

***Phaeoisaria aguilerae* anam. sp. nov.
from submerged wood in Cuba with notes and reflections
in the genus *Phaeoisaria***

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Abstract — *Phaeoisaria aguilerae* anam. sp. nov., collected on a submerged decaying twig, is described and illustrated. The new species is characterized by clavate, curved, slightly uncinata, 1-septate, smooth, hyaline conidia. The species of *Phaeoisaria* are briefly reviewed, and a key to the accepted taxa is provided. *Helicomina triseptata* comb. nov., based on *P. triseptata* Hol.-Jech., is proposed.

***Phaeoisaria* / *Helicomina* / Hyphomycetes / systematics / tropical fungi / Cuba**

Résumé — *Phaeoisaria aguilerae* anam. sp. nov., isolé de branches pourrissantes, est décrite et illustrée. Cette nouvelle espèce se caractérise par des conidies en massue, légèrement courbes, bicellulaires, lisses et hyalines. Les espèces du genre *Phaeoisaria* sont brièvement revues et une clef est proposée. *Helicomina triseptata* comb. nov., basé sur *P. triseptata* Hol.-Jech., est proposé.

***Phaeoisaria* / *Helicomina* / Hyphomycètes / systématique / tropiques / Cuba**

INTRODUCTION

During the survey of microfungi from the Cuban rainforest, an interesting hyphomycete was collected on a decayed submerged twig of an unknown angiosperm. This fungus has the typical morphological features of *Phaeoisaria* Höhn (1909), but cannot be assigned to any of the previously published species of the genus and is described here as new.

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Phaeoisaria is distinguished by having erect, brown or nearly so, indeterminate or determinate, compound synnemata with parallel stipe and hogenous, multilocal, sympodial, denticulate conidiogenous cells. In nature the species occur mainly on bark, wood and twigs of many different plants. Generic descriptions have been published by Morris (1963), Ellis (1971) and de Hoog & Papendorf (1976) (in pure culture); fourteen taxa have been accepted into the genus *Phaeoisaria*. These are: *P. clematidis* (Fuckel) S. Hughes (1958) (the type species), *P. clavulata* (Grove) E.W. Mason & S. Hughes (1953) (in Mason & Ellis, 1953), *P. sparsa* B. Sutton (1973), *P. magnifica* Deighton (1974), *Phaeoisaria* anam. *Peroneutypella echidna* (Cooke) Deighton (1974), *P. curvata* de Hoog & Papendorf (1976), *P. glauca* (Ellis & Everh.) de Hoog & Papendorf (1976), *P. infrafertilis* B. Sutton & Hodges (1976), *P. uniseptata* Mercado (1984), *P. triseptata* Hol.-Jech. (1988), *P. tuberculata* B. Sutton (1993), *P. caffer* Matsush. (1996), *P. sparsa* B. Sutton var. *cubensis* Mercado, Figueras & Gené (1997) and *P. muscariformis* Siboe, P.M. Kirk & P.F. Cannon (1999).

TAXONOMIC PART

Phaeoisaria aguilerae R.F. Castañeda, S. Velázquez et Cano sp. nov. Fig. 15

Etymol.: Latin, *aguilerae*, dedicated to Hilda Aguilera, Cuban Ministry of Agriculture.

Ad fungos conidiales, Hyphomycetes pertinens. Coloniae in substrato naturali effusae, brunneae. Mycelium plerumque in substrato immersum. Hyphae septatae, ramosae, laeves, brunneae, 1.5-3.0 µm diam. Conidiomata synnemata, erecta, cylindrica, indeterminata, dissita, atrobrunnea ad basim et brunnea ad apicem, 129-207 µm alta, 14-30 µm crassa ad basim; cum stipitibus compactis vel fasciculatis, 7-14 filamentis parallelis, 5-9-septatis, laevibus, brunneis infra, pallide brunneis vel brunnea supra, 2-3 µm, praedita. Cellulae conidiogenae multilocales, hogenousae, sympodiales, terminales, integratae indeterminatae, cylindricae, leviter inflatae et curvatae ad apicem, dilute brunneae vel brunneae, denticulatae, 16-30 × 3.0-3.5 µm, cum denticulis cylindricis, manifestis, 1.0-1.5 µm praeditae. Secedentia conidiorum schizolytica. Conidia holoblastica, clavata vel cylindrica, curvata, obtusa vel rotundata ad apicem, leviter uncinata et truncata ad basim, solitaria, 1-septata, raro 2-3-septata, hyalina, levia, sicca, 18.0-29.5 × 4.0-5.0 µm.

Teleomorphis ignota.

Holotypus: IMI 386127. *In caulis emuortis putrescenti submerso in fluvii, sylvae pluvialis, Soroa, Pinar del Rio, Cuba. Leg. A. Sarriegui, 15 Oct. 2000.*

Isotypus: INIFAT C00/55, Santiago de Las Vegas, Ciudad de La Habana, Cuba.

Conidial fungi, Hyphomycetes. Colonies on the natural substratum effuse, brown. Mycelium mostly immersed. Hyphae septate, branched, smooth, brown, 1.5-3.0 µm diam. Conidiomata synnematos. Synnemata erect, cylindrical, indeterminate, scattered, dark brown at the base, pale brown or brown at the apex, 129-207 µm long, 14-30 µm wide at base. Stipe compact, composed of 7-14 parallel conidiophorous, 5-9-septate, smooth, brown below, pale brown or brown towards the apex, 2.0-3.0 µm wide. Conidiogenous cells hogenous, multilocal, sympodial, terminal or integrated, indeterminate, cylindrical, slightly inflated and

curved at the apex, pale brown or brown, $16-30 \times 2.8-3.5 \mu\text{m}$, denticulate, with conspicuous cylindrical, $1.0-1.5 \mu\text{m}$ long denticles. Conidial secession schizolytic. Conidia holoblastic, clavate or cylindrical, curved, obtuse or rounded at the apex, slightly uncinuate, truncate at the base, solitary, 1-septate, rarely 2-3-septate, hyaline, smooth, dry, $18.0-29.5 \times 4.0-5.0 \mu\text{m}$.

Teleomorph: unknown.

Specimens examined: Cuba, Pinar del Rio Province, Soroa, on twig submerged in a river, in undisturbed rainforest, col. A. Sarriegui, 15 Oct. 2000 (Holotype: IMI 386127; isotype: INIFAT C00/55). Cuba, Pinar del Río Province, Biosphere Reserve Sierra del Rosario, San Juan River, on submerged twig of *Syzygium jambos*, 08 Oct. 1999, G. Delgado (paratype: HACM 9826).

Colonies on Corn Meal Agar (Difco) attaining a diam. of $18-26 \mu\text{m}$ in three weeks at 25°C , whitish grey, slightly floccose or with limited aerial mycelium, with numerous conidia. Conidiophores erect, simple, rarely branched, 1-3-septate, pale brown, smooth, $21-50 \times 3.0-4.0 \mu\text{m}$, very often reduced to conidiogenous cells. Conidiogenous cells multilocal, sympodial, indeterminate, integrated, denticulate, pale brown, $14-28 \times 3.0-4.0 \mu\text{m}$; denticles cylindrical, $1.5-3.0 \mu\text{m}$ long. Conidia botuliform, lunate, fusiform, clavate, curved, obtuse or rounded at the apex, truncated at the base, irregularly guttulate, 1-septate, hyaline, dry, solitary, $(11.0-)$ $17.0-21.0 \times 3.0-4.0 \mu\text{m}$.

Culture deposited: INIFAT C00/55 = CBS 109482

Phaeoisaria aguilerae resembles *P. sparsa* and *P. sparsa* var. *cubensis* in its conidial shape but differs from both by having larger conidia. Both *P. sparsa* and *P. sparsa* var. *cubensis* have smaller conidia, $10.0-15.5 \times 2.5-3.5 \mu\text{m}$ and $(4-)$ $7-11 (-17) \times 2-3 \mu\text{m}$ respectively, and $18.0-29.5 \times 4.0-5.0 \mu\text{m}$ in *P. aguilerae*.

Other described *Phaeoisaria* species

Phaeoisaria caffera Matsush., Matsushima Mycol. Mem., Kobe, 9: 19 (1996). Fig. 4.

This species is closely related to *P. clematidis* (see below) from which it differs in conidial size (Matsushima 1996).

Habitat: On leaves of *Podocarpus* sp.

Distribution: South Africa.

Descriptions and illustrations: Matsushima (1996).

Phaeoisaria clavulata (Grove) E.W. Mason & S. Hughes, in Mason & Ellis, Mycol. Pap. 56: 42 (1953). Fig. 5.

According to Sutton (1973) the synnemata are longer and thinner than in *P. clematidis*, with slender, tapered, slightly geniculate conidiogenous cells, which produce subspherical to broadly ellipsoidal conidia.

Habitat: On fallen branches of *Fraxinus*, *Pinus*, *Prunus*, *Sambucus*.

Distribution: Europe.

Descriptions and illustrations: Ellis (1971) and Sutton (1973), Ellis & Ellis (1997).

Phaeoisaria clematidis (Fuckel) S. Hughes, Can. J. Bot. 36: 795 (1958). Fig. 1.

Basionym: *Stysanus clematidis* Fuckel, in Jb. nassau. Ver. Naturk. 23-24 (Symb. Mycol): 365 (1870).

Synonym: *Phaeoisaria cornui* (Bainier) Mason, Mycol. Pap. 94 (1937).

This species has indeterminate, dark brown synnemata, with clavate to cylindrical, multilocal, denticulate, pale brown conidiogenous cells which arise along the sides of the conidiomata. The conidia are obovoid to fusiform, smooth, very pale olivaceous, subhyaline to hyaline. Several described species were considered as synonyms by Deighton (1974) and de Hoog & Papendorf (1976).

Habitat: Plurivorous, frequently on palm tree and bamboo.

Distribution: Argentina, Australia, Belgium, Belize, Brazil, Canary Islands, Cuba, Galapagos Islands, Germany, Ghana, India, Indonesia, Japan, Malaysia, Mexico, Panama, Papua and New Guinea, Peru, Sierra Leone, Spain, Sri Lanka, United Kingdom, Venezuela.

Descriptions and illustrations: Morris (1963) "as *P. bambusae*", Ellis (1971), Udagawa & Takada (1971) "as *P. bambusae*", Sutton (1973), Tubaki (1973) "as *P. clavulata*", Deighton (1974), Matsushima (1975, 1993), de Hoog & Papendorf (1976, in pure cultures), Seifert (1990), Heredia (1994), Ellis & Ellis (1997), Goos (1997).

Phaeoisaria curvata de Hoog & Papendorf, Persoonia 8: 412 (1976). Fig. 7.

From the original description on oatmeal agar, synnemata are not formed and the conidiophores are reduced to multilocal, denticulate conidiogenous cells in pure culture. The conidia are clavate to obovoid, pointed at the base, curved and occasionally sickle-shaped. Frequently the conidial shape in pure culture is very variable. It would be better to base the description on material grown on a natural substratum. This sometimes can be obtained by inoculating the culture on sterile pieces of the original natural material, as recommended Nag Raj (1993).

Habitat: On leaves of *Parinari capense*.

Distribution: South Africa.

Descriptions and illustrations: de Hoog & Papendorf, Persoonia 8: 412 (1976).

Phaeoisaria anam. Peroneutypella echidna (Cooke) Deighton, Trans. Br. Mycol. Soc. 62: 249 (1974). Fig. 3.

The material studied by Deighton (1974) was very scanty with few synnemata and ellipsoid to obovoid, non-septate, pale olivaceous conidia of an unmistakable *Phaeoisaria* species. No additional information had been published in order to establish the range of size of the conidia, according to Deighton (1974).

Habitat: On bark.

Distribution: Australia.

Description and illustration: Deighton (1974).

Phaeoisaria glauca (Ellis & Everh.) de Hoog & Papendorf, Persoonia 8: 413 (1976). Fig. 6.

Basionym: *Chloridium glaucum* Ellis & Everh., J. Mycol. 4: 113 (1888).

Also described by the authors from oatmeal agar culture. The conidiophores (as "fertile hyphae") are profusely branched at the apical region and occasionally form a synnemata-like conidiomata. Conidiogenous cells are multilocal, denticulate, cylindrical, tapering towards the apex, producing lacrimiform, ellipsoidal conidia, pointed at the base.

Habitat: On twigs and woods of *Quercus* sp., *Acer* sp., *Buxus sempervirens*, *Parinari capense*.

Distribution: U.S.A., The Netherlands, France, Russia.

Descriptions and illustrations: de Hoog & Papendorf, Persoonia 8: 412 (1976).

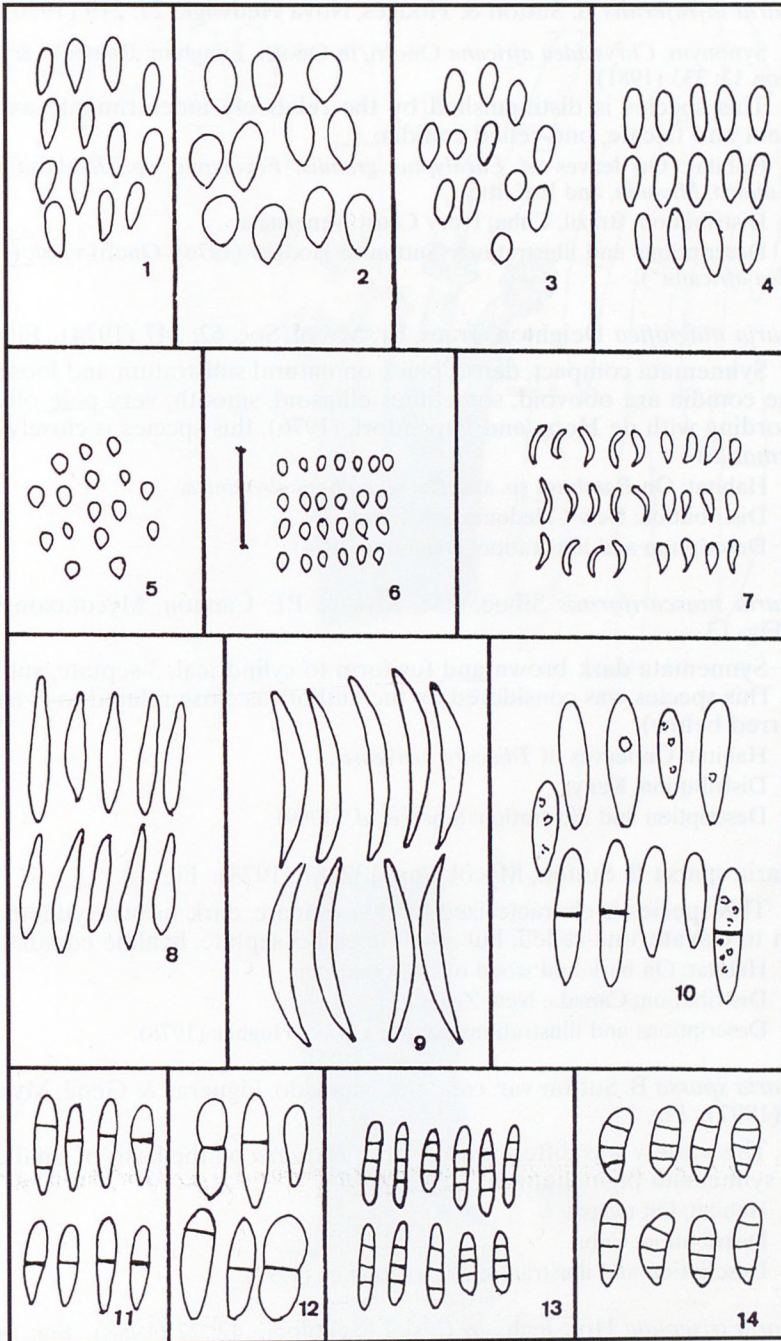


Fig. 1-14. Representative conidia of *Phaeoisaria* spp. and *Helicominia triseptata*. 1: *P. clematidis*, 2: *P. magnifica*, 3: *P. anam*, *Peroneutypella echidna*, 4: *P. caffera*, 5: *P. clavulata*, 6: *P. glauca*, 7: *P. curvata*, 8: *P. tuberculata*, 9: *P. infrafertilis*, 10: *P. sparsa*, 11: *P. sparsa* var. *cubensis*, 12: *P. uniseptata*, 13: *P. muscariformis*, 14: *H. triseptata*. Bar = 10 μ m.

Phaeoisaria infrafertilis B. Sutton & Hodges, *Nova Hedwigia* 27: 219 (1976). Fig. 9.

Synonym: *Chryseidea africana* Onofri, in Onofri, Lunghini, Rambelli & Lustrati, *Mycotaxon* 13: 333 (1981).

This species is distinguished by the relatively indeterminate axis of its synnemata and falcate, one-celled conidia.

Habitat: On leaves of *Eucalyptus grandis*, *Eucalyptus* sp., *Jambosa vulgaris*, *Pimenta dioica*, *Miconia*, and leaf litter.

Distribution: Brazil, Cuba, Ivory Coast, Venezuela.

Descriptions and illustrations: Sutton & Hodges (1976), Onofri *et al.* (1981, "as *Chryseidea africana*").

Phaeoisaria magnifica Deighton, *Trans. Br. Mycol. Soc.* 62: 247 (1974). Fig. 2.

Synnemata compact, dense, black on natural substratum and loose in culture. The conidia are obovoid, sometimes ellipsoid, smooth, very pale olivaceous and according with de Hoog and Papendorf, (1976), this species is closely related to *P. clematidis*.

Habitat: On *Bambusa* sp. and *Oxytenanthera abyssinica*.

Distribution: New Caledonia and Ghana.

Description and illustration: Deighton (1974).

Phaeoisaria muscariformis Siboe, P.M. Kirk & P.F. Cannon, *Mycotaxon* 73: 283 (1999) Fig. 13.

Synnemata dark brown and fusiform to cylindrical, 3-septate, subhyaline conidia. This species was considered by the authors as close related to *P. triseptata* (transferred below).

Habitat: On leaves of *Tiliacora kenyensis*.

Distribution: Kenya.

Description and illustration: Siboe *et al.* (1999).

Phaeoisaria sparsa B. Sutton, *Mycol. Pap.* 132: 87 (1973). Fig. 10.

This species is characterized by determinate, dark brown synnemata and fusiform to clavate, one-celled, but sometimes 1-3 septate, hyaline conidia.

Habitat: On bark and wood of *Acer spicatum*.

Distribution: Canada, New Zealand.

Descriptions and illustrations: Sutton (1973), Hughes (1978).

Phaeoisaria sparsa B. Sutton var. *cubensis*, Mercado, Figueras & Gené, *Mycotaxon* 63: 372 (1997). Fig. 11.

This variety was differentiated from *P. sparsa* on the basis of smaller conidia and synnemata pigmentation.

Habitat: On twigs.

Distribution: Cuba.

Description and illustration: Mercado *et al.* (1997).

Phaeoisaria triseptata Hol.-Jech., in *Ceská Mykologie* 42: 27 (1988). Fig. 14.

Within *Phaeoisaria*, *P. triseptata* Hol.-Jech. (1988) deviates from the presently accepted generic concept. The species is distinguished by having fasciculate to synnematos conidiomata which arise from a rudimentary pseudoparenchymatous stromata, sympodial, terminal conidiogenous cells, becoming intercalary

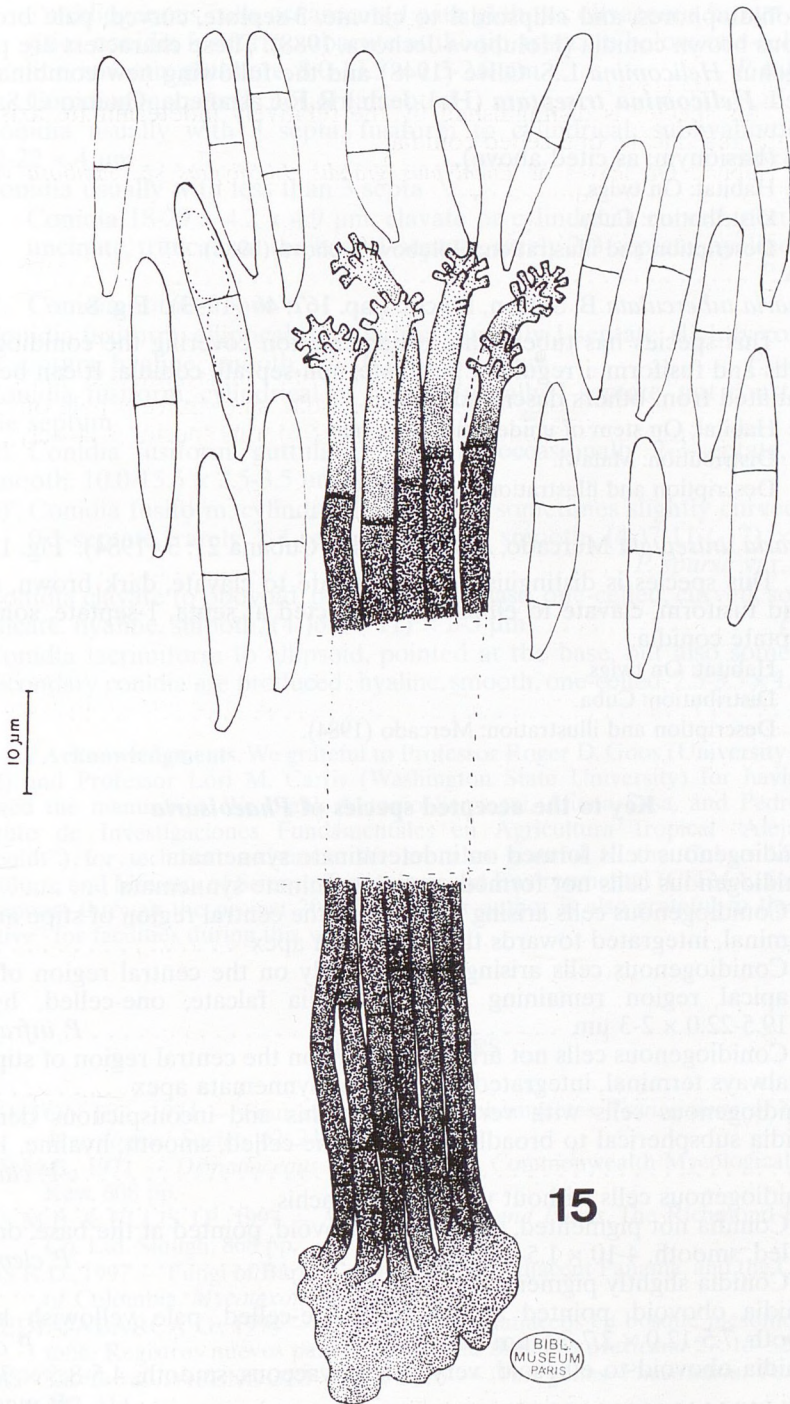


Fig. 15. *Phaeoisaria aguilerae* (ex IMI 386127). Synnema, conidiogenous cells and conidia. Bar = 10 μm.

along conidiophores, and ellipsoidal to clavate, 3-septate, curved, pale brown to olivaceous brown conidia (Holubova-Jechova, 1988). These characters are present in the genus *Helicomina* L.S. Olive (1948) and the following new combination is proposed: *Helicomina triseptata* (Hol.-Jech.) R.F. Castañeda, Guarro et Saikawa comb. nov.

(basionym: as cited above).

Habitat: On twigs.

Distribution: Cuba.

Description and illustration: Holubová-Jechová (1988).

Phaeoisaria tuberculata B. Sutton, Mycol. Pap. 167: 46 (1993). Fig. 8.

This species has tuberculate ornamentation covering the conidiogenous apparatus and fusiform, irregularly guttulate, non-septate conidia. It can be easily differentiated from others described species.

Habitat: On stem of unidentified *Labiatae*.

Distribution: Malawi.

Description and illustration: Sutton (1993).

Phaeoisaria uniseptata Mercado, Acta Botanica Cubana 21: 3 (1984). Fig. 12.

This species is distinguished by subulate to clavate, dark brown, synnemata and fusiform, clavate to ellipsoid, constricted at septa, 1-septate, sometime (0-2)-septate conidia.

Habitat: On twigs.

Distribution: Cuba.

Description and illustration: Mercado (1984).

Key to the accepted species of *Phaeoisaria*

1. Conidiogenous cells formed on indeterminate synnemata 2
- 1'. Conidiogenous cells not formed on indeterminate synnemata 11
2. Conidiogenous cells arising laterally on the central region of stipe and terminal, integrated towards the synnemata apex 3
- 2'. Conidiogenous cells arising only laterally on the central region of stipe, apical region remaining sterile; conidia falcate, one-celled, hyaline, $19.5-22.0 \times 2-3 \mu\text{m}$ *P. infrafertilis*
- 2''. Conidiogenous cells not arising laterally on the central region of stipe and always terminal, integrated towards the synnemata apex 6
3. Conidiogenous cells with very slender rachis and inconspicuous denticles, conidia subspherical to broadly ellipsoid, one-celled, smooth, hyaline, $1-2 \mu\text{m}$ *P. clavulata*
- 3'. Conidiogenous cells without very slender rachis 4
4. Conidia not pigmented, ellipsoid to obovoid, pointed at the base, one-celled, smooth, $4-10 \times 1.5-4.0 \mu\text{m}$ *P. clematidis*
- 4'. Conidia slightly pigmented 5
5. Conidia obovoid, pointed at the base, one-celled, pale yellowish brown, smooth, $7.5-12.0 \times 2.7-3.5 \mu\text{m}$ *P. caffera*
- 5'. Conidia obovoid to ellipsoid, very pale olivaceous, smooth, $4.5-8.5 \times 3-4 \mu\text{m}$ *P. magnifica*
- 5''. Conidia ellipsoid to obovoid, very pale olivaceous, smooth, $3.0-5.5 \times 2.0-2.5 \mu\text{m}$ *Phaeoisaria* anam. *Peroneutypella echidna*

- 6. Conidiogenous cells ornamented with globose, olivaceous brown verrucosities, conidia fusiform, subacute at the tip, truncate below, one-celled, hyaline, smooth, guttulate, $8.0-13.5 \times 1.5-2.0 \mu\text{m}$ *P. tuberculata*
- 6'. Conidiogenous cells not ornamented 7
- 7. Conidia usually with 3 septa, fusiform to cylindrical, subhyaline, smooth, $12-22 \times 4 \mu\text{m}$ *P. muscariformis*
- 7'. Conidia usually with less than 3 septa 8
- 8. Conidia $18-29 \times 4.2 \times 4.9 \mu\text{m}$, clavate or cylindrical, curved, obtuse apex, uncinata, truncate at the base, 1-septate, rarely 2-3-septate, hyaline, smooth *P. aguilerae*
- 8'. Conidia not as above 9
- 9. Conidia fusiform, elliptical to cylindrical, usually 1-septate, slightly constricted at septum, hyaline, smooth, $3.6-10.2 \times 1.6-3.4 \mu\text{m}$ *P. uniseptata*
- 9'. Conidia fusiform, cylindrical or clavate, usually 1-septate, not constricted at the septum 10
- 10. Conidia fusiform, guttulate, 1-septate, occasionally 2-3-septate, hyaline, smooth, $10.0-15.5 \times 2.5-3.5 \mu\text{m}$ *P. sparsa*
- 10'. Conidia fusiform, cylindrical to clavate, sometimes slightly curved, mostly 0-1-septate, rarely 2-4-septate, hyaline, smooth, $(4-7)-11-(-17) \times 2-3 \mu\text{m}$ *P. sparsa* var. *cubensis*
- 11. Conidia clavate to obovoid, pointed at the base, one-celled, curved, sometimes falcate, hyaline, smooth, $(4-6)-8 (-11) \times 2-3 \mu\text{m}$ *P. curvata*
- 11'. Conidia lacrimiform to ellipsoid, pointed at the base, but also some globose secondary conidia are produced; hyaline, smooth, one-celled, $2.5-3.5 \times 1.6-2.2 \mu\text{m}$ *P. glauca*

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REFERENCES

DEIGHTON F.C., 1974 — Four synnematosous hyphomycetes. *Transactions of the British Mycological Society* 62: 243-252.

ELLIS M.B., 1971 — *Dematiaceous Hyphomycetes*, Commonwealth Mycological Institute, Kew, 608 pp.

ELLIS M.B. & ELLIS J.P., 1997 — *Microfungi on Land Plants*. The Richmond Publishing Co. Ltd. Slough, 868 pp.

GOOS R.D., 1997 — Fungi of Barro Colorado Island, adjacent Panama, and the Cali region of Colombia. *Mycotaxon* 64: 375-383.

HEREDIA-ABARCA G., 1994 — Hifomicetes dematiaceos en bosque mesófilo de montaña. Registros nuevos para Mexico. *Acta Botánica Mexicana* 27: 15-32.

HOOG G.S. de & PAPENDORF M.C., 1976 — The genus *Phaeoisaria*. *Persoonia* 8: 407-414.

HÖHNEL F. von, 1909 — Fragmente zur Mycologie. VI. Mitteilung. In *Sber. Akad. Wiss. Wien, Abt. I*, 118: 275-452.

- HOLUBOVÁ-JECHOVÁ V., 1988 — Studies on Hyphomycetes from Cuba. VII. Seven new taxa of dematiaceous hyphomycetes. *Ceská Mykologie* 42: 23–30.
- HUGHES S.J., 1958 — Revisiones Hyphomycetum aliquot cum appendice de nominibus rejiciendis. *Canadian Journal of Botany* 36: 727–836.
- HUGHES S.J., 1978 — New Zealand Fungi. 25. Miscellaneous species. *New Zealand Journal of Botany* 16: 311–370.
- MASON E.W. & ELLIS M.B., 1953 — British species of *Periconia*. *Mycological Papers* 56: 1–127.
- MATSUSHIMA T., 1975 — *Icones Microfungorum a Matsushima Lectorum*, published by T. Matsushima, Kobe, 209 pp.
- MATSUSHIMA T., 1993 — *Matsushima Mycological Memoirs* 7: 1–75. Published by T. Matsushima, Kobe.
- MATSUSHIMA T., 1996 — *Matsushima Mycological Memoirs* 9: 1–40. Published by T. Matsushima, Kobe.
- MERCADO SIERRA A., 1984 — Nuevas especies de *Deightoniella*, *Phaeoisaria*, *Sporidesmium*, y *Taeniolella* (Hyphomycetes) de Cuba. *Acta Botánica Cubana* 21: 1–10.
- MERCADO SIERRA A., FIGUERAS M.J. & GENÉ J., 1997 — New or rare hyphomycetes from Cuba. VIII. Species of *Lylea*, *Phaeoisaria*, *Arxiella*, *Graphium*, *Periconia*, and *Ramichloridium*. *Mycotaxon* 63: 369–375.
- MORRIS E.F., 1963 — The synnematos genera of the fungi imperfecti. *Illinois University Ser. Biological Science* 3: 1–137.
- NAG RAJ T.R., 1993 — *Coelomycetes anamorphs with appendage-bearing conidia*. Mycologue Publications, Ontario, 1101 pp.
- OLIVE L.S., 1948 — Taxonomic notes on Louisiana fungi. I. *Mycologia* 40: 6–20.
- ONOFRI S., LUNGHINI D., RAMBELLI A. & LUSTRATI L., 1988 — New dematiaceous hyphomycetes from tropical rain forest litter. *Mycotaxon* 13: 331–338.
- SEIFERT K.A., 1990 — Synnematos Hyphomycetes. *Memoirs of the New York Botanical Garden* 59: 109–154.
- SIBOE G.M., KIRK P.M. & CANNON P.F., 1999 — New dematiaceous hyphomycetes from Kenyan rare plants. *Mycotaxon* 73: 283–302.
- SUTTON B.C., 1973 — Hyphomycetes from Manitoba and Saskatchewan, Canada. *Mycological Papers* 132: 1–143.
- SUTTON B.C., 1993 — Mitosporic fungi from Malawi. *Mycological Papers* 167: 1–93.
- SUTTON B.C. & HODGES C.S., 1976 — Eucalyptus microfungi. *Microdochium* and *Phaeoisaria* species from Brazil. *Nova Hedwigia* 27: 215–222.
- TUBAKI K., 1973 — Descriptive catalogue of I.F.O. cultures collection. *IFO Res. Comm.* 6: 83–94.
- UDAGAWA S. & TAKADA M., 1971 — Soil and coprophilous microfungi, in Kobayasi Y. *Mycological Reports from New Guinea and the Solomon Islands (I-II)*. *Bulletin of the Natural Science Museum, Tokyo* 13: 501–515.