepta seldom are inserted in conidia of young colonies; only 1–2 can be found in a very few conidia of a spore sample. Longitudinal or oblique divisions of large locules may occur, but these have not been seen to become euseptate. Conidium bodies reach a dominant size range of 80–100 × 10–14 µm with a narrow, flexuous, but not fragile beak up to 100–210 × 2 µm. Conidium colour is a dilute yellowish tan. The surface of the comparatively narrow conidium body is diagnostically evenly and conspicuously punctate in ornamentation, usually so densely so that viewing the arrangement of internal septa is difficult.

When conidia of somewhat similar *N. alternantherae* from the same host species and locale are produced under the same culture conditions they are essentially smooth-walled, 80–115 × 18–20 µm with unbranched beaks 350–470 × 2–4 µm, and have 6–10 cell-like locules. With these characters they are more robust, less cellular, smoother walled, and longer beaked than are conidia of *N. perpunctulata*.

Stemphylium*: a first novel species from *Symphytum

It seems a curious circumstance that no species of *Alternaria* or *Stemphylium* ever has been described as novel from a member of the *Boraginaceae*, particularly from the widely cultivated species *Symphytum* × *uplandicum* Nyman (= *S. peregrinum* Ledeb.). A distinctive species of *Stemphylium* is known on this host from collections made as early as 1957 (see below).

Stemphylium symphyti E.G. Simmons, **sp. nov.** MycoBank MB500030. Fig. 6.

Ex cultura in agaro PCA descripta. Coloniae in agaris PCA et V-8 pallidae, gossypinae, in Hay arachnoideae. In maturitate in PCA conidiophora et conidia abundantia. Conidiophora nunc curta et simplicia, *ca.* 20–30 µm longa, nunc praelonga, erecta, ad *ca.* 1.0 mm. longa, ramis lateralibus, conidiogenis 8–10. Rami laterales *ca.* 30–50 × 6–8 µm, apice conidiogeno 10–12 µm dilatato. Conidia late ovoidea, subsphaeroidea, vel subdoliiformia; ad 28–40 × 21–28 µm, 3–5 septis primariis tranversalibus et 1–4 septis longitudinalibus. Paries externus conidiorum modice olivaceus, conspicue punctatus. Habitatio typi in folio *Symphyti* × *uplandici* Nyman, **U.S.A.**, Geneva, New York, S.W. Braverman sejuncta, *ca.* 1958. **Holotypus**: pars ex cultura E.G.S. 12.094 desiccata et in BPI 842296 conservanda (Cult. ex-typ. = CBS 115268).

Colonies of *S. symphyti* are pale cottony on PCA and V-8, arachnoid on Hay. As the PCA or V-8 colony spreads, the cottony center gives way to great numbers of tall, erect or flexuous, simple or branched conidiogenous hyphae that arise directly from the substrate. Some conidiophores remain short and simple, *ca*. 20–30 µm long; but the majority of the conidiogenous hyphae become conspicuously aerial and up to 1 mm or more in length, with as many as 8–10 lateral conidiogenous branches. Lateral branches are *ca.* 30–50 × 6–8 µm, with the conidiogenous apex enlarging to 10–12 µm. The apex may produce multiple swollen conidiogenous cells by means of percurrent growth. The individual apical cell is distinctive among species known for the genus: it is subspherical with a strongly pigmented, pyriform, sometimes subdoliiform internal apparatus.

Conidia are solitary on each conidiophore; they become lateral when secondary percurrent growth occurs. Conidia are broadly ovoid, subspherical, or almost doliiform throughout development. They reach a size range of 28–40 × 21–28 µm; and have 3–5 major transverse septa and, in lateral view, 1–4 longisepta in each of the transverse sections. Conidium colour is a medium, dull olive-brown; walls are ornamented from the beginning, becoming conspicuously punctate at maturity.

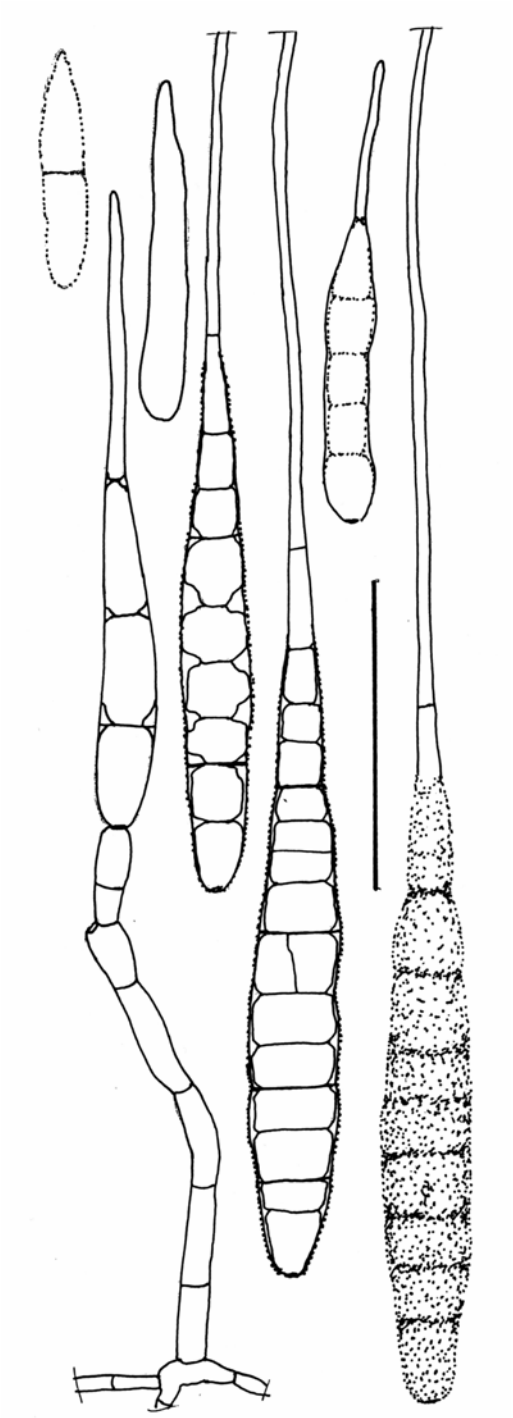

Fig. 5. *Nimbya perpunctulata*. Conidiophore and conidia in developmental stages, ex type isolate E.G.S. 51.130; from a colony developed on PCA agar. Partially drawn filamentous beaks of largest conidia actually extend to 175–210µm in length. All conidia have punctulate surface ornamentation throughout development. Bar = 50 µm.

The known sources of specimens and isolates of *S. symphyti*, all from *Symphytum* × *uplandicum*, are E.G.S. 12.094 (**U.S.A**., New York, 1958, isol. S.W. Braverman); E.G.S. 21.131 (**U.K**., Aug. 1962, K. Pirozynski, IMI 95205b); E.G.S. 21.132 (**Kenya**, Aug.1957, R.M. Nattrass, IMI 70232); E.G.S. 48.082 (**New Zealand**, 23 Jan. 2000, isol. C.F. Hill, Lynfield 113A).

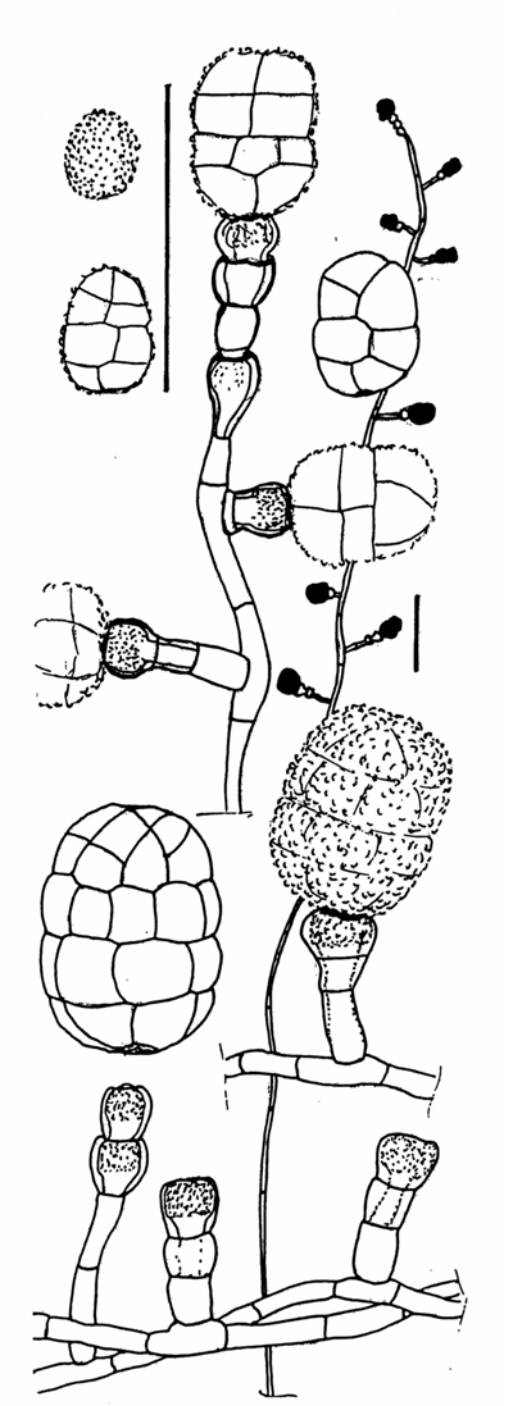

Fig. 6. *Stemphylium symphyti*. Conidia, conidiophores, and extended sporulation habit, ex-type isolate E.G.S. 12.094; from a colony developed on PCA agar. Bars = 50 µm.

Ulocladium: a novel species with an arborescent growth habit

Many species of *Ulocladium*, when in culture, produce masses of conidia in bushy growths of branching chains in a dense mat over the surface of the agar substrate. A few small-spored taxa of *Alternaria* have similar dense, bushy sporulation habits, but the initially obovate nature of *Ulocladium* conidia permits separation of taxa of the two genera. Now comes an isolate of *Ulocladium* that has a somewhat different pattern of sporulation; it is similar to that of an *Alter-*

naria species-group centered on *A. arborescens* E. G. Simmons (1999). However, the obovate pattern of conidium initiation and development defines it as a *Ulocladium* taxon.

Ulocladium arborescens E.G. Simmons, **sp. nov.** MycoBank MB500031. Fig. 7.

Ex cultura in agaro PCA descripta. Auctus colonialis velox, sporulatione abunda, conspicue concentrice zonata. Conidiophora solitaria, arcte disposita sed distincta, plerumque curta ad *ca.* 50–100 × 4 µm, etiam vulgo praelonga, erectiuscula, 500–800 × 5 µm. Sporulatio lateralis vel apicalis. Conidia solitaria vel plerumque in catenis ramosis. Conidiophora secundaria saepe longiuscula, ad *ca.* 50–70 µm, 2–4+ apicaliter geniculata et conidiogena. Conidia obovoidea, ellipsoidea vel late ellipsoidea, vulgo 24–40 × 12–15 µm, 3(–7) transversaliter septata et 1–2 longe septata in segmentis transversalibus. Color conidiorum fulvus; paries externus semper dense ornatus. Habitatio typi in nuce *Pistaciae verae* L., **Iran**, M. Mayama (Japan) 21 Jun. 1993 sejuncta, IMI 369777. **Holotypus** pars ex cultura E.G.S. 44.109 desiccata et in BPI 842295 conservanda (Cult. ex-typ. = CBS 115269).

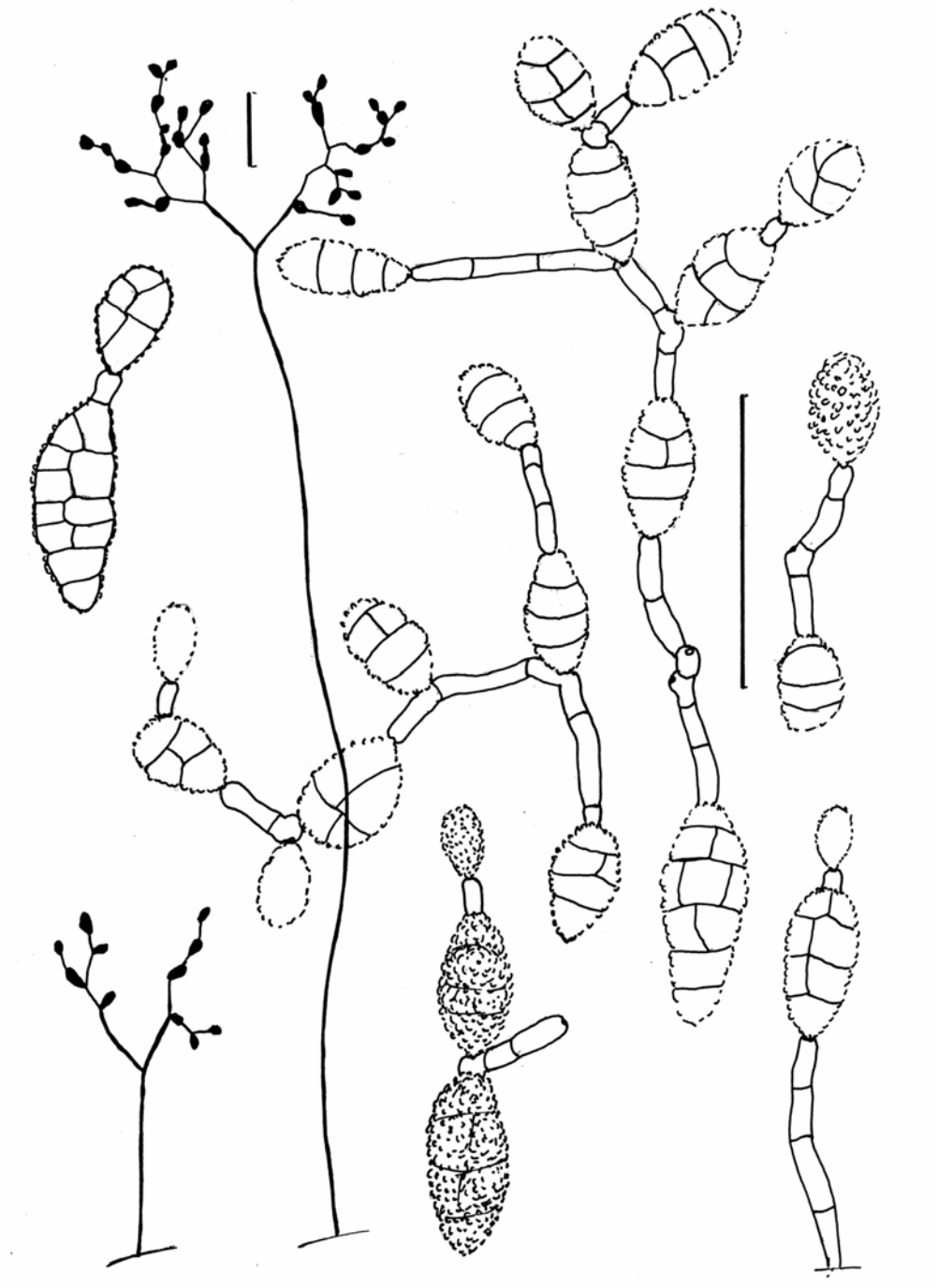

Fig. 7. *Ulocladium arborescens*. Conidia, conidiophores, and sporulation habits, ex type isolate E.G.S. 44.109; from a colony developed on PCA agar. All conidia are conspicuously ornamented throughout development. Bars = 50 µm.

Colony growth of *U. arborescens* on all media is rapid, completely covering individual sectors of 90 mm diam Y-plates within 5 d. Sporulation on PCA and Hay is very abundant, on V-8 dense. Concentric zonation of growth and sporulation is pronounced. No non-sporulating aerial hyphae are evident at 50× magnification.

Primary conidiophores arise singly from surface or subsurface hyphae; they are closely spaced but distinct and uncrowded. Conidiophores usually remain relatively short, up to *ca*. 50–100 µm in the denser (light-exposed) zones; but those that develop in zones of growth produced during dark periods commonly are long, 500–800 × 5 µm, solitary, erect or nearly so. Conidium production is on short lateral branches or in terminal branching chains on both forms of conidiophore.

Conidia may remain solitary or more commonly proliferate in branching chains. Secondary spore production is by means of well-defined secondary conidiophores, often of considerable length up to *ca*. 50–70 µm and with 2–4+ apical geniculate conidiogenous extensions.

Conidia initially are ellipsoid or obovoid, becoming broad-ellipsoid. They commonly reach a size range of 24–40 × 12–15 µm, usually have 3 transepta (up to 7) and 1–2 longisepta in 1–4 of the widest transverse sections. Conidium colour is tawny-brown; walls are densely ornamented throughout spore development.

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