# MYCOTAXON

*AN INTERNATIONAL JOURNAL DESIGNED TO EXPEDITE PUBLICATION OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI & LICHENS*

Vol. VI October-December 1977 No. 2

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[MYCOTAXON for July-September 1977 (6: 1-212) was issued July 30, 1977]

*ISSN 0093-4666* *MYXNAE 6(2) 213-420 (1977)*

*Library of Congress Catalogue Card Number 74-7903*

*Published quarterly by MYCOTAXON, Ltd., P.O. Box 264, Ithaca NY 14850*

*For subscription details, see back cover*

MYCOTAXON

Vol. VI, No. 2, pp. 213-214 October-December 1977

# VALIDATION OF SUBCLASS CERATIOMYXOMYCETIDAE AND ORDER CERATIOMYXALES (CLASS MYXOMYCETES)

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Recent taxonomic treatments of the Myxomycetes (Martin & Alexopoulos, 1969; Alexopoulos, 1973; Nannenga-Bremekamp, 1974; Farr, 1976) have employed the ordinal taxon "Ceratiomyxales" in neglect of the fact that it is not validly published.

To rectify this situation, a brief Latin diagnosis is provided here, in accordance with Article 32 of the International Code of Botanical Nomenclature.

Order Ceratiomyxales Martin ex Farr & Alexopoulos

Ceratiomyxales Martin, G. W. 1949. No. Amer. Fl. 1(1): 5. Nomen seminudum.

Ut in diagnosi cohortis "Exosporeae" Rostafinski (=subclassis "Ceratiomyxomycetidae" Martin) descripta.

The subclass Ceratiomyxomycetidae Martin is not validly published in the work usually cited, Ainsworth,

G. C. 1961. Dictionary of the Fungi, ed. 5, p. 497. Instead, it dates from Martin & Alexopoulos (1969), where reference is made to the description of "Cohors Exosporeae" by Rostafinski. The subclass is, therefore, to be authored by Martin ex Martin & Alexopoulos.

Olive (1975) classifies these organisms in the subclass Protostelia, order Protosteliida, as family Ceratiomyxidae Schroeter, 1897.

## LITERATURE CITED

ALEXOPOULOS, C. J. 1973. Myxomycetes. In THE FUNGI, an advanced treatise (G. C. Ainsworth, F. K. Sparrow, and A. S. Sussman, eds.). Vol. IV B, Ch. 3: 39-60. pl. IV. Acad. Press, New York.

FARR, M. L. 1976. Myxomycetes. Flora Neotropica Mon. No. 16. 304 pp. 9 figs. New York.

MARTIN, G. W. and C. J. ALEXOPOULOS. 1969. The Myxomycetes. 561 pp., incl. 41 col. pls. Univ. of Iowa Press, Iowa City.

NANNENGA-BREMEKAMP, N. E. 1974. De Nederlandse Myxomyceten. 440 pp., 13 pls., many unnumb. text-figs. Nederl. Natuurhist. Ver., Zutphen (Netherlands).

OLIVE, L. S. 1975. The Mycetozoans. 293 pp. 251 figs. Acad. Press, New York.

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Vol. VI, No. 2, pp. 215-260 October-December 1977

# THE OSTROPALEAN FUNGI II: SCHIZOXYLON, with notes on STICTIS, ACAROSPORINA, COCCOPEZIZA, AND CARESTIELLA

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SUMMARY

Twenty-five species of *Schizoxylon* not discussed in a previous paper on the Ostropalean fungi (Sherwood, 1977) are treated. Eight are retained in the genus and redescribed, two are transferred to *Stictis*, one to *Acarosporina*, and eight are considered to be non-Ostropalean. Five new species of *Stictis* are described. *Carestiella* is accepted as Ostropalean and *Coccopeziza* is shown to be a later synonym of *Arthonia*. A key to all hitherto known species of *Schizoxylon* is provided.

## INTRODUCTION

In a previous paper (Sherwood, 1977) I discussed the general characters of the Ostropales, and provided a key to genera and descriptions of individual genera. Only the North American species of *Schizoxylon* were treated there. In the course of investigating the non-North American species of *Schizoxylon* and unidentified material in that genus I encountered several species of *Stictis* not covered in the previous treatment. In addition I examined the types of two genera formerly assigned to the Stictidaceae, *Coccopeziza* and *Carestiella*. The results are presented below. The genera are listed in alphabetical order, and the species are listed in alphabetical order under each generic heading. Synonyms not found in the previous paper are cross-referenced. Materials and methods were identical to those described in the previous paper (Sherwood, 1977).

(1). *ACAROSPORINA* Sherwood, Mycotaxon 5: 33 (1977)

*(11.* ACAROSPORINA HORMOSPORA (Speg.) Sherwood, comb. nov.
≡ *Schizoxylon hormosporum* Speg., An. Soc. Ci. Argent. 10: 148 (1880)
= *Schizoxylon abutilonis* Cash, Mycologia 30: 97 (1938)

Figure 1

1. Present address: Farlow Herbarium, Harvard University, Cambridge, Mass. 02138 USA.

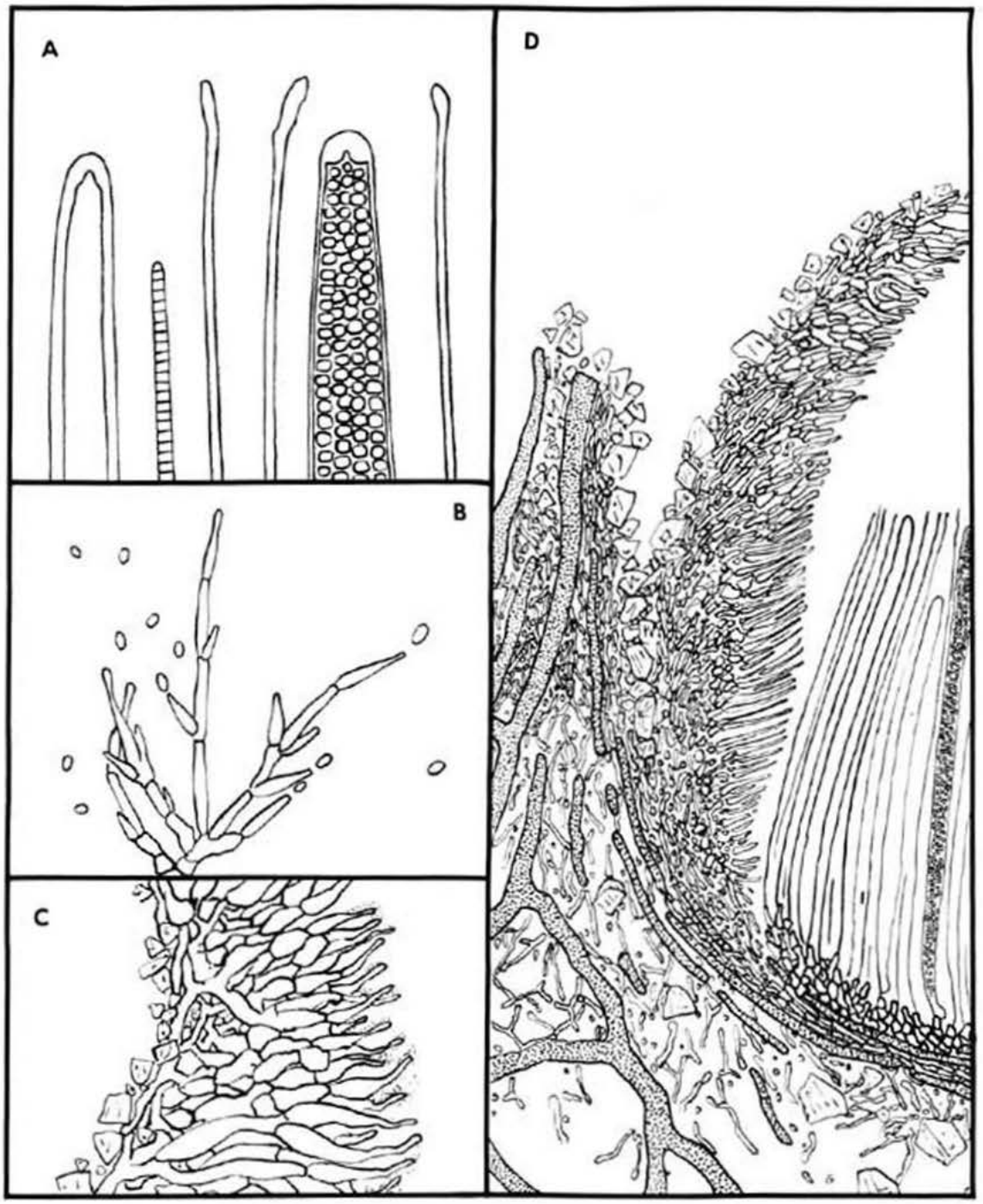


Figure 1. *Acarosporina hormospora*. A. Detail of apices of asci, paraphyses, spores, and part-spores, x1500. B. Imperfect stage? x750. C. Detail of upper periphysoids, x750. D. Cross section of margin, x300. Drawn from the holotype of *Schizoxylon abutilonis*.

Apothecia at first immersed, opening by a pore and finally becoming partially erumpent, densely gregarious, often clustered, 0.3-1.0 mm broad, with an annulate margin, remaining for a long time covered by a dark grey-pruinose peridium, opening by a pore (rarely by a transverse slit), the disc deeply immersed, pale ochraceous, splitting away

from the margin when dry. Margin in cross section predominantly periphysoidal (as in *Stictis* sect. *Lichenopsis* [Schw.] Sherw.), lacking a distinct internal crystalline layer, the wall 25-30 µm thick, somewhat gelatinous, of interwoven colorless hyphae 1.5-3.0 µm diam., crystalliferous in the upper part and splitting away from the substrate. Upper periphysoids brown, 30-40 x 3-4.5 µm, not gelatinous, branched, forming a compact layer. Lower periphysoids 30-40 x 1.5 µm, simple to sparingly branched, colorless. Subhymenium colorless, 5-10 µm thick. Asci and paraphyses apices J+ blue. Paraphyses filiform, colorless, 1.0 µm diam. below, scarcely enlarged above, simple. Asci 150-200 x 4-5(-7) µm, the cap 2.5 µm thick, with a narrow pore. Spores 8, 1.2 µm diam., at first septate with cells 1.0 µm long, breaking up into cubical or globose part-spores 1.2 µm diam.

On woody plants, associated with cankers, Hawaii and Argentina. The Hawaiian specimen has sporodochia producing unicellular colorless phialospores associated with it. This is unlike the pycnidial stages associated with other species of *Schizoxylon* and is probably a different fungus. Except that the apothecia in Spegazzini's collections are smaller (0.3-0.6 mm) than those of the type of *S. abutilonis*, I find no character to separate the two species.

SPECIMENS EXAMINED: OCEANIA: Hawaii (BPI, on *Abutilon molle*, N. Honolulu, Shear & Stevens 551, 18.I.1928, holotype of *Sch. abutilonis*). SOUTH AMERICA: Argentina (LPS 28218, on *Populus italica*, Buenos Aires, 16.V. 1880, holotype of *Sch. hormosporum*; LPS 38650, La Plata, VIII.1900, Spegazzini).

(2). *CARESTIELLA* Bresadola, Malpighia 11: 274 (1897)

*(1). CARESTIELLA SOCIA* Bres. , l.c.

Figure 2

Apothecia at first immersed in decorticated wood, becoming partially erumpent, 0.5-1.0 mm diam., the margin narrow, black, entire, lacking crystals, the disc moderately deeply immersed, black, not splitting away from the margin when dry. Margin in cross section c. 120 µm thick, the outermost portion of tightly compacted dark brown hyphae 1.5-3.0 µm diam., the inner portion of widely-spaced, inward-pointing, branched interwoven hyphae with free ends. Paraphyses filiform, slightly longer than the asci, 1.0 µm diam. below, the apices enlarged to 2-3 µm, brown, J+ blue, forming an epithecium. Marginal paraphyses brown along their entire length, in an agglutinated layer 2-3 cells thick. Subhymenium c. 30 µm thick, of somewhat loosely-packed cells 2-3 µm diam., resting on an obscure pale brown continuation of the wall, the substrate beneath invaded by hyphae but barely compressed. Asci 90-110 x 11(-15) µm, very thick-walled when young, appearing bitunicate but without a demonstrable jack-in-the-box mechanism, the cap 2-2.5 µm thick, with a broad pore. Spores ultimately 32/ascus, 36-45 x 2.0 µm, colorless (pale brown when old and shrivelled), slightly curved, multiseptate, the cells 4-7 µm long.

On wood, Italy. Known only from a fragmentary type collection. The material I examined was fully mature and it

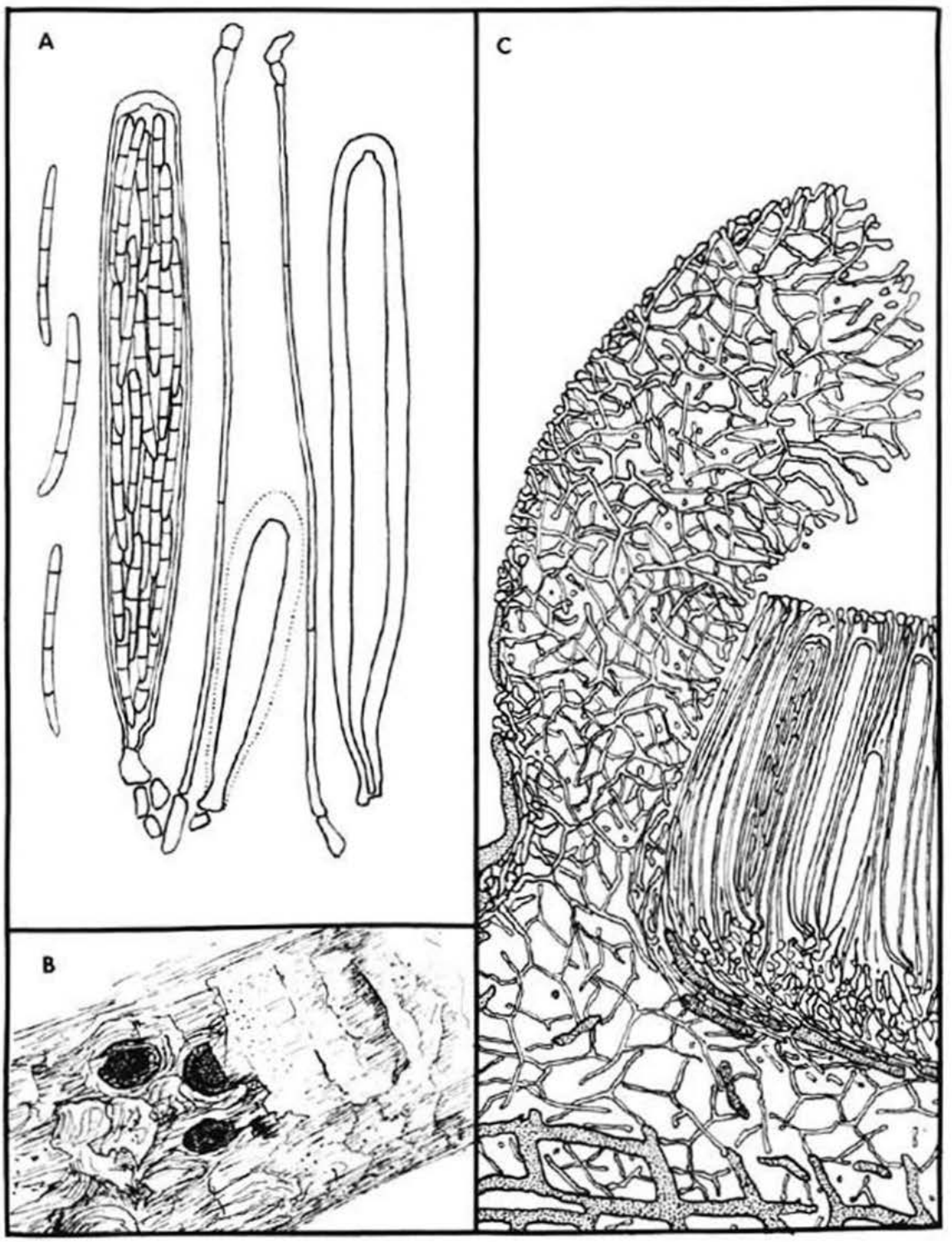


Figure 2. *Carestiella socia*. A. Asci, paraphyses, and spores, x750. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype.

was unclear whether the asci were initially polysporous or whether the polysporous condition arises from disarticulation of filiform spores. The external appearance of the species and the structure of the margin and asci recall *Stictis*

*schizoxyloides* Ell. & Ev. *Carestiella*, a monotypic genus based on *C. socia*, would appear to be a distinct genus of the Ostropales, differing from *Schizoxylon* in its marginal structure and from *Stictis* in marginal structure and polysporous asci. Although the margin separates readily from the hymenium when mounted for microscopic observation it does not do so in the dried material. The margin of *C. socia* may be more flexible than in most species of *Stictis*.

SPECIMEN EXAMINED: EUROPE: Italy (S, herb. Bresadola, holotype of *Carestiella socia*)

(3). *(COCCOPEZIZA)* Hariot & Karsten, Rev. Mycol. (Toulouse) 12: 128 (1890)

= *Arthonia* Ach., Neues J. Bot. 3(3): 3 (1806)

The type specimen of the holotype species, *C. ootheca* Har. & Karst., is an *Arthonia* with unequally 2-celled spores 15 x 4.5 µm, perhaps *A. galactites* (DC) Duf., which occurs on *Populus* and has spores of these dimensions.

SPECIMEN EXAMINED: EUROPE: France (H, Gallia, in cortice levi *Populi albae*, c, 1890, leg. P. Hariot Det. P. A. Karsten 1623, presumed holotype of *Coccopeziza ootheca*).

(4). *SCHIZOXYLON* Pers., Ann. Wetterauischen Ges. Gesammte Naturk. 2: 11 (1810)

The nomenclature, generic characters, and North American species of *Schizoxylon* were treated in a separate paper (Sherwood, 1977). The remaining, non-North American species are treated here. All known species are uncluded in the key; page references are provided for those species treated in the previous publication ("OF 1"). Additional records and synonyms are provided for some of these species.

Accepted and excluded species are listed in alphabetical order. Excluded species are enclosed in parentheses.

## KEY TO SPECIES OF SCHIZOXYLON

1. Apothecia developing beneath a clypeus, at maturity surrounded by a massive stromatic involucrum (subgen. *Stromatostropa*). *Schizoxylon emergens*

1'. Apothecia without an obvious clypeus or stromatic involucrum, although sometimes with a fairly prominent thalline margin (subgen. *Schizoxylon*) (2)

2(1'). Part-spores 4-seriate or less than 4-seriate in the mature ascus (asci 4-spored or spores much shorter than the ascus) (3)

2'(1'). Ascospores and part-spores more than 4-seriate in the ascus (Asci 8-spored; spores nearly as long as the asci (6)

3(2). Part-spores globose, 3.5-5 µm diam. *S. juniperinum* OF 1: 126

3'(2). Part-spores cylindrical (4)

4(3'). Part-spores 5-7 µm broad. *S. crassisporum* OF 1: 121

4'(3'). Part-spores 3-3.5 µm broad (5)
5(4'). Marginal hyphae brown. Margin not exceeding 75 µm in thickness. *S. compositum* OF 1: 119
5'(4'). Marginal hyphae colorless. Margin 200-300 µm broad. *S. crassum* OF 1: 124
6(2'). Ascospores not regularly disarticulating (7)
6'(2'). Ascospores regularly disarticulating into simple or septate part-spores (17)
7(6). Asci not over 150 µm long; ascospores 5 µm broad. *S. pseudocyanosporum*
7'(6). Asci over 150 µm long; ascospores less than 3 µm broad (8)
8(7'). Marginal hyphae brown (9)
8'(7'). Marginal hyphae colorless (12)
9(8). Apothecia white, grey, or yellow-pruinose. Asci over 300 µm long (10)
9'(8). Apothecia black, shining, not pruinose. Asci 250-300 µm long. *S. lantanae* OF 1: 129
10(9). Ascospores 450-500 x 1.0-1.2 µm. Margin bright yellow. *S. sulfurinum* OF 1: 138
10'(9). Ascospores 400 µm long or less; margin grey-pruinose (11)
11(10'). Ascospores 1.5-2.0 µm broad. Margin not notably gelatinous. *S. alboatrum* OF 1: 111
11'(10'). Ascospores 2.0-2.5 µm broad. Margin very thick and gelatinous. *S. pachychlamydum*
12(8'). Paraphyses apices brown, J+ or J-. *S. cordobensis* OF 1: 121
12'(8'). Paraphyses apices colorless, J- (13)
13(12'). Ascospores 2.5-3.0 µm broad (14)
13'(12'). Ascospores 1.0-2.0 µm broad (15)
14(13). Ascus cap 2.0 µm thick, indistinct. Apothecia very large (up to 3 mm diam.) *S. gigas*
14'(13). Ascus cap 7.5 µm thick. Apothecia c. 1 mm diam. *S. pallescens*
15(13'). Asci 600-700 µm long. Apothecia often taller than broad. *S. andinum*
15'(13'). Asci 500 µm long or less (16)
16(15'). Ascospores 300-500 x 2.0 µm. Disc pruinose, plane. North America. *S. melleum* OF 1: 131
16'(15'). Ascospores 300-350 x 1.75 µm; disc epruinose, concave. South Africa. *S. bellum* OF 1: 113
17(6'). Asci more than 300 µm long (18)
17'(6'). Asci less than 300 µm long (21)
18(17). Asci 500 µm long. Margin black, carbonized. (*S. broteriana*, an imperfectly known species, will also key here). *S. involutum* OF 1: 126
18'(17). Asci 300-350 µm long. Margin thin, colorless (19)
19(18'). Apothecia with a distinct stellate margin. *S. floridanum*
19'(18'). Apothecia with an entire margin (20)
20(19'). Part-spores 2.0 µm broad. Africa. *S. pruiniferum* OF 1: 137
20'(19'). Part-spores 2.5-3.5 µm broad. North America. *S. schweinitzii*

21(17'). Part-spores septate (22)
21'(17'). Part-spores unicellular (27)
22(21). Part-spores 1-septate (23)
22'(21). Part-spores multiseptate (26)
23(22). Part-spores 2-2.5 µm broad.
*S. berkeleyanum* OF 1: 115
23'(22). Part-spores more than 3 µm broad (24)
24(23'). Hymenium intensely J+ blue (25)
24'(23'). Hymenium J-. Minute graminicolous species with a very reduced margin. *S. pratense*
25(24). Asci without a distinguishable apical cap.
*S. compositum* OF 1: 119
25'(24). Asci with a distinct apical cap 2.5 µm thick,
*S. centauriae*
26(22'). Part-spores 3-5 septate.
*S. microstomum* OF 1: 134
26'(22'). Part-spores 10 or more septate.
*S. buriticae* OF 1: 117
27(21') Asci 15-18 µm broad. Part-spores more than 8-seriate. *S. nigrellum* OF 1: 134
27'(21'). Asci 6-14 µm broad. Part-spores 8-seriate (28)
28(27'). Epithecium intensely J+ blue (29)
28'(27'). Epithecium J- (34)
29(28). Part-spores globose or cubical, isodiametric (30)
29'(28). Part-spores cylindrical (31)
30(29). Part-spores globose. Argentina.
*S. taenioides*
30'(29). Part-spores cubical. Australia.
*S. lividum*
31(29'). Part-spores 3-4 µm broad (32)
31'(29'). Part-spores less than 3 µm broad (33)
32(31). Margin greenish or yellowish, KOH+ yellow.
*S. compositum* OF 1: 119
32'(31). Margin pale brown, KOH-. *S. argentinum*
33(31'). Asci 100-140 µm long. *S. henningsianum*
33'(31'). Asci 180-200 µm long.
*S. berkeleyanum* var? OF 1: 115
34(28'). Part-spores 3-3.5 µm broad; ascocarps fleshy when moist. *S. ligustri* OF 1: 129
34'(28'). Part-spores 2.5 µm broad; ascocarps carbonized. *S. sepincola* OF 1: 138

## INCLUDED AND EXCLUDED SPECIES OF SCHIZOXYLON

*(1). (SCHIZOXYLON ABUTILONIS)* see *Acarosporina hormospora*

*(2). SCHIZOXYLON ALBO-VELATUM* Rick, Broteria 3: 289 (1904)

According to the original description this Brazilian species had erumpent apothecia 2 mm broad, with a grey-white margin and colorless disc, asci 800 x 14 µm, and ascospores 4 µm broad which disarticulated to form 1-septate part-spores which subsequently disarticulated to form simple part-spores 8 µm long. Paraphyses were said to be branched and longer than the asci. I received no answer to inquiries for type material of this species. According to Rick (l.c.)

the species might have been referred to *Robergea* Desm. and resembled *Schizoxylon* only in possessing disarticulating spores. The description of a fungus with an exposed hymenium, branched paraphyses, and an ascocarp considerably broader than tall suggests *Schizoxylon* rather than *Robergea*. The species should be recognizable if recollected.

*(3). (SCHIZOXYLON ALNEUM)* Feltgen, Vorstud. Pilzfl. Luxemburg suppl. 2: 90 (1901)
= *Vibrissea filisporia* (Bon.) Korf & Sánchez, J. Agric. Univ. Puerto Rico 51: 85 (1967), according to A. Sánchez (note with specimen).

SPECIMEN EXAMINED: EUROPE: Luxemburg (FH-Höhnel A4659, an *Alnus*-Zw., Schimpach, 9.1900, Feltgen, isotype of *S. alneum*)

*(4). SCHIZOXYLON ANDINUM* Patouillard, Bull. Soc. Mycol. France 11: 220 (1895)

Figure 3

Apothecia at first immersed, becoming partially erumpent, 0.5-0.8 (-1.0 fide Patouillard) mm diam., nearly a millimeter tall (generally taller than broad), orbicular in face view, reddish-brown pruinose, somewhat darker towards the center, without an exposed disc, defined slit, or ostiole. Margin in cross section entirely colorless, without a prominent accessory thalline margin, 10-20 µm broad below, enlarged to 100-150 µm above, the hyphae 1.5-2.5 µm diam.; crystals scattered, non-rosettiform, not forming a distinct layer. Periphysoids absent. Asci 600-700 x 8-10 µm, strictly cylindrical, thick-walled when young, the cap 2.0 µm thick. Paraphyses numerous, filiform, J- throughout, colorless, sometimes branched and slightly swollen at the apex, not forming an obvious epithecium. Ascospores 8, nearly as long as the asci, 2.5-3.0 µm broad, the cells 4-6 µm long, not sheathed, coiling, or disarticulating.

On wood, Ecuador. The type specimen appears to be slightly immature, as the margin is still closed above the hymenium. It is possible that this is an *Ostropa* Fr. rather than a *Schizoxylon*; superficially it appears rather similar to *O. cinerea* (Pers.) Fr. var. *virens* (Otth) Sherw.

SPECIMEN EXAMINED: SOUTH AMERICA: Ecuador (FH-Patouillard 5009, Pululahua, sur brindille de bois pourri, Lagerheim, holotype of *Schizoxylon andinum*)

*(5). SCHIZOXYLON ARGENTINUM* Speg., An. Soc. Ci. Argent. 9: 186 (1880)

Figure 4

Apothecia at first immersed, opening by a pore and at length becoming somewhat erumpent, 0.5-0.75 mm diam., the margin raised, white to pale brown, strongly pruinose, the disc tan, pruinose, concave, not splitting away from the margin when dry. Margin in cross section c. 30 µm thick, of colorless interwoven hyphae 1.5 µm diam., becoming pale brown near the apex, surrounded by a prominent, predominantly crystalline thalline margin. Subhymenium colorless, 10 µm thick, resting on a prominent crystalline layer, J-. Asci

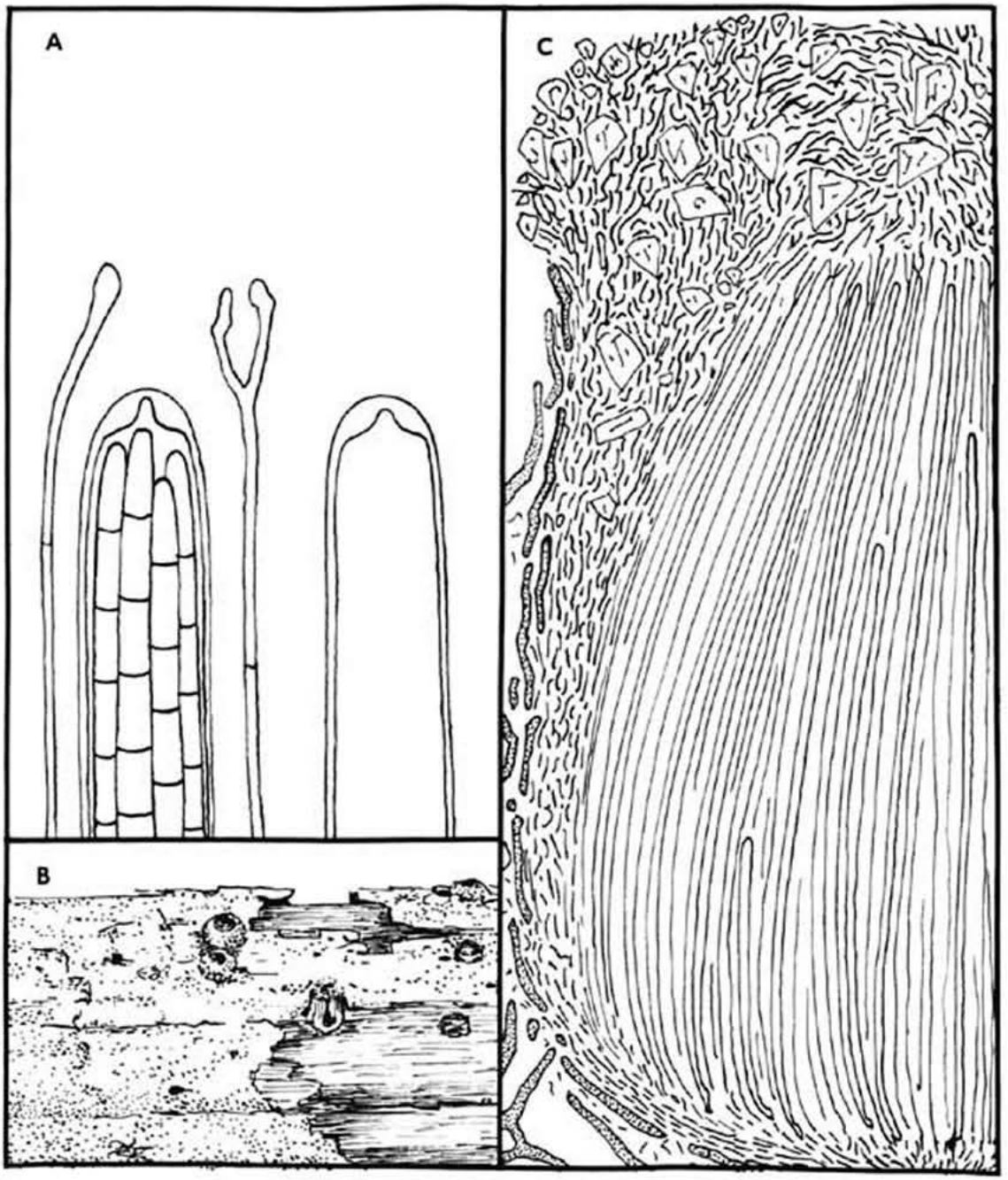


Figure 3. *Schizoxylon andinum*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x150. Drawn from the holotype.

220-250 (-300 fide Spegazzini) x 8-9(-15) µm, the cap 3.0 µm thick, pierced by a broad pore, not distinct. Paraphyses filiform, 1.0 µm broad below, brown above, much-branched but scarcely enlarged at the apex, abundantly crystalliferous. Ascospores 8 (sometimes fewer), nearly as long as the asci, soon breaking apart into segments 5-8 x 3-4 µm.

On wood, Argentina. The type collection contains only a few fertile apothecia and was evidently rather old when collected. Both the original description and the type-

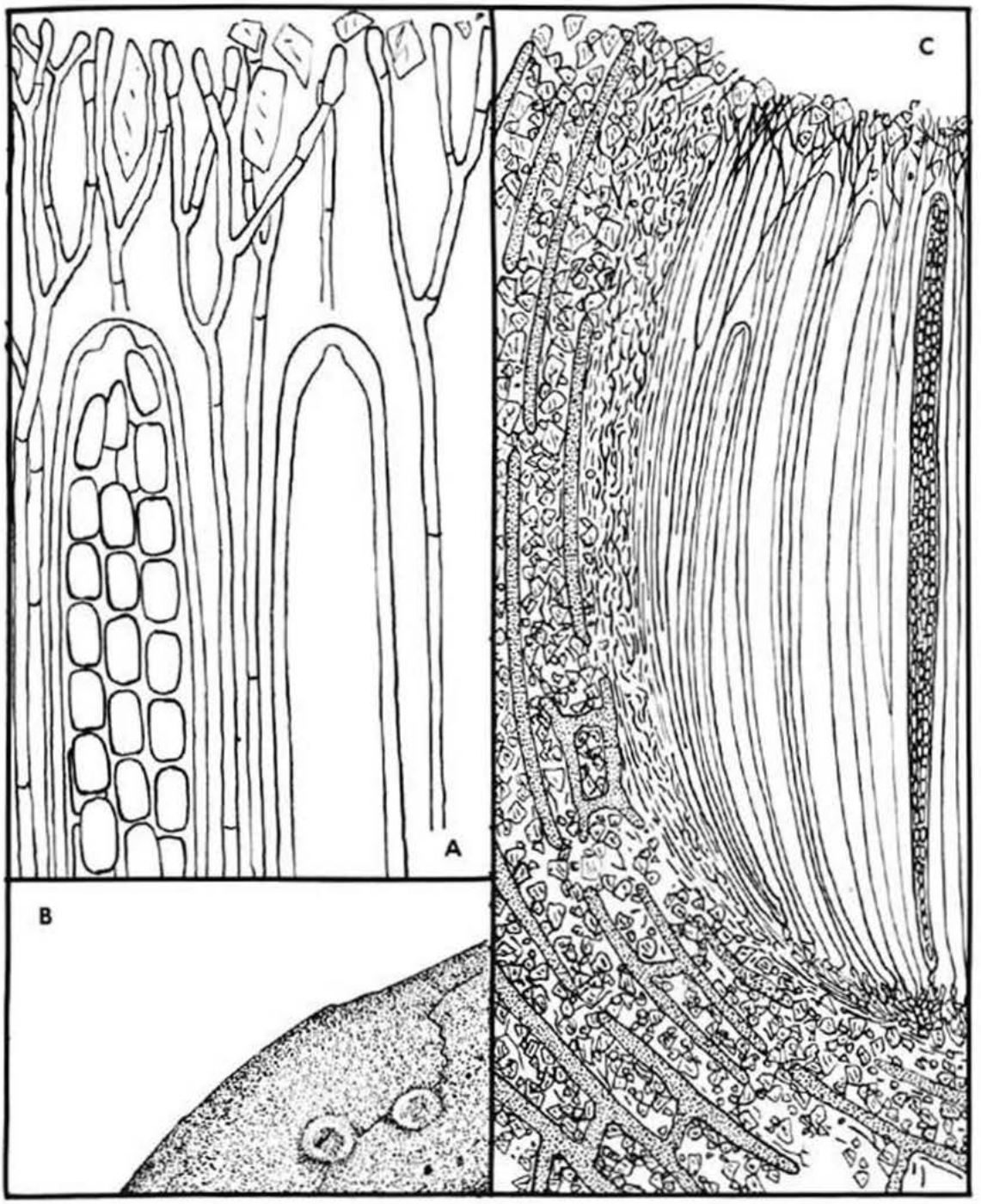


Figure 4. *Schizoxylon argentinum*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype.

written label on the packet list the host as *Bauhinia*, but Spegazzini's handwritten label inside the packet lists the host as *Robinia pseudacacia*. There seems to be only one species of *Schizoxylon* in the packet. Spegazzini gives the measurements of the asci as "300 x 15-20 μ" and the part-spores as "10-12 x 5 μ". Perhaps he examined abnormal asci.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28214, s/ *Bauhinia aculata*, Buenos Aires, La Recoleta, II-1880, holotype of *S. argentinum*)

*(6). SCHIZOXYLON ASPHODELII* see *S. centauriae*

*(7). SCHIZOXYLON BAGNISIANUM* see *S. ligustri*

*(8). (SCHIZOXYLON BAMBUSINUM)* Speg., Bol. Acad. Nac. Ci. 11: 588 (1889)

The type specimen contains a few apothecia of a *Stictis*, probably *S. stellata* Wallr. (I did not examine it microscopically). The apothecia with a dark disc, asci 45-50 x 8-9, spores 2 x 1 1/2 , chlorino-oliv. of Spegazzini's description would most plausibly appear to be a parasite in the hymenium of this *Stictis*. It consists of pads of stromatic tissue with vertically-oriented hyphae (not paraphyses), brown near the surface and hyaline within, containing pockets of innumerable brown spores of the dimensions ascribed to them by Spegazzini. This is definitely no *Schizoxylon*. If it is an Ascomycete at all the asci have completely disintegrated.

SPECIMEN EXAMINED: SOUTH AMERICA: Brazil (LPS 28213, Apiahy, Puiggari 2386, holotype of *S. bambusinum*)

*(9). SCHIZOXYLON BERKELEYANUM* (Dur. & Lév.) Fckl. (OF 1: 115)

*Sphaeria xantholeuca* Fr., cited as a possible synonym by Sherwood (1977), is typified by a fungus consisting of transluscent, flesh-colored, orbicular erumpent fruitbodies with obscure hairlike appendages and no obvious ostiole. It is definitely not a *Schizoxylon* and is probably Tuberculariaceous. The genus *Sphaerolina* Fckl., based on this species, should not be considered a synonym of *Schizoxylon*.

SPECIMEN EXAMINED: EUROPE: Switzerland (UPS, Herb. Fries, caule *Epilobii*, ex Helveti, apparent holotype of *Sphaeria xantholeuca*)

*(10). SCHIZOXYLON CENTAURIAE* Bres., Atti R. Acc. Sci., Lett. Arti Agiati Roverto 8: 135 (1902)
= *S. asphodelii* Maire, Bull. Soc. Mycol. France 46: 239 (1930)

Figure 5

Apothecia at first immersed, soon becoming strongly erumpent, 0.5-1.5 mm diam., the margin thick, entire, white-pruinose with a faint yellowish or greenish tinge, KOH+ yellow, the disc dark grey, strongly white-pruinose, not depressed. Margin in cross section c. 100 µm thick above, narrower below, of interwoven, crystalliferous, slightly gelatinous pale brown hyphae 2.0 µm diam. Accessory thalline margin inconspicuous. Subhymenium colorless, c. 50 µm thick, J-, resting directly on disintegrating host tissue. Asci 250 x 9(-11-12) µm, 8 or fewer per ascus (rarely 4), soon breaking up into part spores which are 5-7 x 3-3.5 µm, rarely longer and 2-3 septate. Paraphyses J+, 1.0 µm broad below, enlarged to 1.5-2 µm at the apex, branched, brown, slightly crystalliferous, forming an epithecium 75 µm thick.

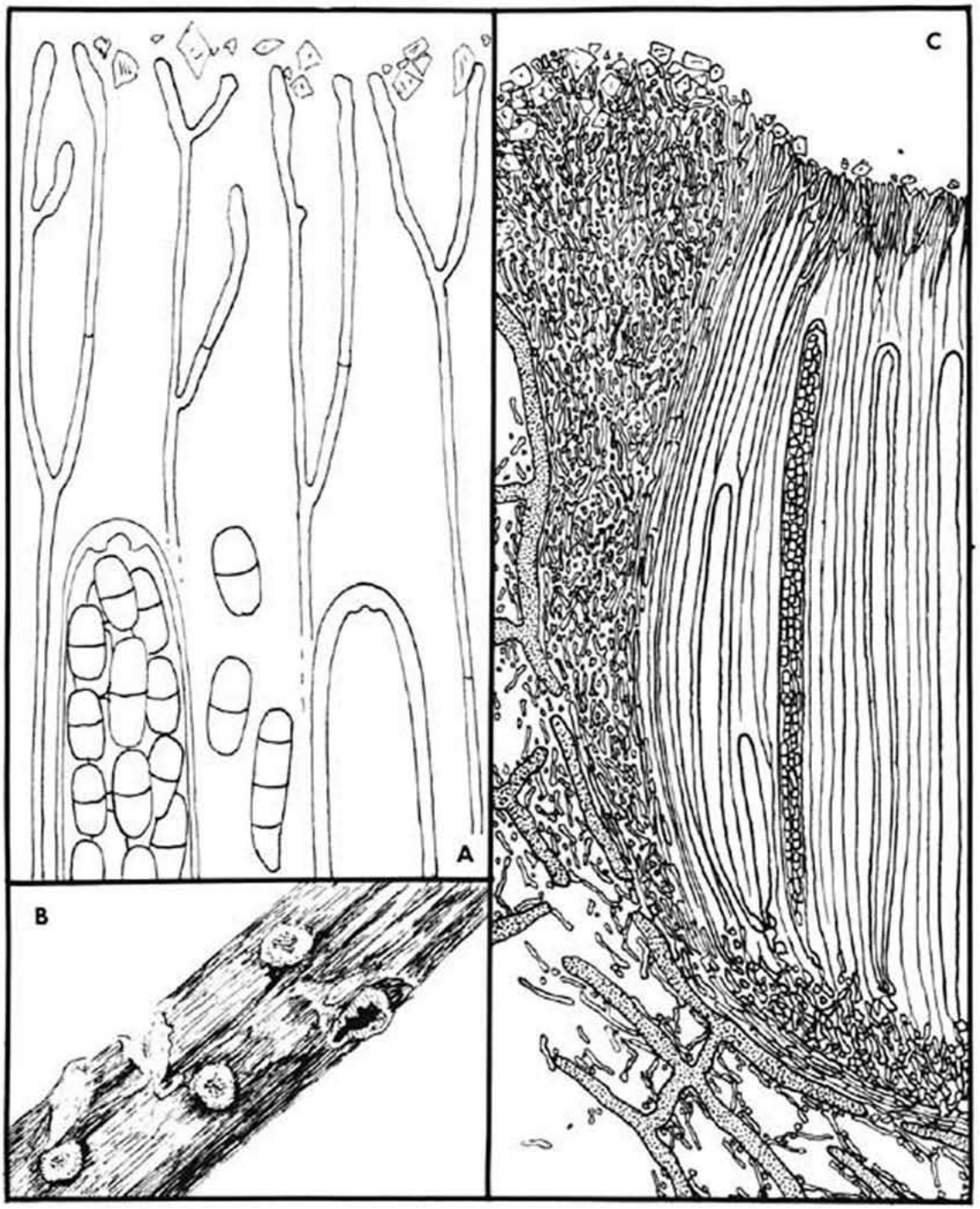


Figure 5. *Schizoxylon centauriae*. A. Detail of apices of asci, paraphyses, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section on margin, x300. Drawn from the holotype of *S. centauriae*.

On stems of *Centauria*, Portugal, and *Asphodelus*, Greece. The species is similar to *S. compositum* Ell. & Ev., but has a thicker margin and distinct ascus cap. According to Bresadola (l.c.) the asci were 340-360 µm long. I could find no asci longer than 250 µm in his material. Perhaps the very thick epithecium was included in measurements of the asci.

SPECIMENS EXAMINED: EUROPE: Portugal (S, herb. Bresadola, in caulibus *Centauriae sempervirentis*, Setubal, Torrend, holotype of *S. centauriae*). Greece (MPU, Maire 3938, in caulibus aridis *Asphodeli messeniaci* pr. Manoladka, Elidis 5.V.1908).

*(11). SCHIZOXYLON COMPOSITUM* Ell. & Ev. (OF 1: 119)

As indicated in the key, the ascospores in this species are sometimes 4-seriate and sometimes 8-seriate, not invariably 4-seriate as was implied by the earlier paper (Sherwood, 1977).

*(12). SCHIZOXYLON CORDOBENSIS* (Speg.) Sherwood (OF 1: 121)
= *Schizoxylon tenuisporum* Speg., Bol. Acad. Nac. Ci. 29: 164 (1926)

The two epithets were published simultaneously. Having redescribed and accepted the species under the epithet *cordobensis* I would prefer retaining that name. The species is evidently widespread in warm climates; several additional records are reported here.

SPECIMENS EXAMINED: OCEANIA: Hawaii (BPI, on *Lantana*, Shear & Stevens 553, 11.XII.1927, reported by Cash (1938) as *S. insigne* (de Not.) Rehm). NORTH AMERICA: USA (BPI, Key Largo, Florida, Shear 1261, 16.XII.1938; Alabama, on *Ligustrum*, Carver 10.VI.1932). SOUTH AMERICA: Argentina (LPS 28221, s/ *Vachelia farnesiana*, Cordoba II-1925, C. Bruch, holotype of *S. tenuisporum*).

*(13). (SCHIZOXYLON CORTICOLUM)* (Fr.) Nyl., Mém. Soc. Sci. Nat. Cherbourg 3: 197 (1855)
≡ *Coniangium corticolum* Fr., Summa veg. scand. sect. prior. 121 (1846)
≡ *Bactrospora corticola* (Fr.) Almq., Om de skandin. artern. slägt. Schismatomma, Opegrapha, och Bactrospora 25 (1869)
≡ *Lecanactis corticola* (Fr.) Lett., Repert. Spec. Nov. Regni Veg. Beih. 69: 26 & 42 (1932)

For additional synonyms see Zahlbruckner (1922-24). The species is based on a specimen, originally identified by Fries as *Lecidea dryina* (Ach.) Ach. and issued under that name in Lichenes Scandinaviae, but later redescribed by Fries as a distinct species, *Coniangium corticolum*. Nylander (1861) agreed that Fries's species was distinct from Acharius's, provided brief descriptions of the microscopic characters of both, and concluded that they belonged in *Schizoxylon*. *L. dryina* and *S. corticola* are sometimes placed in a distinct genus, *Bactrospora* Massal., synonymized with *Lecanactis* Eschw. by most current authors. Judging from the material in Nylander's herbarium, *S. corticolum* is indeed a species of *Lecanactis*, distinguished from *L. dryina* by a J- hymenium and cubical part-spores. A distinct lichen thallus, obviously bitunicate asci, superficial habit and well-developed excipulum readily separate this species from *Schizoxylon*.

SPECIMEN EXAMINED: EUROPE: Great Britain (H, Herb. Nylander 4731, New Forest, Crombie 1867).

*(14). (SCHIZOXYLON DRYINUM)* (Ach.) Nyl., Mém. Soc. Sci. Nat. Cherbourg 3: 197 (1855)
≡ *Lichen dryinus* Ach., Lichenogr. Suec. Prodrom. 16 (1798)
≡ *Lecidea dryina* (Ach.) Ach., Method. Lich. 34 (1803)
≡ *Bactrospora dryina* (Ach.) Massal., Ricerch. Auton. Lich. 133 (1852)
≡ *Lecanactis dryina* (Ach.) Lett., Repert. Spec. Nov. Regni Veg. Beih. 69: 26 & 45 (1932)

Additional synonyms are given by Zahlbruckner (1922-24). The species is evidently a *Lecanactis*, distinguished from *L. corticola* by the J+ reaction of the hymenium and cylindrical part-spores. Some authors (cfr. Poelt, 1969) have hesitated to ascribe the species to Acharius, but the fragment of the type which I examined agrees with the concept of Nylander and later authors.

SPECIMENS EXAMINED: EUROPE: Sweden (S, Magnusson, Swedish Lichens 531, on *Quercus*, 12.8.1948) (H, herb. Acharius, "Suecia", presumed holotype of *Lichen dryinus*). Finland (H, herb. Nylander 4729, on *Quercus*). Germany (S, Rabenhorst, Lichenes Europaei 617, on *Quercus*, Münster)

*(15).* SCHIZOXYLON (STROMATOSTROPA) EMERGENS Sherwood, subgen. et spec. nov.

Figure 6

STROMATOSTROPA Sherw., subgen. nov.

Apothecia primum clypeo stromatico obtecta, postea erumpentia et submersa in verrucis stromaticis superficie fusca carbonacea hyphas tenuis in gelatina rare dispersas continente praeditis. Periphysoidea et strata crystallina definite nulla. Asci elongate cylindrici, sporis filiformibus, achromis, multiseptatis. A subgenere typico matrice stromatica continente distinctum.

Apothecia at first covered by a stromatic clypeus, later erumpent and immersed in stromatic warts with a dark carbonized surface surrounding slender hyphae widely spaced in a gel. Periphysoids and well-defined crystalline layers absent. Asci long-cylindrical; spores filiform, colorless, multiseptate. Distinguished from *Schizoxylon* subgen. *Schizoxylon* by the stromatic matrix surrounding the apothecium.

Holotypus: *Schizoxylon emergens* Sherw.

SCHIZOXYLON EMERGENS Sherw., spec. nov.

Apothecia in verrucis erumpentibus nigris stromaticis submersa, 0.4-1.5 mm diam., margine griseo-pruinoso, disco punctiformi, non depresso, nigro. Stroma c. 200 µm crassum, externe nigrum, interne ex hyphis achromis minus quam 1.0 µm diam., in gelatina submersis consistans. Paries ca. 40 µm crassus, ex hyphis infra achromis 1.5 µm diam., supra brunneis 2-3 µm diam. consistens. Paraphyses 500-525 x 1.0 µm, apice brunneo ad 1.5-2.0 µm incrassatae, in iodo non caerulescentes. Asci 450-500 x 7-8 µm, apice 4 µm crassi, 4- vel 8-spori. Sporae 450-475 x 2.0 µm, septatae, cellulis 4-6 µm longis.

In caulibus herbaceis emortuis, ad elevationes altas in Andibus montibus.

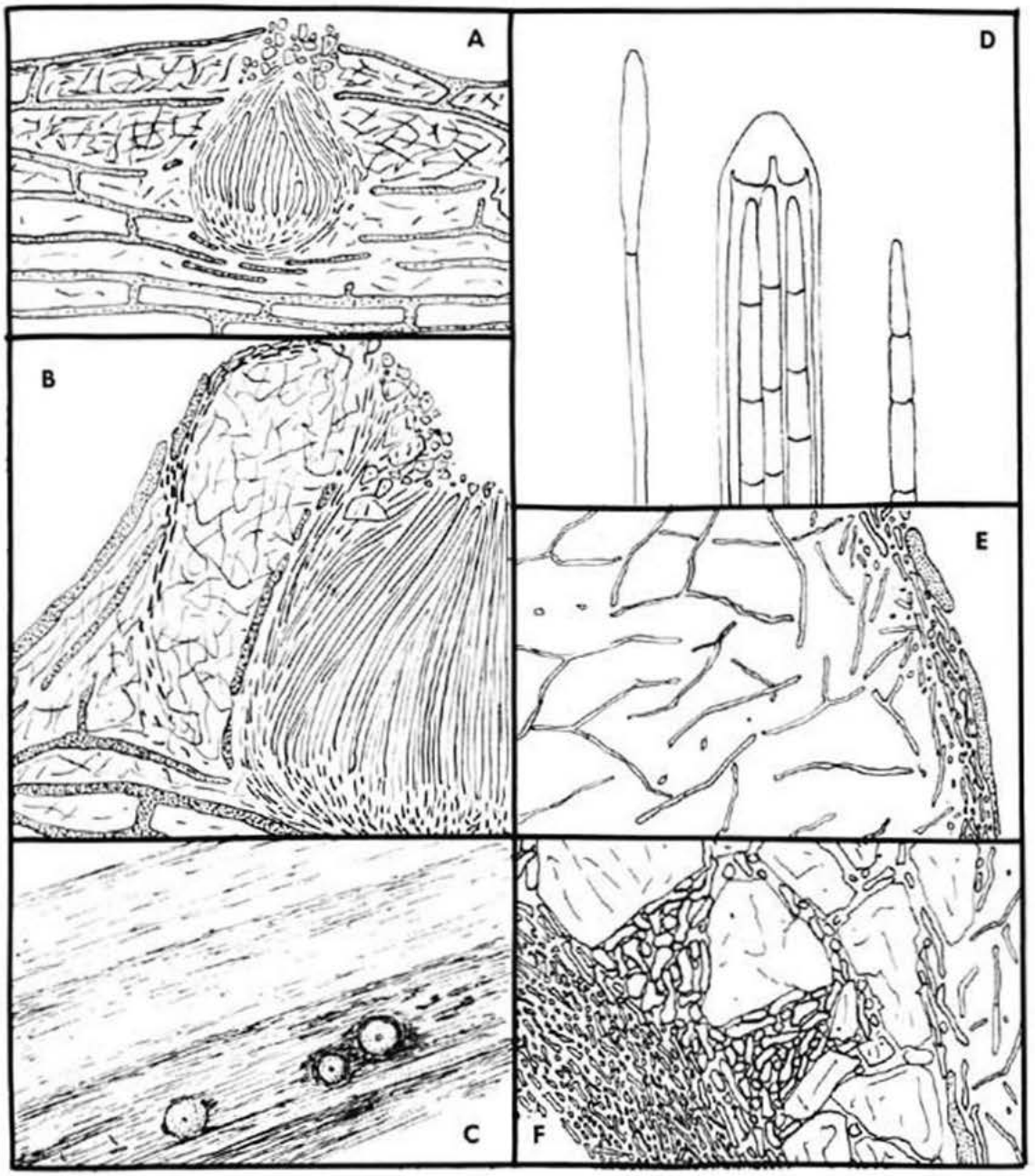


Figure 6. *Schizoxylon (Stromatostropa) emergens*. A. Early stage in ascocarp development, x75. B. Later stage in ascocarp development, x75. C. Habit sketch, x7.5. D. Detail of apices of an ascus, paraphyses, and spores, x1500. E. Outer face of stromatic involucrum, x750. F. Summit of wall, x750. Drawn from NY-Co 8014.

HOLOTYPUS: COL-Dumont 8014, vicinity of km post 53 on the Rio de Paz-Chita-La Uvita road, Dpto. Boyacá, Colombia, elev. ca. 11,000 ft. K. P. Dumont, P. Buriticá, M. I. Umaña. 15 September 1976. ISOTYPUS: NY

Apothecia at first completely immersed, with a distinct, gelatinous, stromatic clypeus surrounding the developing fruitbody, later erumpent, orbicular in outline, tough, black, shining, with an orbicular, non-depressed, grey-

pruinose disc, often with a darker center, appearing pyrenomycetous. The pyrenomycetous aspect of the perithecium is the result of being entirely immersed in a stromatic mass. Accessory thalline margin deriving from the clypeus present earlier in development, c. 200 µm thick, with an outer layer 20-25 µm thick of hyphae tightly cemented in brown amorphous matter and an inner layer of colorless hyphae less than 1.0 µm diam. widely spaced in a gel. Wall c. 40 µm thick, separated from the stromatic thalline margin by a layer of compressed host tissue and crystals, composed of tightly-packed colorless hyphae 1.5 µm diam. below, of dark brown. crystalliferous hyphae 2-3 µm diam. above. Subhymenium c. 70 µm thick, colorless, resting directly on disintegrating host tissue. Asci 450-500 x 7-8 µm, 4 or 8-spored, the cap 4 µm thick. Paraphyses numerous, filiform, 1.0 µm broad, enlarged to 1.5-2.0 µm at the apex, pale brown, J-. Ascospores nearly as long as the asci, 2.0 µm broad, not sheathed or coiling, septate, the cells 4-6 µm long, not disarticulating.

On herbaceous stems, Colombia and Peru.

SPECIMENS EXAMINED (see also holotype, above): SOUTH AMERICA: Colombia (NY-Co 6114, Dto. Antioquia, Dumont, Carpenter, Sherwood, 12.VIII.1976; Co-6129, *Ibid.*; Co-6122-a, *Ibid.*; Co-8145, Dto. Cundinamarca, Dumont, Buriticá, Umaña, 17.IX.1976). Peru (NY-Pe 1937, Dto. Cuzco, Dumont, Buriticá, Carpenter, Sherwood, 19.VII.1976).

*(16)*. SCHIZOXYLON FLORIDANUM Sherwood, spec. nov.

Figure 7

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.3-0.8 mm diam., margine lacerato, albo, disco albo. Margo in sectione transversali 30 µm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis achromis constans. Paraphyses filiformes, ramosae, apice non incrassatae, pallide brunneae, in iodo non caerulescentes. Asci 290-320 x 6.5-7.5 (-9) µm, apice 2 µm crassi, 8-spori. Sporae 250-300 x 2.0 µm, cellulis 5-7 µm longis, ad septa se disjungentibus et articulos simplices formantibus.

HOLOTYPUS: BPI-Shear 1270, on *Magnolia*, Oveido, Florida, USA, Feb. 4 1940.

Apothecia at first immersed, opening by a pore and becoming slightly erumpent, 0.3-0.8 mm diam., the disc plane or slightly raised, white or pale grey, pruinose, the margin white-pruinose, stellate, not splitting away from the disc when dry. Margin in cross section 30 µm broad below, 75 µm broad above, of interwoven colorless hyphae 1.0 µm diam., eventually covered with numerous small colorless crystals. Subhymenium colorless, c. 50 µm thick, J-. Asci 290-320 x 6.5-7.5 (-9) µm, the cap 2 µm thick, not distinct. Ascospores 8, nearly as long as the asci, 2.0 µm broad, disarticulating at the septa to form unicellular part-spores 5-7 µm long. Paraphyses filiform, branched apically but scarcely enlarged, pruiniferous, pale brown at the apex, J-, forming an epithecium 20 µm thick.

On wood and bark, southeastern USA. *Sch. pruiniferum* Sherw. is completely colorless, and has a thicker ascus cap and poorly-defined margin. *Sch. alboatrum* Rehm has a thicker ascus cap, longer asci, a brown margin, and non-disartic-

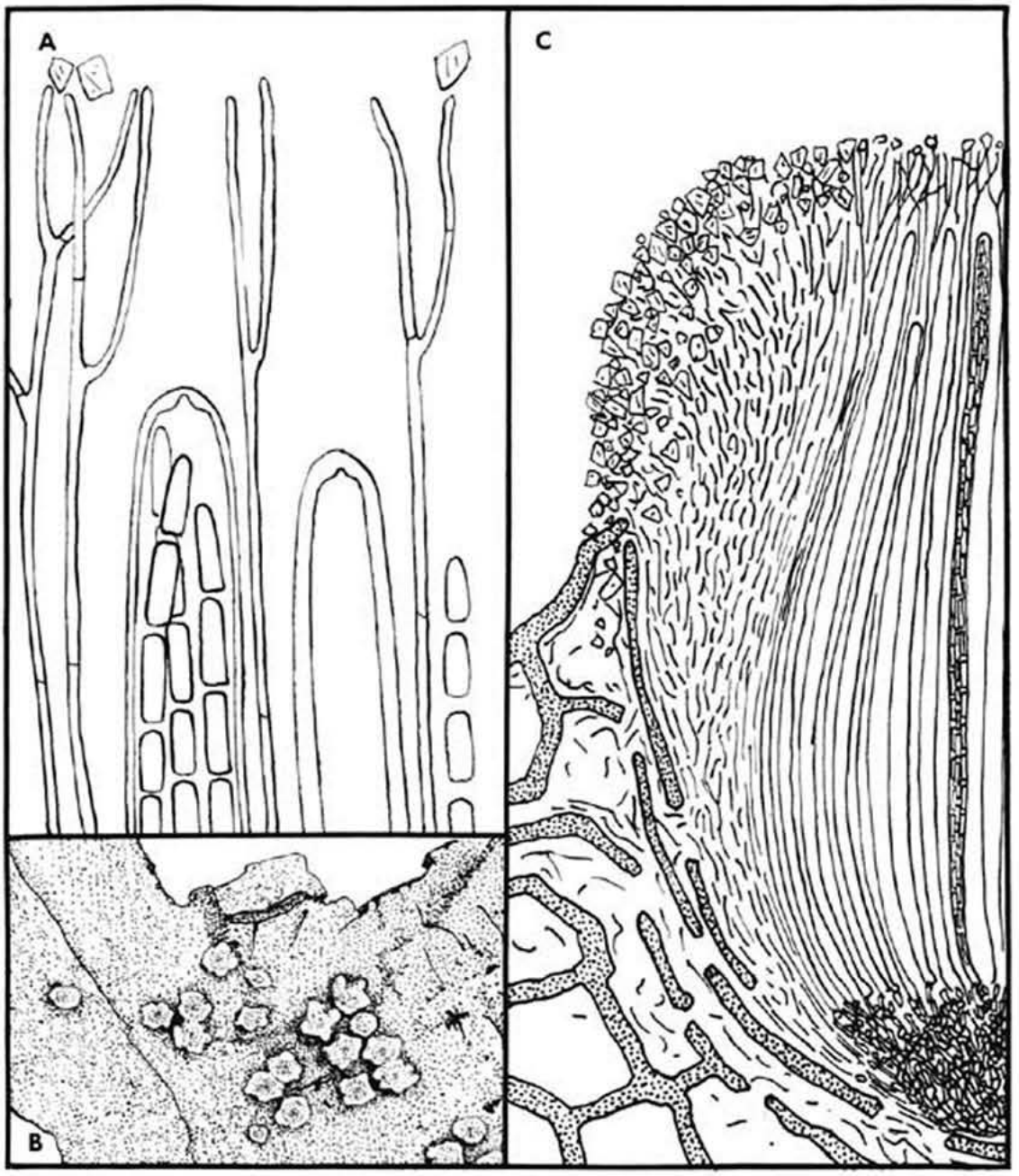


Figure 7. *Schizoxylon floridanum*. A. Detail of apices of asci, paraphyses, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x300. Drawn from the holotype.

ulating spores.

SPECIMEN EXAMINED (see also holotype, above): NORTH AMERICA: USA (BPI, on *Fraxinus*, Shear, 23.I.1943).

*(17). SCHIZOXYLON GAUBAE* see *S. lividum*

*(18). SCHIZOXYLON GIGAS* Speg., An. Mus. Nac. Ci. Hist. Nat. Buenos Aires 19: 456 (1909)

Apothecia at first immersed, becoming strongly erumpent and at length nearly superficial, orbicular, approximately 2 mm broad, with a thick, pale-brown, pruinose margin and convex reddish-pruinose disc. Margin in cross section c. 200 µm thick, of loosely interwoven hyphae 1.5 µm diam., colorless, not notably gelatinous, with numerous small non-rosettiform crystalline inclusions. Paraphyses filiform, 500 x 1.0 µm, branched at the apex and enlarged to 1.5 µm, colorless, forming an epithecium 150 µm thick.

All of the asci in my microscopic preparations were extremely immature. According to Spegazzini the asci were 250-500 x 10 µm and the spores were 2.0 µm broad, breaking up into segments 10-25 µm long. In view of the narrow immature asci these measurements seem plausible. The type specimen contains only one intact apothecium. The species cannot be completely characterized from its scanty type, but seems to be distinct and should be recognizable if recollected. *Sch. alboatrum* and *Sch. cordobensis* are smaller, less erumpent, and have narrower margins.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28219, s/leños podridos, La Plata, XII.1905, C. Spegazzini, holotype of *Sch. gigas*).

*(19). SCHIZOXYLON GRAECUM* see *Stictis graeae*

*(20). SCHIZOXYLON HANSFORDII* see *S. lividum*

*(21). SCHIZOXYLON HENNINGSIANUM* Ploettn., Verh. Bot. Vereins Prov. Brandenberg 41: 95 (1899)

Figure 8

Apothecia at first immersed, opening by a pore and at length becoming somewhat erumpent, 0.3-0.6 mm diam., the margin thin, entire, yellowish-pruinose, KOH+ yellow, the disc black, not pruinose, not deeply urceolate. Margin in cross section c. 40 µm thick, of interwoven brown hyphae 1.5-2.5 µm diam., somewhat crystalliferous on the outer face. The brown hyphae continue beneath the subhymenium but do not form a complete layer. Subhymenium colorless, J-, the cells 2-3 µm diam., forming a layer 20 µm thick. Asci 120-140 x 6-7 (-9-11) µm (80-100 x 9-11 um according to Hennings and Ploettner, l.c., but I can find no asci shorter than 100 µm which are not obviously immature), the cap 2.5-3.0 um thick. Paraphyses numerous, filiform, branched once or twice near the apex, swollen to 2.0 um, brown, intensely J+ blue apically. Ascospores 8, nearly as long as the asci, soon breaking up into simple part-spores 3-5 x 2-2.5 (-3 fide Hennings & Ploettner) µm.

On herbaceous stems, Germany. The species differs from *Sch. berkeleyanum* only in having somewhat smaller apothecia, a narrower margin, simple part-spores, and shorter asci. The specimen appears to be fully mature but may merely represent a variety of *Sch. berkeleyanum*, as was suggested by Rehm (1912).

SPECIMENS EXAMINED: EUROPE: Germany (S, auf *Chenopodium album*, Rathenau, Ploettner I.1899, isotype of *Sch. henningsianum*)(B, on *Chenopodium*, Rathenau, Kirschstein, 1900)

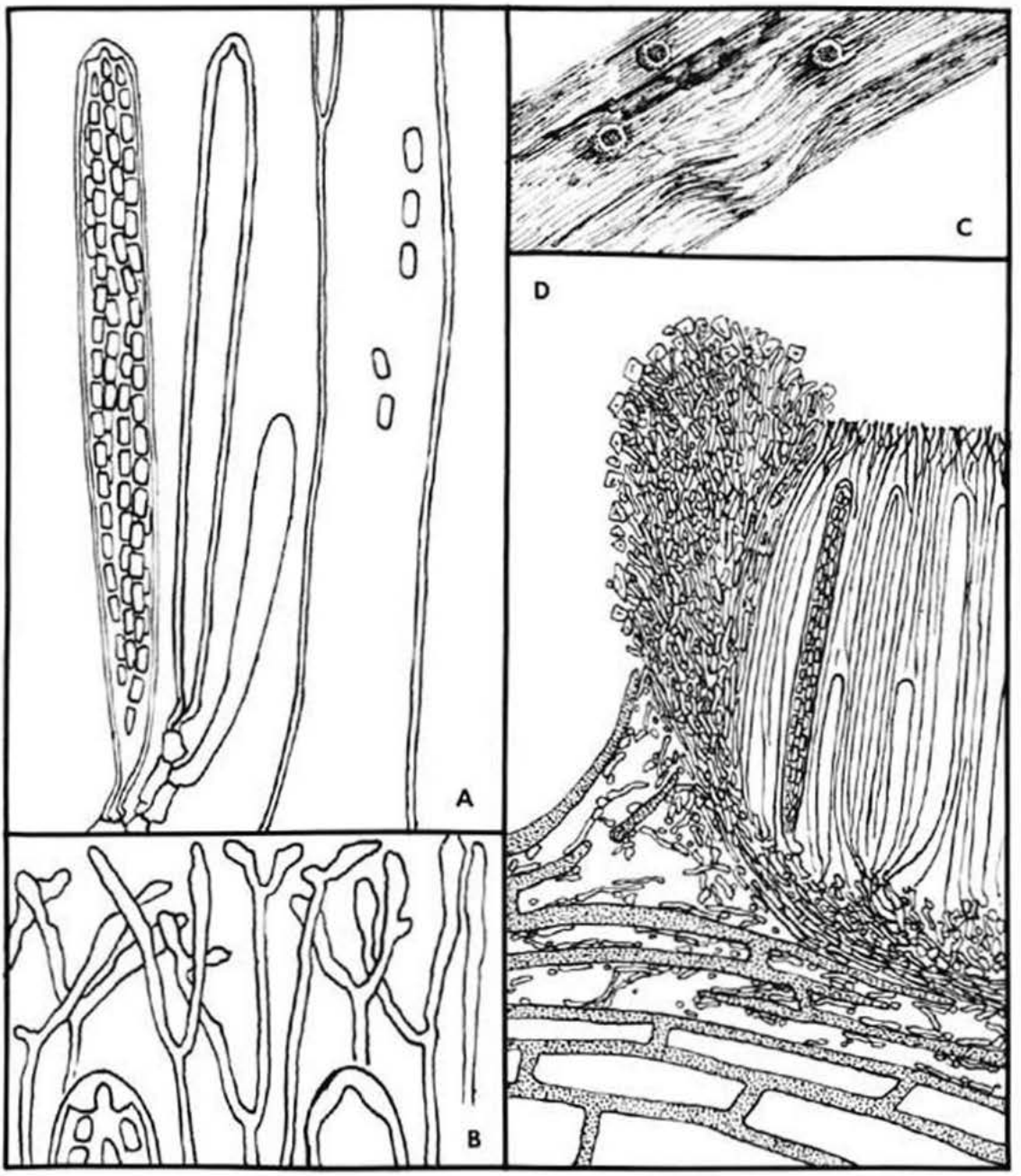


Figure 8. *Schizoxylon henningsianum*. A. Asci, paraphyses, and part-spores, x750. B. Detail of apices of asci, paraphyses, and spores, x1500. C. Habit sketch, x7.5. D. Cross section of margin, x375. Drawn from an isotype in herb. S.

*(22). SCHIZOXYLON HIPPOPHAES* Rehm, Ber. Bayer. Bot. Ges. 13: 160 (1912)
≡ Tympanis hippophaes (Rehm) Sherwood, comb. nov.

Apothecia at first immersed beneath the bark of the host, caespitose, erumpent singly or in small groups, 0.2-0.5 mm diam., sessile on a narrow base, the disc deeply immersed when dry, black, the margin thick, tough, black, white-pruinose, inrolled when dry. Margin paraplechten-

chymatous throughout, of dark hyphae 3-4 µm diam. Paraphyses numerous, filiform, scarcely enlarged above, their apices imbedded in dark gelatinous material and forming an epithecium, J-. Asci long cylindric-clavate, narrowed below, very thick-walled when young, later moderately thick-walled, with the inamyloid, non-refractive apical apparatus characteristic of a *Tympanis*, 190-220 (-250, fide Rehm) x 12-15 µm, at first containing 8 subglobose primary ascospores, soon budding off chains of cells 5-6 x 2.0 µm (group A-2 of Oulette and Pirozynski, 1974), in this stage somewhat resembling *Schizoxylon* asci, ultimately budding off innumerable spermatiod bodies 3-4 x 0.8-1.2 µm.

On bark of *Hippophae*, Germany. Apparently most closely allied to *Tympanis myricariae* Höhn. & Rehm and *T. saligna* Tode, but differing somewhat from both in ascospore measurements and host range. As species limits are now conceived in *Tympanis* (Groves, 1952; Oulette & Pirozynski, 1974) this should probably be considered a distinct species.

SPECIMEN EXAMINED: EUROPE: Germany (S, on *Hippophae*, München, 25.X.1904, Rehm, holotype of *Schizoxylon hippophaes*)

*(23). (SCHIZOXYLON IMMERSUM)* see *Stictis immersa*

*(24). (AGYRIOPSIS JAVANICA)* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. Abt. 1, 118: 1227 (1909)
≡ *Bisbyella javanica* Boedijn, Sydowia 5: 211 (1951)

*Agyriopsis* Sacc. & Sydow (≡*Bisbyella* Boedijn) is a synonym of *Schizoxylon* (Sherwood, 1977), but the above species seems to have been assigned to the wrong genus. The leaves in the type packet have nothing corresponding to von Höhnel's description on them. His slide shows a crush mount of an apothecium which evidently had a reduced, colorless margin, true paraphyses, somewhat thick-walled, clavate asci with no obvious apical apparatus, and clavate 3-septate spores which do not appear to regularly disarticulate. This is definitely not an *Agyriopsis* or *Schizoxylon* and may merely represent fragmentary material of a foliicolous *Bacidia*.

SPECIMEN EXAMINED: ASIA: Java (FH-Höhnel 4994, Unters. Bl. *Paratropia* sp., Tijbodas, 1907-1908, holotype of *Agyriopsis javanica*)

*(25). SCHIZOXYLON LICHENOIDE* see *S. ligustri*

*(26). SCHIZOXYLON LIGUSTRI* (Schw.) Sherw. (OF 1: 129)
= *S. bagnisianum* Speg., An. Soc. Ci. Argent. 10: 14 (1880)
= *S. lichenoide* Speg., *Ibid.* 12: 226 (1881)
= *S. bagnisianum* Speg. var. *minus* Speg. in Sacc., Syll. Fung. 8: 698 (1889)

This species appears to be widespread in South America. Spegazzini cites the spore measurements of *S. bagnisianum* as 4.5 µm broad. I could find no spores in the fragmentary type specimen broader than 3.5 µm. LPS 38649, identified by Spegazzini as *S. bagnisianum* but considered a variety there-

of by Saccardo, is typical *Schizoxylon ligustri*.

SPECIMENS EXAMINED: EUROPE: Italy (LPS 38651, Conegliano XI.1878, C. Spegazzini). SOUTH AMERICA: Peru (NY-Pe 414, 431, 437, 439, all Dto. Huanuco, elev. 8500 ft., Dumont, Carpenter, Sherwood, Buriticá, 2.VI. 1976). Argentina (LPS 28217, s/ *Acacia bonariensis*, Buenos Aires, San José de Flores, V.1880, Spegazzini, holotype of *Sch. bagnisianum*; LPS 38649, s/*Prunuum cerasum*, Buenos Aires, Chacarita, V.1880, holotype of *Sch. bagnisianum* var. *minus*; LPS 28216, s/ *Citrus aurantium*, Buenos Aires, Palermo, 15.V.1881, C. Spegazzini, holotype of *Sch. lichenoide*)

*(27). SCHIZOXYLON LIVIDUM* McAlp., Fung. Dis. Stone Fruit Trees 120 (1901)
= *Sch. gaubae* Petr., Sydowia 8: 208 (1954)
= *Sch. hansfordii* Dennis, Kew Bull. 1958: 338 (1958)

Figure 9

Apothecia at first completely immersed beneath the epidermis of the host, visible as black stromatic patches 0.3-0.6 mm diam., raising the substrate into pustules but not becoming erumpent, the margin thick, entire, black, shining, covered for the most part by transparent host epidermis, the disc small, rather more deeply sunken than in most species of *Schizoxylon*, dark grey-pruinose. Accessory thalline margin prominent, consisting of multiple layers of disintegrating host tissue overlain with 30-40 µm of interwoven dark brown hyphae 2.5-4 µm diam. forming the visible portion of the margin. Margin in cross section 25-50 µm thick below, expanded to 150 µm above, of branched hyphae 1.0 µm in diam. widely spaced in a gel below, ending above in thickened moniliform brown apices 2-5 µm diam., resembling the apices of the paraphyses. Subhymenium J-, 20 µm thick, of small angular colorless cells resting directly on host tissue. Asci 220 x 6-7 µm, the cap 3.5 µm thick, pierced by a narrow pore. Paraphyses filiform, 1.0 µm broad below, 1-3 times branched apically and enlarged to 3-4 (-5) µm at the apex, which is brown, septate, and somewhat moniliform, exceeding the asci by 25 µm and forming an intensely J+ blue crystalliferous epithecium. Ascospores 8, nearly as long as the asci, soon breaking up into cubical to short-cylindrical part-spores 2.5-6 x 1.5-2.5 µm.

On wood and herbaceous stems, Australia. Strong iodine reactions and longer asci distinguish this species from *S. sepincola* and *S. ligustri*.

SPECIMENS EXAMINED: AUSTRALASIA: Australia (K, on *Linum marginalis*, Meningie, S. Australia, I.1957, W.A.R.I. 7719, holotype of *Sch. hansfordii*)(BPI, Petrak Pilzherbarium 813, on *Davisia latifolia*, N.S.W., II.1954, G. Gauba)(BURNLEY, on dead peach twigs [*Pyrus*], Melbourne, 1901, holotype of *Sch. lividum*)

*(28). (SCHIZOXYLON MELANOSTICTUM)* Speg., An. Mus. Nac. Hist. Nat. Buenos Aires 19: 456 (1913)

The only fungus resembling the original description in the type packet is a small group of immersed discoid pycnidia with brown margins and deeply immersed ochraceous discs containing innumerable colorless unicellular spores 2 x 1 µm. Perhaps the specimen once contained ascigerous

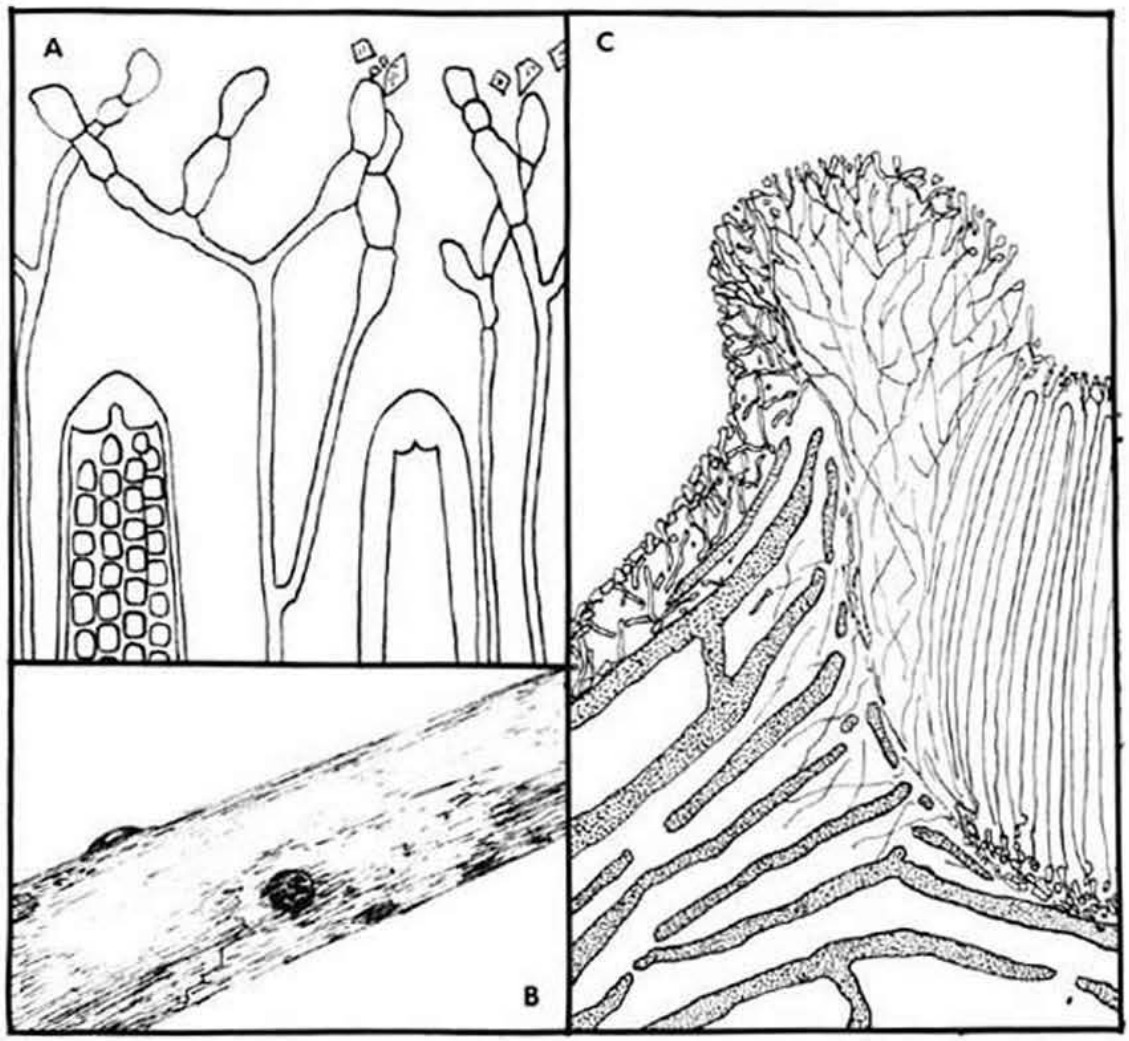


Figure 9. *Schizoxylon lividum*. A. Detail of apices of asci, paraphyses, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype of *Sch. hansfordii*.

material, but no trace of it remains, and the species cannot be characterized from Spegazzini's description alone. According to Spegazzini (l.c.) the species had asci 200 x 8-10 µm containing globose part-spores 1.5-1.75 µm diam., a dark margin, and honey-colored disc. The description corresponds roughly to the characters of *Acarosporina hormospora*, q.v.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28220, s/*Lippia geminata*, La Plata, Ensenada, 8.X.1905, C. Spegazzini, holotype of *S. melanostictum*)

*(29)*. SCHIZOXYLON PACHYCHLAMYDUM Sherwood, spec. nov.

Figure 10

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.8-1.2 mm diam., margine integro, nigro, disco griseo. Margo in sectione transversali 500 µm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis brunneis et achromis constans. Paraphyses filiformes, ramosae, 425-450 x 1.0 µm, apice non incrassatae, brunneae, in

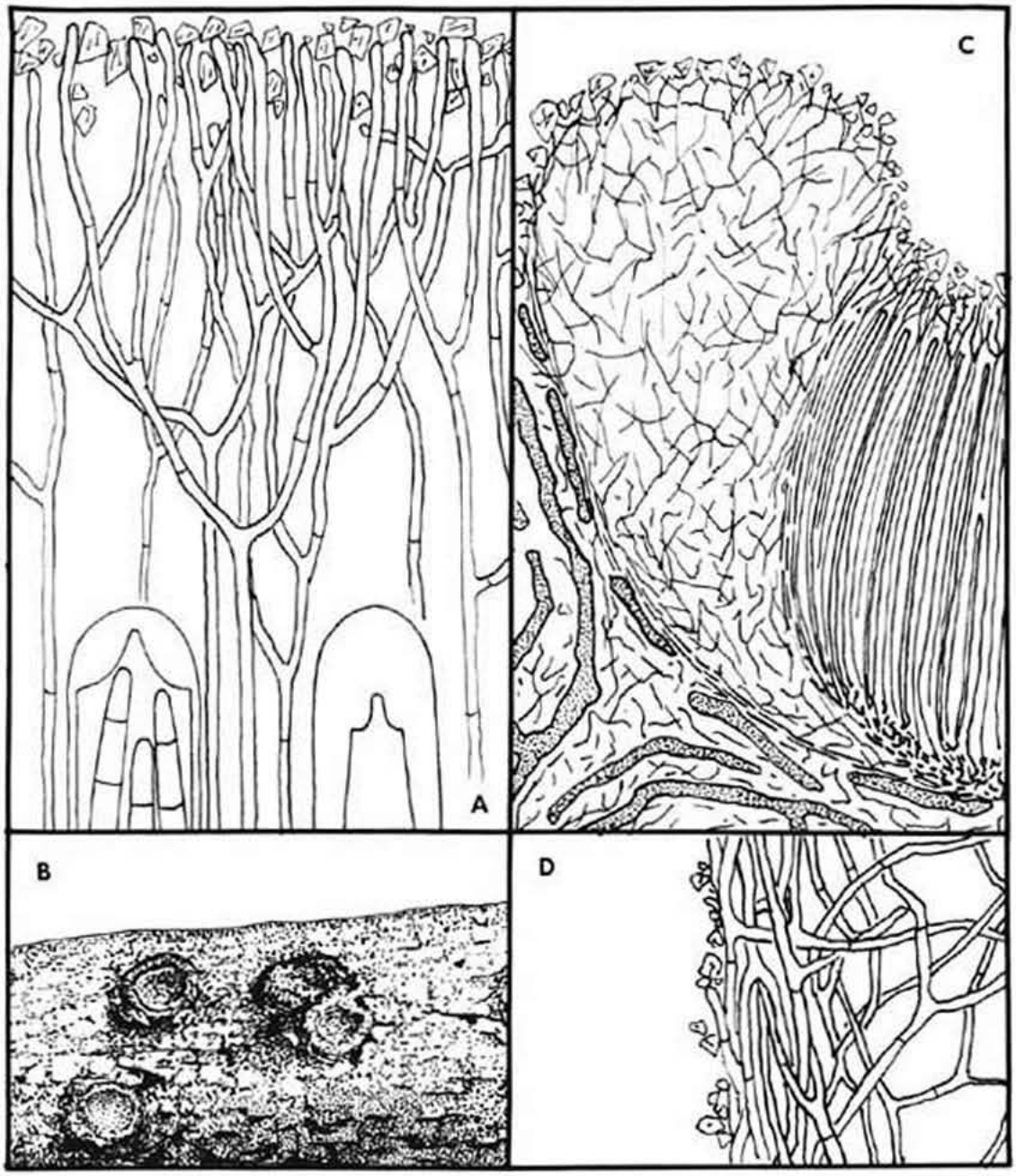


FIGURE 10. *Schizoxylon pachychlamydum*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x75. D. Detail of outer face of margin, x750. Drawn from NY-Pe 432.

iodo caerulescentes. Asci 350-400 x 8-10 µm, apice 6 µm crassi, 8-spori. Sporae 325-400 x 2-2.5 µm, cellulis 4-7 µm longis.

HOLOTYPUS: NY-Pe 432, vicinity km post 450 from Lima, on the Huanuco-Tingo Maria Rd., Dpto. Huanuco. Elev. 8500 ft. K. P. Dumont, S. E. Carpenter, M. A. Sherwood, P. Buriticá, 2 July 1976.

Apothecia at first immersed, becoming erumpent, 0.8-1.2 mm diam., the margin raised, thick, black, dark grey-pruinose, not splitting away from the hymenium when dry, the disc concave, pale grey-pruinose. Margin

in cross section 500 µm thick, swelling markedly when rehydrated, lacking periphysoids and internal crystalline inclusions, moderately crystalliferous on the upper and outer faces. Outermost layer of the margin c. 10 µm thick, of agglutinated dark brown hyphae 1.5-2 µm thick enclosing a matrix of colorless hyphae 1.0 µm diam. widely spaced in a gel. The boundary between the margin and the hymenium is marked by a few layers of tightly-packed colorless hyphae, without any included host tissue. Asci 350-400 x 8-10 µm, very thick-walled when young, the cap 6 µm thick, with a broad pore. Ascospores 8, nearly as long as the asci, 2-2.5 µm broad, the cells 4-7 µm long, not disarticulating. Paraphyses numerous, filiform, much-branched apically but scarcely enlarged, brown at their tips and faintly J+ blue, abundantly crystalliferous, forming an epithecium c. 50 µm thick. Subhymenium colorless.

On twigs, Peru. The very thick gelatinous margin and darker pigmentation distinguish this species from *Sch. cordobensis*.

SPECIMEN EXAMINED: See holotype, above.

*(30)*. SCHIZOXYLON PALLESCENS Sherwood, spec. nov.

Figure 11

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.5-1.0 mm diam., margine integro, albo, disco pallide ochraceo vel griseo. Margo in sectione transversali 150 µm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis achromis constans. Paraphyses filiformes, ramosae, apice ad 2.0 µm incrassatae, achromae, in iodo non caerulescentes. Asci 350-425 x 9-10 µm, apice 7.5 µm crassi, 8-spori. Sporae 325-400 x (2.5-) 3.0 µm, cellulis 3-5 µm longis.

HOLOTYPUS: NY-Ve 3283, on unidentified wood, 49 km N. of San Cristobal, on the San Cristobal-La Grita rd., Edo Tachira. K. P. Dumont, G. J. Samuels, L. Borjas, 28 July 1971. ISOTYPUS: VEN.

Apothecia at first immersed, opening by a pore or by splitting the substrate irregularly, 0.5-1.0 mm diam., the margin thick, entire to 2-4 lobed, not lacerate, white-pruinose, the disc transluscent-ochraceous or somewhat greyish, shallowly cupulate, not splitting away from the margin when dry. Thalline margin prominent, continuing beneath the hymenium. Margin in cross section 150 µm thick, of colorless interwoven hyphae 1.0 µm diam., not notably gelatinous, with scattered crystals near the summit and in the part nearest the hymenium; periphysoids absent. Subhymenium 65 µm thick, of small, colorless, angular cells, J- or faintly J+ blue in older apothecia. Asci 350-425 x 9-10 µm, thick-walled when young, with a distinct apical cap 7.5 µm thick pierced by a fairly broad pore. Paraphyses numerous, filiform, entirely colorless, J- or faintly J+ blue in older apothecia, exceeding the asci by 30 µm, their apices inflated to 2.0 µm, branching 1-3 times to form a distinct epithecium. Ascospores 8, nearly as long as the asci, (2.5-) 3.0 µm broad, slightly thick-walled or obscurely sheathed, not markedly constricted at the septa or disarticulating, the cells 3-5 µm long.

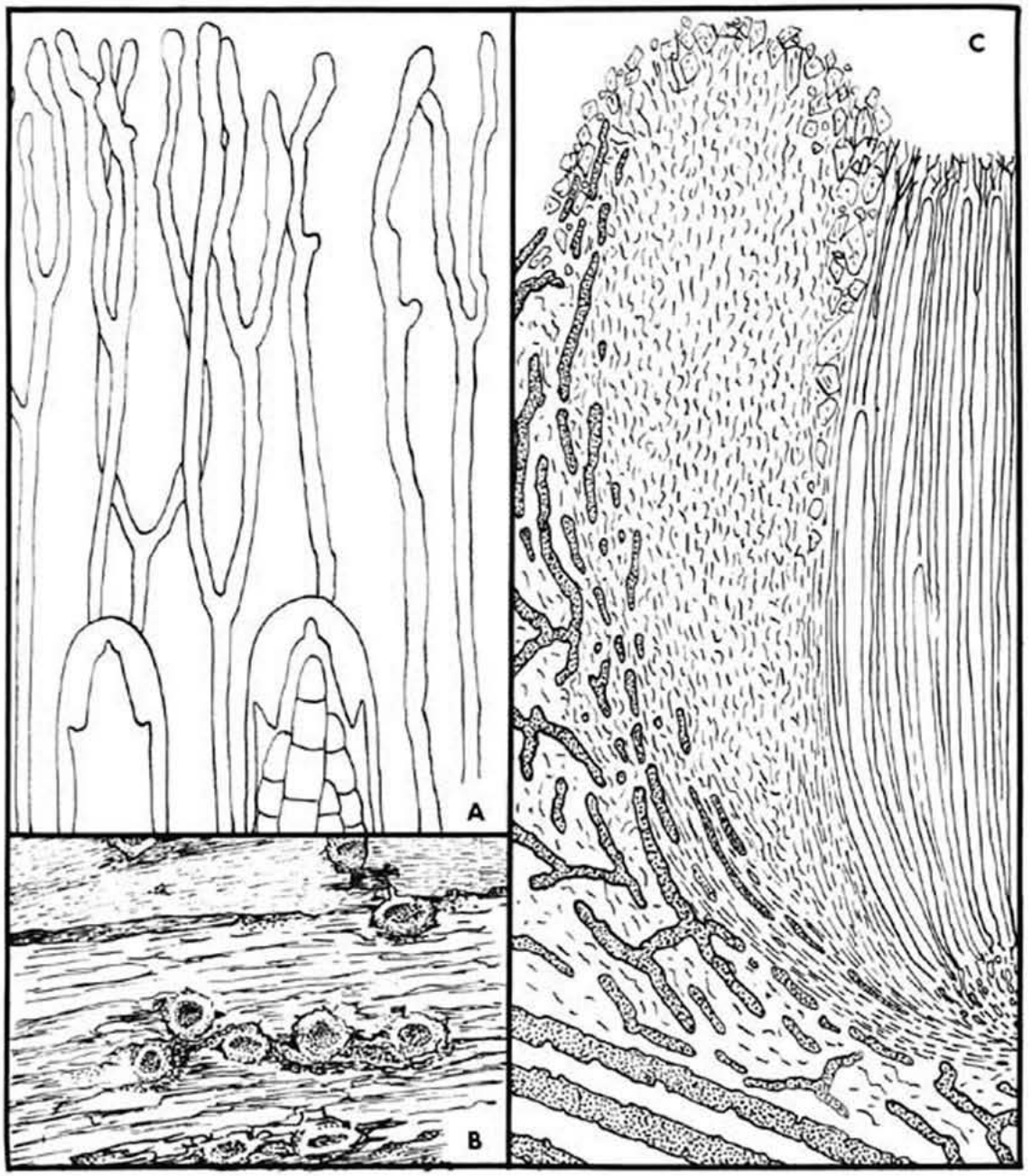


Figure 11. *Schizoxylon pallescens*. A. Details of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from NY-Ve 3283.

On wood, Venezuela. The species is very similar to *Sch. cordobensis*, from which it differs principally in having spores twice as broad.

SPECIMEN EXAMINED: See holotype, above.

*(31)*. SCHIZOXYLON PRATENSE Sherwood, spec. nov.

Figure 12

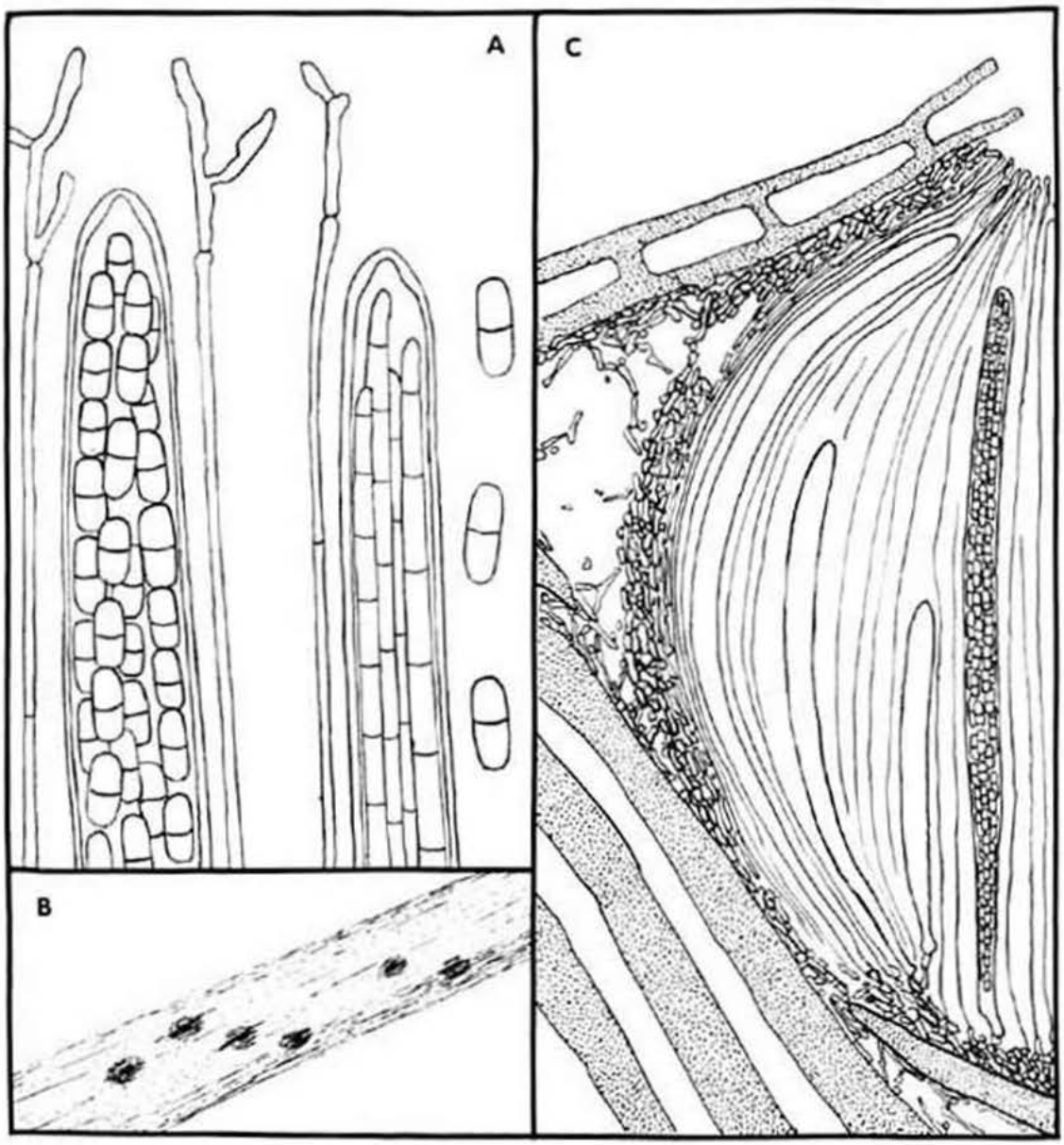


Figure 12. *Schizoxylon pratense*. A. Detail of apices of asci, paraphyses, spores, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from the holotype.

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.3-0.6 mm diam., margine integro, nigro, disco nigro. Margo in sectione transversali c. 10 µm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis brunneis constans. Paraphyses filiformes, apice ad 2.0 µm incrassatae, ramosae, brunneae, in iodo non caerulescentes. Asci 250 x 7(-9) µm, apice non incrassatae, 8-spori. Sporae 200-225 x 2.5-3 µm, cellulis 3-4 µm longis, ad septa se disjungentibus et articulos 1-septatis formantibus.

HOLOTYPUS: BPI, on *Muhlenbergia* sp. ex Mexico, intercepted at New York City [Plant Quarantine] by Plummer & McConnel, Aug. 30 1940.

Apothecia small, 0.3-0.6 mm broad, remaining completely immersed except for the black punctiform disc, not pruinose, visible on the surface of the substrate as oblong, black perithecioid bodies showing through the colorless epidermis of the host. Subhymenium colorless. Margin very reduced, consisting of 2-3 layers of dark brown interwoven hyphae 2.0-3.0 µm diam. cemented in brown amorphous material. Periphysoids and crystals absent. Iodine reactions none. Asci 250 x 7(-9) µm, fairly thin-walled when young, without a defined apical cap. Paraphyses numerous, filiform, often apically branched, pale brown, inflated to 2.0 µm at the apex, forming an epithecium c. 10 µm thick. Ascospores 8, nearly as long as the asci, 2.5-3.0 µm broad, soon disarticulating to form 1-septate part-spores 6-8 µm long.

On grass used as packing material, Mexico. The morphology and habitat of this species are so distinctive that I have ventured to describe it despite the lack of accurate collection data.

SPECIMEN EXAMINED: See holotype, above.

*(32)*. SCHIZOXYLON PSEUDOCYANOSPORUM Sherwood, spec. nov.

Figure 13

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 1.0 mm diam., margine integro, disco griseo. Margo in sectione transversali c. 30 µm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis brunneis constans. Paraphyses filiformes, ramosae, apice ad 2.0 µm incrassatae, brunneae, in iodo caerulescentes. Asci 80-120 x 12-13 (-15) µm, apice 5 µm incrassatae, 8-spori. Sporae 60-75 x 5 µm, cellulis 2-5 µm longis.

HOLOTYPUS: BPI, on *Pinus excelsa*, Kagan Valley, Shagran, West Pakistan, July 16, 1951. S. Ahmad.

Apothecia at first immersed in elongated greenish-grey stromatic pustules, not becoming erumpent, c. 1.0 x 0.5 mm, strongly compressed with the grain of the wood, opening by splitting the overlying substrate longitudinally to expose the flat, greenish-grey pruinose disc. The narrow margin is obscured by the overlying stromatized wood. Margin in cross section c. 30 µm thick, of pale brown non-carbonized hyphae 1.5 µm diam., not notably gelatinous, with a few scattered crystalline inclusions. Subhymenium colorless, 20 µm thick, J-. Asci 80-120 x 12-13(-15) µm, very thick-walled when young, the cap 5 µm thick, pierced by a broad pore. Paraphyses numerous, filiform, branched and brown near the apex, inflated to 2.0 µm, J+, forming an epithecium 30 µm thick. Ascospores 8, 60-75 x 5 µm, tapering below, septate, the cells 2-5 µm long, not regularly disarticulating at the septa.

On decorticated conifer wood, Pakistan. The fungus is generally accompanied by small erumpent black fructifications consisting of masses of globose dark green bodies 1.5 m diam. intermingled with hyphae and gel, perhaps an imperfect stage. The oblong stromatic pustules on bleached and decorticated wood superficially resemble those of *Robergea* (formerly *Cyanospora*) *albicedrae* (Heald & Wolf) Sacc. & (above) µm diam.

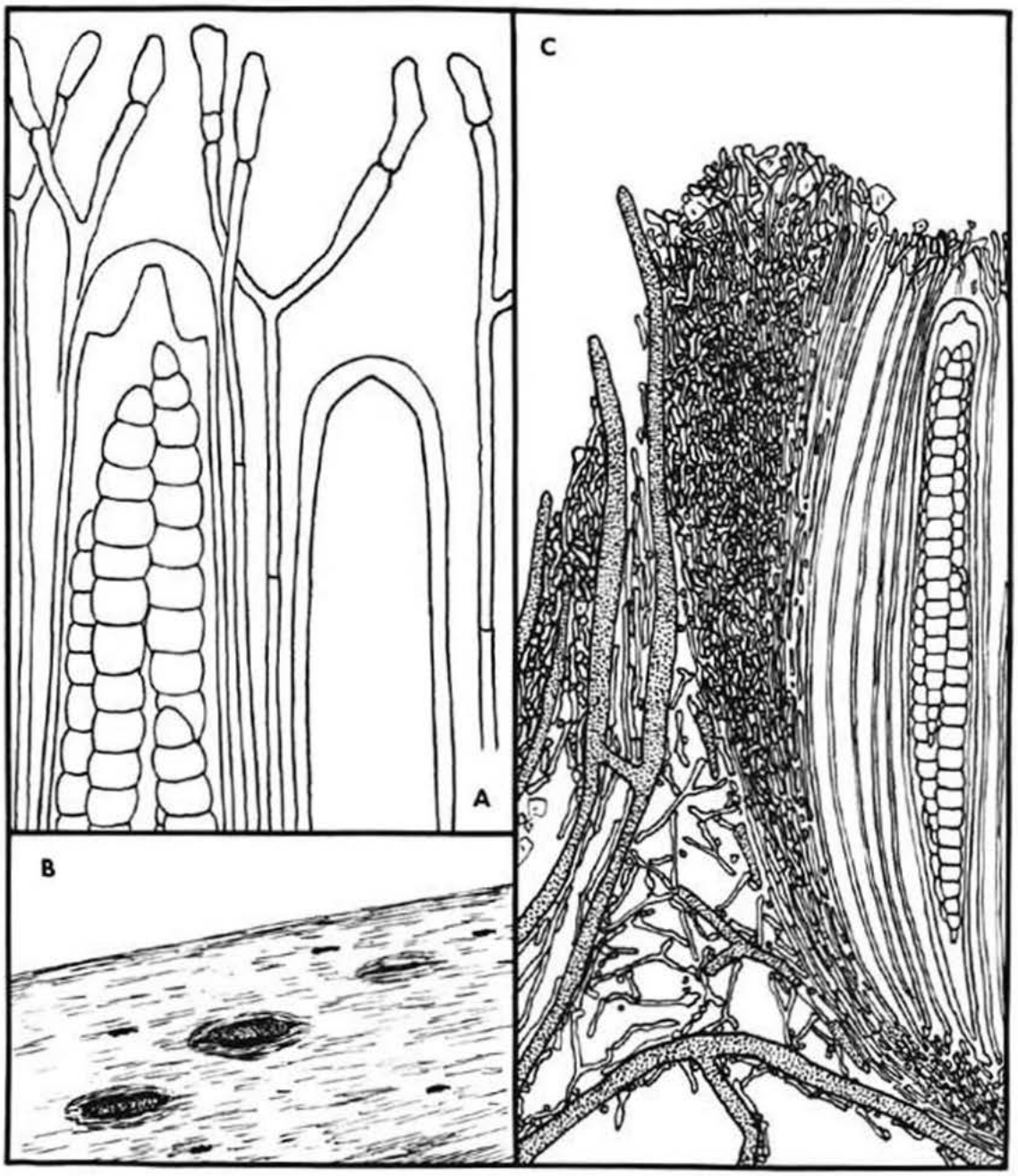


Figure 13. *Schizoxylon pseudocyanosporum*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x750. Drawn from the holotype.

Trav.; hence the specific spithet.

Müller and Ahmad (1962) recorded this species from Pakistan under the name *Lecanidion bacilliferum* (Karst.) Müller & Ahmad (≡ *Patellaria bacillifera* Karst.), a species synonymized with *Lecanactis insignior* (Nyl.) Vain. by Zahlbruckner (1922). Karsten's type is filed under *L. insignior* in Vainio's herbarium. This specimen (TUR-Vainio 26504a, Brasilia, Minas Geraes 1885, Lafayette 300) bears no resemblance to the Pakistani fungus and appears to be a good

*Lecanactis* with orbicular, superficial fruitbodies. Müller (personal communication) claimed that the asci of *Sch. pseudocyanosporum* were bitunicate, but I have been unable to confirm this. The species is more like *Schizoxylon sepincola* than any species of *Lecanidion* known to me.

SPECIMEN EXAMINED: see holotype, above.

*(33). (SCHIZOXYLON SAROTHAMNI)* (Fckl.) Rehm, Rabenh. Kryptogamenfl. ed. II, 1(3): 183 (1888)
≡ *Calloria? sarothamni* Fckl., Jahrb. Nassauischen Vereins Naturk. 27-28: 57 (1873)

Fuckel (l.c.) described a fungus whose imperfect stage was represented by Fungi Rhenani I: 2568. The material I examined, evidently the same "conidial" stage, is an immature or poorly-preserved Tremellaceous fungus with cruciately divided basidia. The ascigerous stage was said to have cylindrical poslysporous asci but cannot be characterized from the original description. Obviously it has no connection with its alleged conidial stage.

SPECIMEN EXAMINED: EUROPE: Germany (BPI, Herbier Barbier-Boissier 1459, on *Sarothamnus*, Nassau, ex herb. Fuckel)

*(34).* SCHIZOXYLON SCHWEINITZII Sherwood, spec. nov.

Figure 14

Ascocarpi primum immersi, non erumpescentes vel erumpescentes, 0.4-0.8 mm diam., margine integro, albo, disco pallide ochraceo. Margo in sectione transversali 25 µm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis achromis constans. Paraphyses filiformes, apice non incrassatae, ramosae, achromae, in iodo non caerulescentes. Asci 300-400 x 8 (-10) µm, apice 3 µm crassi, 4- vel 8-spori. Sporae 250-375 x 2.5-3.5 µm, cellulis 3-6 µm longis, ad septa se disjungentibus et articulos simplices formantibus.

HOLOTYPUS: BPI, on *Citrus*, Highlands Hammock, Florida, USA, Shear 260, Feb. 17, 1937.

Apothecia at first immersed, dissolving a small pore in the substrate and eventually becoming partially erumpent, 0.4-0.8 mm broad, the margin at first closed over the hymenium, white-pruinose, tending when mature to open by a transverse slit to expose the pale ochraceous disc, sometimes opening irregularly, without a stellate border. Margin in cross section 25 µm thick below, 50-60 µm thick above (the lips arch over the hymenium, forming a sort of peridium), of colorless hyphae 1.5 µm diam., slightly gelatinous, covered with small colorless crystals on the outer face. Accessory thalline margin moderately prominent. Subhymenium 10 µm thick, J-, resting on a layer of crystals and disintegrating host tissue. Asci 300-400 x 8(-10) µm, the cap 3 µm thick, pierced by a broad pore. Ascospores 4 or 8, nearly as long as the asci, 2.5-3.5 µm broad, soon breaking apart at the septa to form part-spores 3-6 µm long. Paraphyses colorless throughout, 1.0 µm broad, branched apically but scarcely enlarged, J-, crystalliferous, forming an epithecium 15 µm thick.

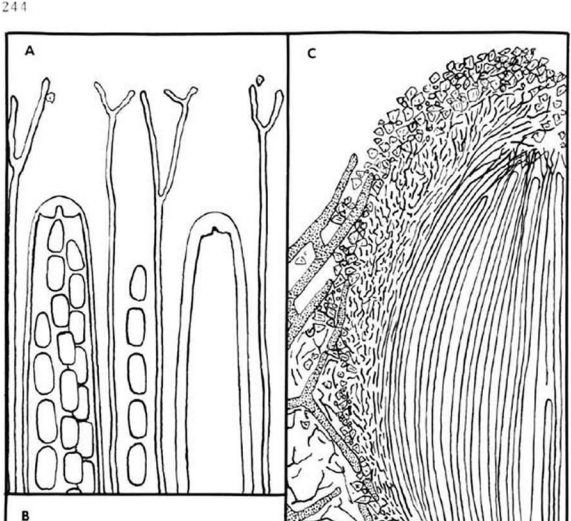


Figure 14. *Schizoxylon schweinitzii*. A. Detail of apices of asci, paraphyses, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x750. Drawn from the holotype.

On wood, Florida. The species is distinguished from *S. pruiniferum* Sherw. and *S. floridanum* by the broader part-spores and longitudinal dehiscence of the ascocarp.

SPECIMENS EXAMINED (see also holotype, above): NORTH AMERICA: USA (BPI, Sterlington LA, Shear, March 25, 1941; on *Citrus*?, Florida, Shear 17.II. 1937; on *Sambucus*, Florida, Shear 20.III.1943; on *Callicarpa*, Florida, Shear 12.XI.1941; on *Smilax*, Florida, 20.II.1942; on *Sambucus*, Florida, Shear 289, 1.II.1937)

*(35). SCHIZOXYLON SEPINCOLA* Pers. (OF 1: 138)

In addition to the localities previously recorded, this species also occurs in Crimea and the Canary Islands. The Canary island specimens were collected on small dead twigs of a non-gymnosperm host and are less erumpent than specimens on bare wood, but appear identical to typical *Sch. sepincola* microscopically.

SPECIMENS EXAMINED: ASIA: USSR (H, herb. Nylander 4732, on *Juniperus*, Son-Dagh, Tauria). AFRICA: Canary Islands (CUP-MM 747, La Palma, on *Cistus*, Korf, Denison, Kohn & Sherwood, 15.I.1976; MM-1062, Gran Canaria, on *Cistus*, *Ibid.*, 21.I.1976; MM-1064, *Ibid.*)

*(36). (AGYRIOPSIS STRYCHNI)* Rehm, Hedwigia 39: 216 (1900)

I could find nothing resembling resembling Rehm's original description in the type packet. Von Höhnel (1909) suggested that the species might be a foliicolous lichen, which Rehm's description of apothecia occurring on epiphyllous white spots containing green gonidia would certainly support. In any case it is highly unlikely that the species is an *Agyriopsis* (=*Schizoxylon*).

SPECIMEN EXAMINED: SOUTH AMERICA: Brazil (S, Sta. Catharina, Ule 1454, on *Strychnus*, holotype of *Agyriopsis strychni*).

*(37). SCHIZOXYLON TAENIOIDES* Speg., An. Mus. Nac. Hist. Nat. Buenos Aires 23: 102 (1912)

Figure 15

Apothecia gregarious, at first immersed, becoming erumpent, 0.3-0.5 mm diam., the margin black, entire or somewhat rugose, narrow, not clearly delimited from the shallowly cupulate matte black disc. Margin in cross section essentially obsolete, consisting of 2-3 layers of interwoven pale brown hyphae 2.0-3.0 µm diam. Thalline margin moderately prominent, c. 30 µm thick, containing disintegrating host tissue, narrow-diameter colorless hyphae, and dark torulose hyphae evidently belonging to another fungus. Asci 150-200 x 8-9 (-12) µm, the cap 5 µm thick but very inconspicuous, pierced by a broad pore. Paraphyses filiform, 1.0 µm broad below, much-branched and enlarged to 3-5 µm at the spex, dark brown, J+, forming an epithecium 15 µm thick. Ascospores 8, nearly as long as the asci, 3.0 µm broad above, tapering somewhat below, soon breaking up into globose part-spores 2.0 (below)-3.5 (above) µm diam.

On wood, Argentina. The ascospores are somewhat less tapered than Spegazzini implied in his original description. Parst spores enlarge from the ascus apex downward after they disarticulate (see figure 14). *Sch. taenioides* is similar to *Sch. lividum*, but differs in having globose part-spores, a less well-defined ascus cap, and narrower margin.

SPECIMEN EXAMINED: SOUTH AMERICA: Argentina (LPS 28215, s/*Condalia lineata*, Mendoza, Potrerillas, 26.IV.1910, C. Spegazzini, holotype of *Sch. taenioides*).

*(38). SCHIZOXYLON TENUISPORUM* see *S. cordobensis*

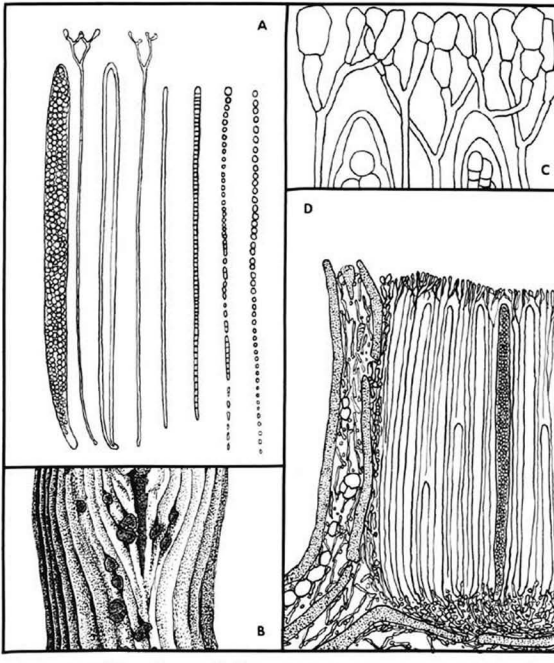


Figure 15. *Schizoxylon taenioides*. A. Asci, paraphyses, spores, and part-spores, showing ascospore development, x375. B. Habit sketch, x7.5. C. Detail of apices of asci, paraphyses, and spores, x1500. D. Cross section of margin, x300. Drawn from LPS 28215.

*(89). SCHIZOXYLON YUCCAE* Maubl., Bull. Soc. Mycol. France 20: 72 (1904)

I was unable to locate any material, type or otherwise, of this species. According to the original description the apothecia were amphigenous, minute, with a white margin and plane dark colorled disc, with asci 80-100 x 6-8 µm and part-spores 1.5-3 x 1.5 µm. The species occurred on *Yucca* in France.

(5). *STICTIS* Pers., Obs. Mycol. 2: 73 (1799)

Nomenclature, generic characters, and the majority of the species were treated in a separate paper (Sherwood, 1977). The following species are either transfers from *Schizoxylon* or were discovered amongst unidentified and misidentified *Schizoxylon* species in various herbaria.

*(1)*. STICTIS CONOTREMOIDES Sherwood, spec. nov.

Figure 16

Ascocarpi primum immersi, erumpescentes, 0.8-1.2 mm diam., margo integro, griseo, disco griseo. Margo in sectione transversali 120-150 µm crassus, siccus ab hymenio se abrumpens, hypharum pariete 3-4 µm diam., brunneo. Stratum crystallinum abest. Periphysoidea 75 x 2.5-3 µm, ramosa, brunnea. Paraphyses filiformes, ramosae, apice ad 1.5-2 µm incrassatae, brunneae, in iodo non caerulescentes. Asci 220-250 x 9-11 µm, apice 5-6 µm crassi, 8-spori. Sporae 200-225 x 4-4.5 µm, cellulis 3-5 µm longis.

HOLOTYPUS: BPI, Fungi Boreali-Americani 369c, Alaska, 151-152° W, 69°30' N, on *Salix alaxensis*, dried stream bed 3 mi. W. of Tuluga L. alt. 1000 M. G. A. Llano, 7/12/1949.

Apothecia at first immersed, becoming erumpent, 0.8-1.2 mm diam., the margin thick, entire, dark grey, involute, the disc deeply immersed, dark grey, splitting away from the margin when dry. Margin in cross section 120-150 µm thick, with a few crystalline inclusions but lacking a distinct crystalline layer, the wall 75 µm thick, of tightly-packed interwoven dark brown hyphae 3-4 µm thick. The brown layer beneath the subhymenium is continuous with the marginal paraphyses rather than with the wall. Periphysoids 75 x 2.5-3 µm, faintly brown, especially near the summit of the margin, much-branched and appearing pseudoparenchymatous. Subhymenium 20 µm thick, faintly J+ blue. Asci 220-250 x 9-11 µm, thick-walled when young, with a distinct apical cap 5-6 µm thick, 8-spored. Spores nearly as long as the asci, 4-4.5 µm broad, the cells 3-5 µm long, not obviously sheathed or coiling. Paraphyses 1.0 µm broad below, enlarged to 1.5-2 µm above, brown, frequently branched, J-, not crystalliferous, forming an epithecium. Marginal paraphyses in an agglutinated layer 3-4 deep, brown along their entire length.

On decorticated wood in the Alaskan arctic. In addition to being morphologically distinct from *S. lumbricus* Sherw. and *S. serpentaria* Ell. & Ev., this specimen was collected far outside the known range of other species of *Stictis*. *S. conotremoides* looks superficially a good deal like *Conotrema urceolatum* (Ach.) Tuck, but is not lichenized.

SPECIMEN EXAMINED: See holotype, above.

*(2)*. STICTIS CUNDINAMARCAE Sherwood, spec. nov.

Figure 17

Ascocarpi primum immersi, profunde cupulati, 0.4-1.0 mm diam., margo integro, albo, disco pallide ochraceo. Margo in sectione transversali 80-90 µm crassus, siccus ab hymenio se abrumpens, hypharum pariete 1.5-

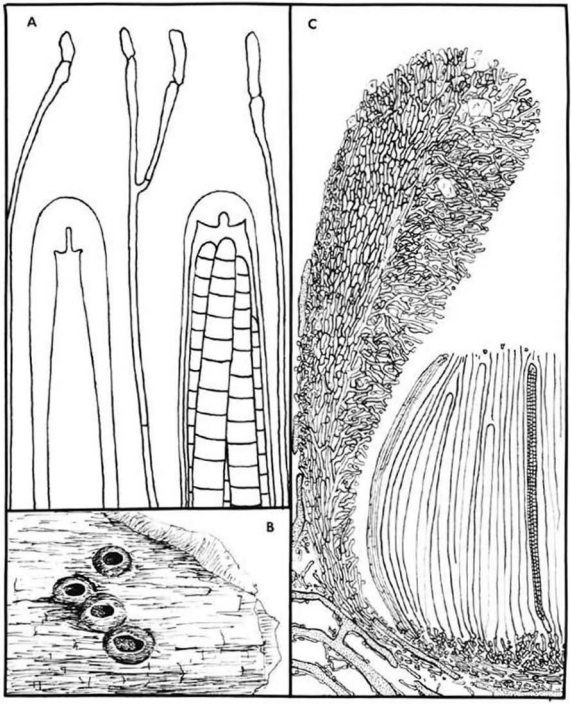


Figure 16. *Stictis conotremoides*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from the holotype.

2.0 µm diam., achromo. Stratum crystallinum 40-50 µm crassum. Periphysoidea 60 x 1.5 µm, non ramosa. Paraphyses filiformes, ramosae, circinatae, apice ad 1.5 µm incrassatae, achromae, in iodo non caerulescentes. Asci 300-320 x 6-7 (-10) µm, apice 7-8 µm crassi, 4-8 spori. Sporae 250 x 3.5-4.5 µm, vagina gelatinosa involutae, ad septa se disjungentibus et articulos 2.5-4.5 µm longis formantibus.

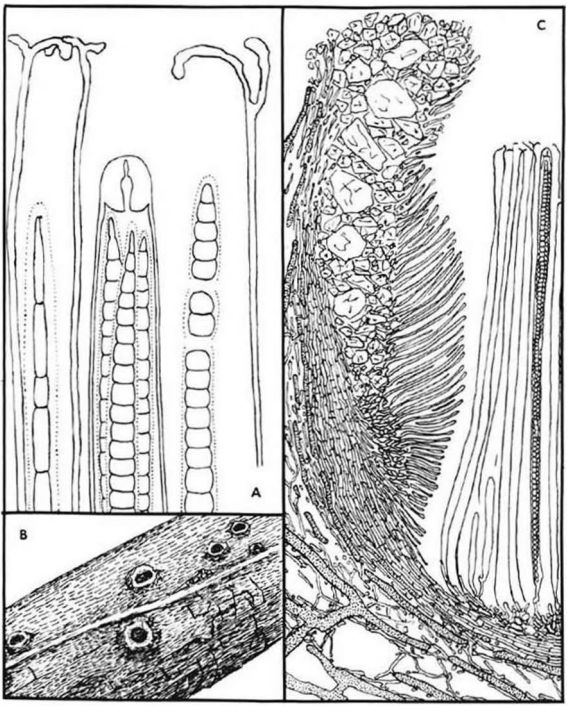


Figure 17. *Stictis cundinamarcae*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x300. Drawn from the holotype.

HOLOTYPUS: COL-Dumont 2217, on indet. twig, vicinity of km post 18 from Bogota on the Bogota-Villavicencia road via Caqueza, Dpto. Cundinamarca. Elev. ca. 10,200'. K. P. Dumont, P. Buriticá, J. Luteyn, 7 January 1976. ISOTYPUS: NY.

Apothecia at first immersed, raising the substrate into prominent pustules but not becoming erumpent, 0.4-1.0 mm

diam., the margin thick, white-pruinose, entire to lacerate, the disc deeply immersed, pale ochraceous, not splitting away from the margin when dry. Margin in cross section 80-90 µm thick, with a moderately prominent accessory thalline margin. Crystalline layer distinct, narrow. Wall colorless, 20 µm thick, of closely-packed non-gelatinous hyphae 1.5-2.0 µm diam., continuing beneath the subhymenium. Subhymenium 20 µm thick, J-. Periphysoids numerous, 60 x 1.5 µm, mostly unbranched, forming a compact layer. Asci 300-320 x 6-7 (-10) µm, the cap 7-8 µm thick, pierced by a complex narrow pore. Ascospores 8, sometimes fewer (some aborting), c. 250 µm long, 3.5-4.5 µm broad, obviously sheathed, particularly when young, constricted at the septa, moniliform, tending to disarticulate at the septa, the cells 2.5-4.5 µm long. Paraphyses numerous, branched and circinate, inflated to 1.5 µm at the apex, J-.

On dead twigs at relatively high elevations, South America.

SPECIMENS EXAMINED (see also holotype, above): South America: Colombia (NY-Co 7036, Norte de Santander, Dumont, Sherwood, Velasquez, 21.VIII. 1976). Venezuela (NY-Ve 3342, Edo. Tachira, Dumont, Samuels, Borjas, 29.VII.1971).

*(3).* STICTIS DAVIDSONII Sherwood, spec. nov.

Figure 18

Ascocarpi primum immersi, erumpescentes, profunde cupulati, 0.5-1.5 mm diam., margo integro, griseo vel nigro, disco pallide brunneo. Margo in sectione transversali 100-120 µm crassus, siccus ab hymenio se abrumpens, hypharum pariete 2.0-3.0 µm diam., brunneo. Stratum crystallinum abest. Periphysoidea 40-50 x 0.75 µm, ramosae, achromae, et 30 x 2.0 µm, non ramosae, brunneae. Paraphyses filiformes, simplices, apice non incrassatae, brunneae, in iodo non caerulescentes. Asci 220-250 x 7 µm, apice 6 µm crassi, 8-spori. Sporae 200-225 x 2.5 µm, cellulis 2-3 µm longis, ad septa se disjungentibus et articulos 3-septatis formantibus.

HOLOTYPUS: BPI, on *Populus temuloides*, 1/3 m. N.W. of Mesa Lakes Resort, Colorado, USA, June 18, 1930, R. W. Davidson 338-e.

Apothecia at first immersed, opening by a pore and eventually becoming erumpent, 0.5-1.5 mm diam., orbicular, the margin thick, dark grey to black, entire, moderately white-pruinose, the disc deeply immersed, dark ochraceous to brown, splitting away from the margin when dry. Margin in cross section 100-120 µm thick, with a prominent accessory thalline margin, the wall 40-60 µm thick, on brown non-carbonized hyphae 2.0 (-3.0 above) µm diam., not notably gelatinous, with scattered crystalline inclusions, continuing beneath the subhymenium as a layer 40-50 µm thick. Lower periphysoids 40-50 x 0.75 µm, branched, colorless, with gelatinous walls. Upper periphysoids 30 x 2 µm, pale brown, mostly unbranched, not gelatinous. Crystalline layer absent. Subhymenium 15 µm thick, J- or faintly J+ blue. Asci cylindrical, 220-250 x 7 µm, the cap 6 µm thick, pierced by a complex conical pore. Ascospores 8, nearly as long as the asci, 2.5-3 µm broad, breaking apart at every 4th septum to form 3-septate part-spores 8-12 µm long.

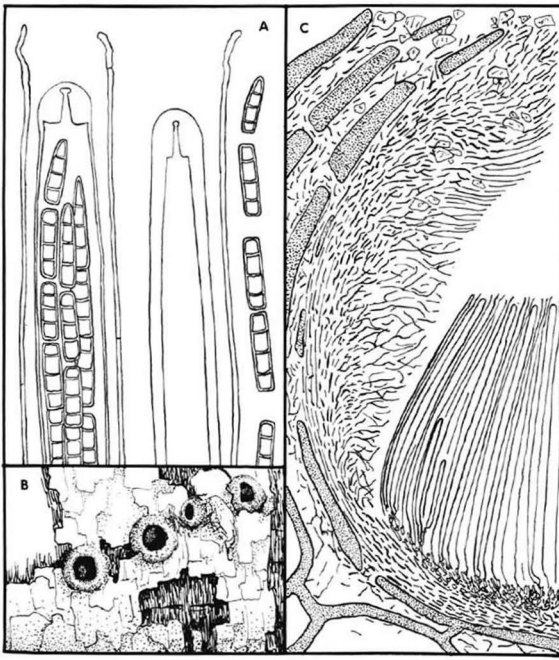


Figure 18. *Stictis davidsonii*. A. Detail of apices of asci, paraphyses, spores, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from BPI-Davidson 338-e.

Paraphyses filiform, 1.0 µm broad below, not enlarged or branched above, J-, their apices pale brown. Brown marginal paraphyses inconspicuous, tending to darken with age.
On decorticated wood, Colorado, USA.

SPECIMENS EXAMINED (see also holotype, above): NORTH AMERICA: USA (BPI, on *Populus*, Colorado, Davidson 335-a, 18VI.1930; on *Salix*, Colorado, Davidson 318-c; on *Salix* or *Populus*, Davidson 315, Colorado, 18.VI.1930)

*(4)*. STICTIS GRAECAE (Höhnel) Sherwood, comb. nov.
≡ *Schizoxylon graecum* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. Abt. 1, 116: 638 (1907)

Figure 19

Apothecia at first immersed, opening by a pore, eventually becoming somewhat erumpent, 0.3-1.0 mm diam., the margin moderately thick, entire or somewhat lacerate, white-pruinose, the disc moderately deeply immersed, dark grey, not pruinose. Margin in cross section c. 100 µm thick. Crystalline layer indistinct, composed of isolated non-rosettiform crystals. Wall c. 20 µm thick, of pale brown, tightly packed hyphae 1.5-2.5 µm diam., not notably gelatinous, not continuing beneath the subhymenium. Periphysoids 50-60 x 1.0 µm, branched, immersed in a gel. Subhymenium colorless, 20 µm thick, resting directly on host tissue, J-. Asci 190-250 x 6-7 (-10) µm, the cap 4 µm thick, pierced by a broad pore. Paraphyses filiform, 1.0 µm broad below, branched and enlarged to 1.5 µm apically, the apex pale brown, J-. Spores 8, nearly as long as the asci, 2-2.5 (-3, fide von Höhnel) µm broad, the cells 2-5 µm long, not sheathed or coiling, not disarticulating at the septa.

On twigs, Greece. The species is similar to *Stictis korfii* Sherw., but the spores are decidedly shorter and broader. Brown paraphyses, a colorless subhymenium, and prominent periphysoids distinguish this species from *S. mollis* Pers.

SPECIMEN EXAMINED: EUROPE: Greece (FH-Höhnel A4659, ad ramos *Olea europ.* insul. Corfu (Griechland) G. Eggerth, holotype of *Sch. graecum*)

*(5)*. STICTIS HYPOPHYLLA Sherwood, spec. nov.

Figure 20

Ascocarpi primum immersi, profunde cupulati, 0.3-0.5 mm diam., margine lacerato, albo, disco pallide ochraceo. Margo in sectione transversali c. 60 µm crassus, siccus ab hymenio se abrumpens, hypharum pariete 1.5-3.0 µm diam., achromo. Stratum crystallinum abest. Periphysoidea 15-20 x 1.0 µm, non ramosa. Paraphyses filiformes, simplices vel ramosae, 250 x 0.8-1.0 µm, achromae, in iodo non caerulescentes. Asci 200-250 x 4-4.5 (-5) µm, apice 2.5 µm crassi, 8-spori. Sporae 190-225 x 0.8-1.0 µm, cellulis 10-12 µm longis.

HOLOTYPUS: COL-Dumont 3327, on indet. leaf of fern, Universidad de Nariño property 3.5 mi. from a point 7 km from Pasto on the Pasto-Ipiales road, Dpto. Nariño, Colombia, K. P. Dumont, J. L. Luteyn, L. A. Molina, 24 Jan. 1976. ISOTYPI: NY, CUP.

Apothecia densely gregarious, 0.3-0.5 mm diam., at first immersed, becoming erumpent, the margin thick, white-pruinose, lacerate, the disc deeply immersed, pale ochraceous, not splitting away from the margin when dry. Margin in cross section c. 60 µm thick, externally pruinose but without a well-defined internal crystalline layer, the wall colorless, 35-50 µm thick, of interwoven hyphae 1.5-3.0 µm diam., with thick glassy walls. Periphysoids 15-20 x 1.0 µm, simple, the upper ones somewhat bulbous, the lower ones pointed, rather widely spaced in a gel. Subhymenium colorless, c. 20 µm thick, J-, resting on 10 µm of wall. Asci

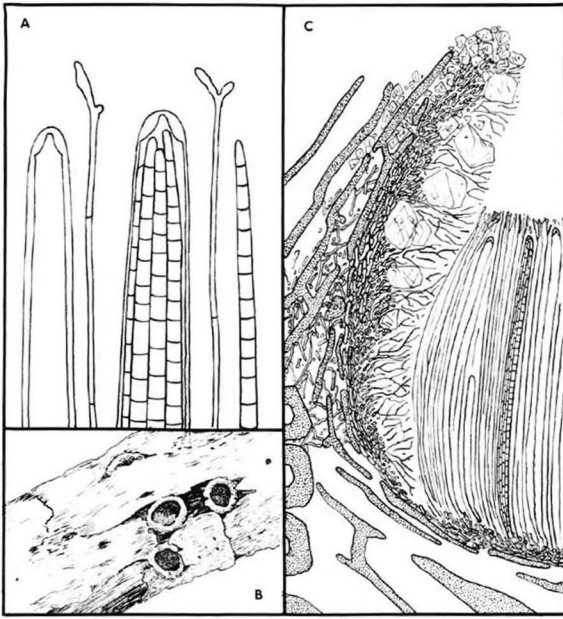


Figure 19. *Stictis graecae*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x300. Drawn from the holotype of *Schizoxylon graecum*.

200-250 x 4.0-5.5(-5) µm, the cap 2.5 µm thick, pierced by a narrow pore. Hymenium J-. Ascospores 8, nearly as long as the asci, 0.8-1.0 µm broad, the cells 10-12 µm long, not sheathed or coiling. Paraphyses 1.0 µm broad below, narrower above, simple to sparingly branched, not circinate or propoloid.

On dead leaves, South America.

SPECIMENS EXAMINED (see also holotype, above): SOUTH AMERICA: Peru (NY-Pe 1138, Dpto. Junín, 11,000', Dumont, Carpenter, Buriticá, Sherwood. 9.VII.1976; Pe-1232, Dpto. Junín, Elev. 10,800', *Ibid.*).

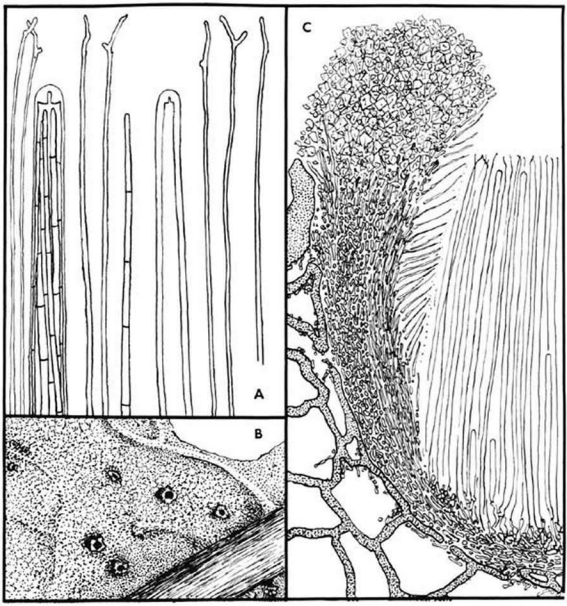


Figure 20. *Stictis hypophylla*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from NY-Co 3327.

*(6)*. STICTIS IMMERSA (Pass. ex Sacc.) Sherwood, comb. nov.
≡ *Schizoxylon immersum* Pass. ex Sacc., Syll. Fung. 8: 698 (1889)
≡ *Schizoxylon immersum* Pass. Diagn. Fung. Nov. 14 (? unpublished)

Figure 21

Apothecia at first immersed, opening by a pore but not becoming erumpent, 0.3-0.5 mm broad, the margin entire, black without, with a dark grey, moderately pruinose border, the disc deeply immersed, dark brown, splitting away from the margin when dry. Accessory thalline margin prominent, c. 80 µm thick, of widely-spaced brown non-carbonized hyphae

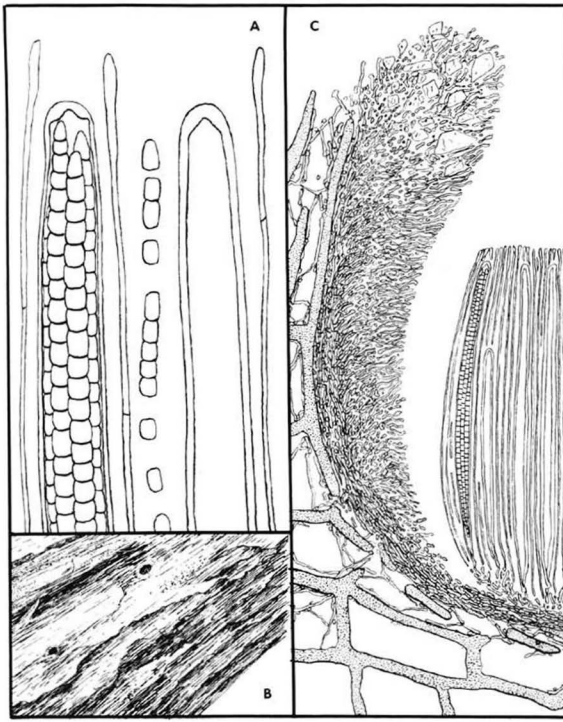


Figure 21. *Stictis immersa*. A. Detail of apices of asci, paraphyses, spores, and part-spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x375. Drawn from CUP-D, Rehm Ascomyceten 1531.

1.5 µm diam., containing much included host material. Margin c. 50 µm thick, the wall 15 µm thick, of interwoven hyphae 1.5-2.0 µm diam., pale brown below, colorless above, continuing beneath the subhymenium for about half the diameter of the apothecium. Crystalline layer poorly developed.

Periphysoids unbranched to sparingly branched, c. 20 x 1.5 µm, J-, forming a compact layer. Paraphyses 180-200 x 1.0 µm, simple, slightly enlarged apically, the apex pale brown, J+ blue. Asci 175-200 x 7-7.5 µm, slightly thick-walled, the cap 2-2.5 µm thick, with a broad pore. Ascospores 8, nearly as long as the asci, 2.5-3 µm broad, constricted at the septa and tending to disarticulate to form simple part-spores 2-3 µm long.

On *Clematis vitalba*, Parma, Italy, according to Saccardo (1889), who cites the place of publication of the species as "Pass. Diagn. fung. nov. 14". Lindau and Sydow (1909) list six articles of that title published by Passerini between 1876 and 1892, but the species does not appear in any of them under *Schizoxylon* or a reasonable synonym. Saccardo's description may have been taken from unpublished manuscript notes. The species is at any rate validly published in the 8th volume of Sylloge Fungorum.

No specimen of *Schizoxylon immersum* remains in Passerini's herbarium (PARMA), and the only specimen in Saccardo's herbarium is from Rehm's Ascomyceten. Rehm's Ascomyceten 1531, from which the above description and Rehm's (1912) redescription of the species were taken, is neither type nor authentic material and has asci twice as long as were claimed by Saccardo (1889) for the species. Although possibly misidentified, it appears to be a distinct species of *Stictis*.

SPECIMEN EXAMINED: EUROPE: Germany (CUP-D 11886, auf dürren ranken von *Clematis vitalba* bei Hersching am Ammersee (Oberbayern) 8/1903, Dr. Rehm, Ascomyceten 1531).

*(7).* STICTIS PARADOXA Sherwood, spec. nov.

Figure 22

Ascocarpi primum immersi, non erumpescentes, profunde cupulati, 0.5-1.2 mm diam., margine integro vel lacerato, disco pallide ochraceo. Margo in sectione transversali 35-50 µm crassus, siccus ab hymenio se abrumpens, ex hyphis intertextis achromis constans. Paraphyses filiformes, ramosae, achromae, apice ad 2.0 µm incrassatae, in iodo non caerulescentes. Asci 375-400 x 5-5.5(-6) µm, apice 3.5-4 µm crassi, 8-spori. Sporae 325-375 x 1.75-2.0 µm, cellulis 3-5 µm longis.

HOLOTYPUS: NY-Ve 3100, on unidentified twig, ravine ca. 80 km N. & W. of Barrancas, on Merida-Barrancas road, Edo. Barinas, Venezuela. K. P. Dumont, G. J. Samuels, L. Borjas. 26 July 1971. Isotypus: VEN.

Apothecia at first immersed, raising the substrate into small pustules but not becoming erumpent, opening by a pore, 0.5-1.2 mm broad, the margin thick, buff-colored, entire to occasionally lacerate, the disc immersed, but not as deeply as in most species of *Stictis*, pale ochraceous, splitting away from the margin when dry. Margin in cross section 35-50 µm thick, predominantly crystalline, of colorless interwoven hyphae 1.5 µm diam. Periphysoidal layer indistinct. The conspicuous thalline margin accounts for most of the broad margin as seen from above. Subhymenium colorless, J-, of small, colorless, angular cells, 15-20 µm thick. Paraphyses numerous, filiform, colorless throughout, J-, enlarged to 2.0 µm at the apex, 1-2 times branched and cir-

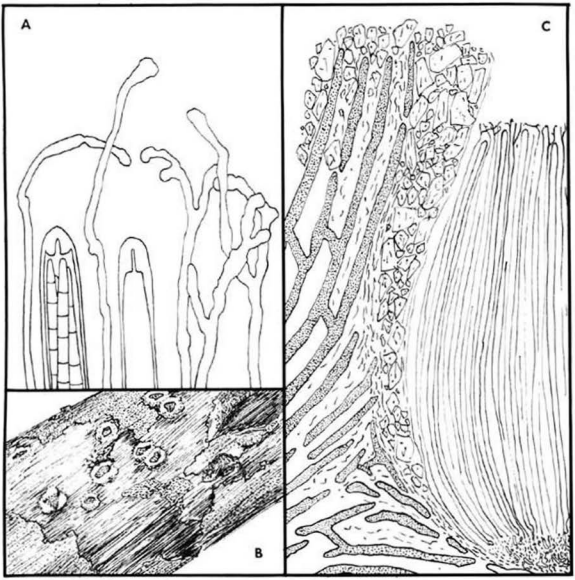


Figure 22. *Stictis paradoxa*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x225. Drawn from NY-Ve 3100.

cinate, not greatly exceeding the asci in length or forming an epithecium. Asci 375-400 x 5-5.5 (-6) µm, the cap 3.5-4 µm thick, with a distinct pore. Spores 8, nearly as long as the asci, 1.75-2.0 µm broad, the cells 3-5 µm long, not disarticulating.

On wood, Venezuela. The margin, with poorly-developed wall and periphysoids, is quite different from that of *Stictis prominens* Sherw., which has a similar hymenium. *Sch. bellum* (Cke. & Kalchbr.) Sherw., an African species with non-disarticulating spores and similar hymenial dimensions, has a very thick wall. I have placed *S. paradoxa* in *Stictis* because of the immersed disc which splits away from the margin when dry, but the species may be transitional to species of *Schizoxylon* with colorless walls and non-disarticulating spores.

SPECIMEN EXAMINED: see holotype, above.

*(8). STICTIS RADIATA* Pers., Obs. Mycol. 2: 73 (1799) var. UNCINATA Phillips ex Sherwood, var. nov.
≡ *Stictis radiata* var. *uncinata* Phill. in herb.

*S. radiata* var. *uncinata* a var. typica extremitibus sporarum ambabus uncinatis differt.

HOLOTYPUS: COL-Dumont 6955, ca. 114 km. from Bucaramanga, on the Bucaramanga-Pamplona rd., Dto. Norte de Santander, Colombia. Elev. ca. 10,200'. K. P. Dumont, M. A. Sherwood, L. F. Velasquez, 21 August 1976. Isotypi: NY, CUP.

*Stictis radiata* var. *uncinata* differs from typical *S. radiata* in having spores which coil from both ends when released from the ascus. Phillips filed a specimen (cited below) and sketch under this name in his herbarium, but does not appear to have published the name. The coiling reaction was observed in lactophenol-cotton blue, Melzer's reagent, and KOH. With the possible exception of Phillips's specimen all of the collections cited were collected at high elevations. Long branched periphysoids 1.0 µm broad refer this variety to *S. radiata* rather than to *S. stellata* Wallr., which is more common in the tropics and has not been observed to have coiling ascospores.

SPECIMENS EXAMINED (see also holotype, above): NORTH AMERICA: Jamaica (K, Dr. Masters 5/85, Phillips's specimen of *S. radiata* var. *uncinata*). SOUTH AMERICA: Colombia (NY-Co 1820, Dpto. Cundinamarca, Dumont, Haines, Idrobo, 23.VII.1974; Co-6985; 6952; 6971, all from Dpto. Norte de Santander, Dumont, Sherwood, Velasquez, 21.VIII.1976; Co-6810, *Ibid.*, 20. VIII.1976; Co-5132, Dpto. Boyaca, Dumont, Sherwood, Carpenter, Molina, 13.VI.1976). Peru (NY-Pe 441, Dpto. Huanuco, Dumont, Carpenter, Sherwood, Buriticá, 2.VII.1976).

*(9).* STICTIS VENEZUELAE Sherwood, spec. nov.

Figure 23

Ascocarpi primum immersi, profunde cupulati, 0.3-0.6 mm diam., margine integro, albo, disco pallide ochraceo. Margo in sectione transversali 50-75 µm crassus, siccus ab hymenio se abrumpens, hypharum pariete 2.0 µm diam., achromo. Stratum crystallinum 20-40 µm crassum. Periphysoidea 15-20 x 2.0 µm, non ramosa. Paraphyses filiformes, simplices vel ramosae, circinatae, apice non incrassatae, achromae, in iodo caerulescentes. Asci 240-280 x 7 µm, apice 4 µm crassi, 8-spori. Sporae 220-250 x 2.5 µm, vagina gelatinosa involutae, cellulis 3-5 µm longis.

HOLOTYPUS: NY-Ve 656, on unidentified twig, trail between Rio Chiquito and Rio Grande, above La Plata, Mt. La Naiguita, Dpto. Federal, Venezuela. Dumont, Haines, & Manara, 25 June 1971. Isotypus: VEN

Apothecia immersed, opening by a pore, 0.3-0.6 mm diam., the margin white, entire, the disc deeply immersed, pale ochraceous, splitting away from the margin when dry. Accessory thalline margin not prominent. Wall 25 µm thick, of interwoven colorless hyphae 2.0 µm diam., not notably gelatinous, appearing somewhat pseudoparenchymatous. Crystalline layer distinct, narrow. Periphysoids 15-20 x 2.0 µm,

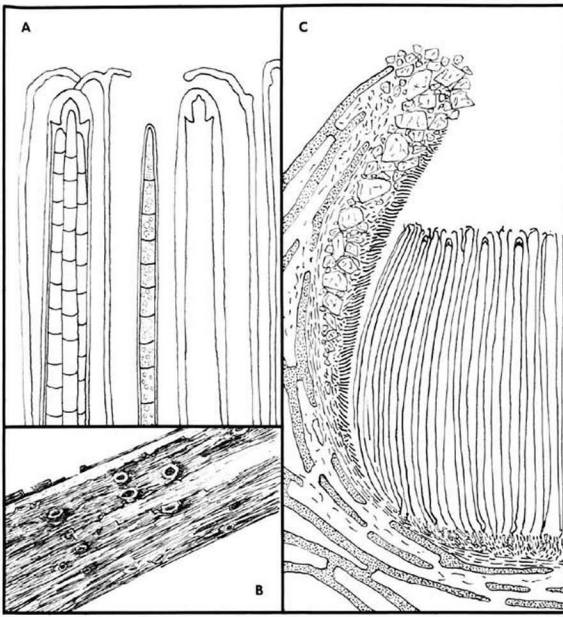


Figure 23. *Stictis venezuelae*. A. Detail of apices of asci, paraphyses, and spores, x1500. B. Habit sketch, x7.5. C. Cross section of margin, x 225. Drawn from NY-Ve 656.

unbranched, not gelatinous, forming a compact layer. Paraphyses filiform, branched and circinate, generally not thickened above, J+ blue. Asci 240-280 x 7 µm, the cap 4 µm thick, pierced by an angular pore. Ascospores 8, nearly as long as the asci, 2.5 µm broad, sheathed, the cells 3-5 µm long.

On twigs, South America. *S. prominens* Sherw. has a much thicker wall, and longer, narrower, branched periphysoids. Longer, broader, sheathed spores and circinate paraphyses distinguish *S. venezuela* from *S. stellata*.

SPECIMENS EXAMINED (see also holotype, above): SOUTH AMERICA: Colombia (NY-Co 7526, Dpto. Risaralda, Dumont & Molina, 27.VIII.1976)

ACKNOWLEDGEMENTS

The author wishes to express a debt of gratitude to the many individuals and institutions who have made this study possible. Thanks are expressed to the directors and staff of the following herbaria for processing loans and making available the specimens on which this study was based: B, BPI, BURNLEY, COL, CUP, FH, H, K, LPS, NY, S, TUR, S, ZT. The author was able to collect fungi in South America under grant GB-28593 to K. P. Dumont (NY) and in the Canary Islands under NSF grant DEB75-23557 to R. P. Korf (CUP). The study was supported primarily by the bequest of Anna Jenkins to the CUP herbarium. R. P. Korf kindly assisted in manuscript preparation and offered many helpful suggestions. W. J. Dress (BH) assisted in preparing the Latin diagnoses.

LITERATURE CITED

Groves, J. W. (1952). The genus Tympanis. Canad. J. Bot. 30: 571-651.

Höhnel, F. von (1909). Fragmente zur Mykologie. 400. Agyriopsis javanica n. sp. Sitzungsber. kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. Abt. 1, 118: 1227-1229.

Lindau, G. & H. Sydow (1909). Thesaurus litteraturae mycologicae et lichenologicae II. Lipsiis. 808 p.

Müller, E. & S. Ahmad (1962). Über einige neue oder bemerkswerte Ascomyceten aus Pakistan. Biologia (Lahore) 8: 151-162.

Nylander, W. (1861). Lichenes scandinaviae. Not. Sällsk. Fauna Fl. Fenn. Förh. 5: 1-312, tab.

Ouelette, G. B. & K. A. Pirozynski (1974). Reassessment of Tympanis based on types of ascospore germination within the asci. Canad. J. Bot. 52: 1889-1911.

Poelt, J. (1969). Bestimmungschlüssel Europaischer Flechten. Lehre. 757 p.

Rehm, H. (1912). Zur Kenntnis der Discomyceten Deutschlands, Deutsch-Österreichs, und der Schweiz. Ber. Bayer. Bot. Gesellsch. 13: 102-206.

Saccardo, P. A. (1889). Sylloge Fungorum 8. Patavii. 1143 p.

Sherwood, M. A. (1977). The Ostropalean Fungi. Mycotaxon 5: 1-277.

Zahlbruckner, A. (1922-24). Catalogus lichenum universalis II. Leipzig. 815 p.

MYCOTAXON

Vol. VI, No. 2, pp. 261-276 October-December 1977

# NOTES ON HYPHOMYCETES. XX. "CERCOSPORA-COMPLEX" FUNGI OF *CASSIA* AND *PSORALEA*.

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## ABSTRACT

Seven species of hyphomycetes originally classified in *Cercospora* Fres. occurring on *Cassia* and *Psoralea* are redescribed and illustrated. One, *C. chamaecristae* Ell. and Kellerm., is accepted as satisfactorily classified in its original genus; one, *C. cassiae* P. Henn., in *Cercosporidium* Earle; one, *C. occidentalis* Cooke in *Phaeoramularia* Mutanola; one, *C. greciana* H. Syd., is reclassified in *Mycovellosiella* Rangel and three, *C. angustata* Chupp and Solheim, *C. nigricans* Cooke and *C. simulata* Ell. and Everh., are reclassified in *Phaeoisariopsis* Ferraris.

## INTRODUCTION

Twenty specific epithets have been proposed in the genus *Cercospora* to accommodate fungi occurring on members of *Cassia* L. and *Psoralea* L. Examination of type collections on which nineteen of these are based has indicated that eleven can be accepted as valid. One is best regarded as a *nomen dubium*. Seven are considered to be facultative nomenclatural synonyms. No decision has been made concerning two epithets since type material has not been seen.

Brown and Morgan-Jones (1976) redescribed and illustrated four of these fungi listing two epithets as synonyms. Two species were reclassified in *Cercosporidium* and one each in *Passalora* and *Phaeoisariopsis*. In the present paper seven species are redescribed and illustrated. Six epithets are listed as synonyms. One species is retained as appropriately classified in *Cercospora*, one is reclassified in *Mycovellosiella* and three in *Phaeoisariopsis*. Two of the species have

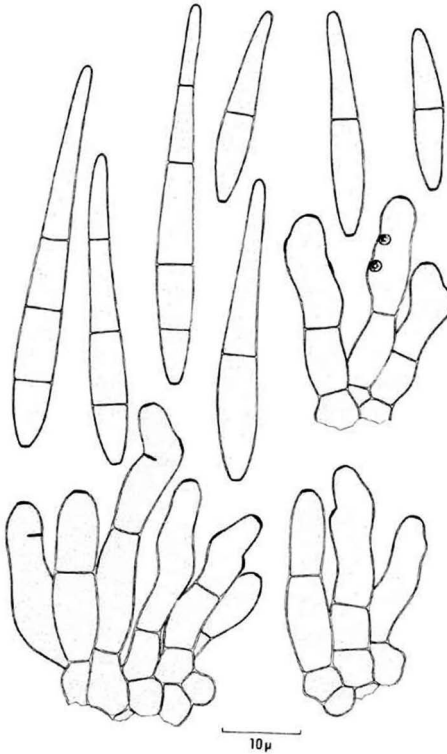


FIGURE 1. *Cercospora chamaecristae*
Conidiophores and conidia.

previously been transferred out of *Cercospora* into *Cercosporidium* and *Phaeoramularia* by Deighton (1967) and Deighton in Ellis (1976), respectively.

## TAXONOMIC PART

*Cercospora chamaecrista* Ellis and Kellerman, J. Mycol. 4:7, 1888 (Fig. 1).

Leaf spots indistinct, brown; leaf tissue appearing scorched. Colonies hypophyllous, effuse, occasionally spreading over most of the abaxial surface of the leaf. Mycelium immersed in the substratum, composed of branched, septate, pale brown, 3 - 4μ wide hyphae. A few prosenchymatous, pale brown cells aggregate in the substomatal cavities and give rise to loose fascicles of conidiophores. Conidiophores macronematous, mononematous, emerging through the stomata, simple, straight, smooth, relatively thick-walled, cylindrical to subclavate, 0 to 2-septate, constricted slightly at the septa, apex obtuse, pale olivaceous brown, conidial scars prominent, 15 - 70 X 4 - 7μ. Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, solitary, dry, acropleurogenous, subhyaline to very pale brown, straight or slightly curved, narrowly obclavate, base somewhat truncate, 1 to 8-septate, basal scars prominent, 15 - 55 X 5 - 7μ.

On leaves of *Cassia chamaecrista* L; North America.

Collection examined: on *C. chamaecrista*, Manhattan, Kansas, October 1887, W. A. Kellerman no. 1126, NY, type.

The conidiophores of *C. chamaecrista* are similar in size and morphology to those of *C. apii* Fres., the type species of *Cercospora*. The broader, more obclavate conidia distinguish *C. chamaecrista*.

*Cercosporidium cassiae* (P. Henn.) Deighton, C.M.I. Mycol. Pap. 112:66, 1967 (Fig. 2).

≡ *Cercospora cassiae* P. Hennings, Bull. Herb. Bossier 1:121, 1893.

= *Berteromyces anaeus* Ciferri, Sydowia 8:267, 1954.

Leaf spots dark brown, generally orbicular, sometimes irregular, individual spots up to 3mm wide, frequently coalescent, occasionally surrounded by a yellow halo, often delimited by leaf veins. Colonies amphigenous but mostly hypophyllous, bearing dark olivaceous, dense, pustular fascicles that sometimes occur outside the leaf spot. Mycelium immersed,

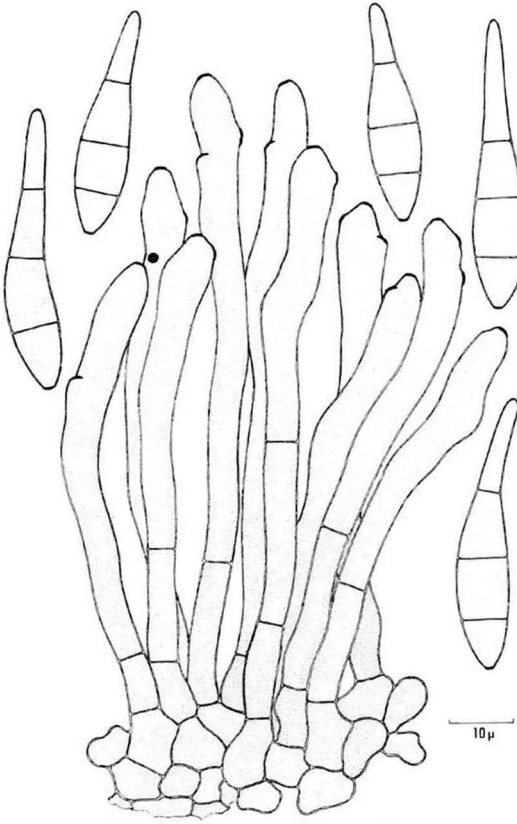


FIGURE 2. *Cercosporidium cassiae*.
Conidiophores and conidia.

subhyaline, branched, septate, 2 - 3μ wide. Stromata composed of tightly appressed, hyaline cells, substomatal, 50 - 75μ wide, about 15μ thick below the densely crowded conidiophore bases. Conidiophores macronematous, mononematous, numerous, fasciculate, erect, straight or flexuous, pale olivaceous brown, paler above, 1 to 3-septate, cylindrical, usually broader towards the apex, conidial scars distinct, markedly thickened, 70 - 130 X 3.5 - 5μ, occasionally up to 10μ wide distally; conidial scars frequently situated on a small shoulder at an angle to the axis. Conidiogenous cells polyblastic, integrated, terminal sympodial. Conidia solitary, dry, acropleurogenous, straight, to slightly curved, occasionally rostrate, apex obtuse, 0 to 4-septate, pale olivaceous brown, 27 - 65 X 8 - 11.5μ, with a distinct thickened basal scar.

On leaves of *Cassia* spp.; Africa, North America, West Indies.

Collection examined: on *C. goratensis* Fres., nr. Akur, Eritrea, Ethiopia, March 5, 1892, G. Schweinfurth no. 777, B, type.

This fungus has been reported to occur on eight other species of *Cassia* (Deighton, 1967).

*Mycovellosiella greciana* (H. Syd.) comb. nov. (Fig. 3).

≡ *Cercospora greciana* H. Sydow, Ann. Mycol. 23: 426, 1925.

Leaf spots indistinct. Colonies effuse, dense, hypophyllous, sometimes delimited by the leaf veins, brown to dark brown. Mycelium superficial or immersed in the substratum; immersed mycelium branched, septate, pale olivaceous brown, 6 - 7μ wide, superficial mycelium similar but hyphae usually slightly constricted at the septa. Conidiophores macronematous, mononematous, arising from the superficial hyphae terminally or as small lateral branches, smooth, relatively thick-walled, straight or slightly flexuous, cylindrical, somewhat broader towards the apex, septate, sometimes mildly geniculate, mid olivaceous brown, paler above, 20 - 73 X 5 - 7μ, bearing distinct scars. Conidiogenous cells polyblastic, terminal, integrated, sympodial. Conidia holoblastic, solitary, dry, acropleurogenous, cylindrical to narrowly obclavate, usually curved, smooth, thick-walled, pale to mid olivaceous brown, 0 to 14-septate, basal scars distinct, truncate, 22 - 108 X 6 - 8μ.

On leaves of *Cassia oxyphylla* Kunth; Central America.

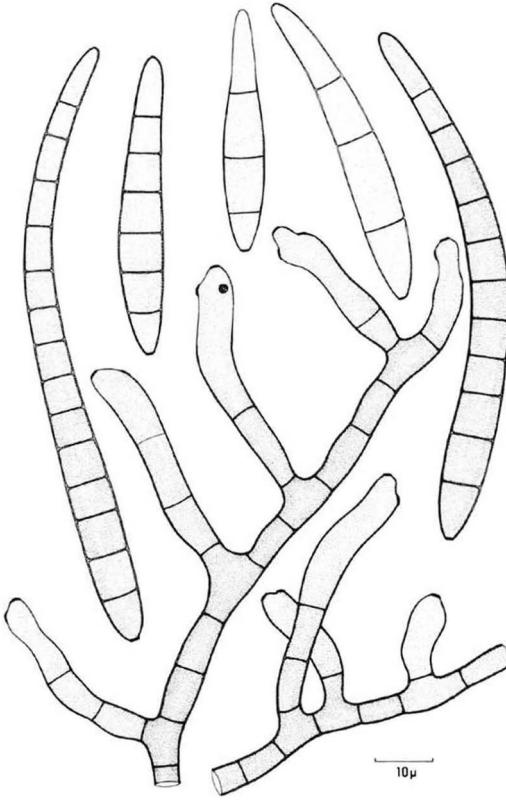


FIGURE 3. *Mycovellosiella greciana.* Conidiophores and conidia.

Collection examined: on *C. oxyphylla*, Grecia, Costa Rica, January 19, 1925, H. Sydow, Fungi exotici exsiccati no. 710, S, type.

Chupp (1953) suggested that this species might be placed in *Helminthosporium* Link ex Fr. on account of its colored conidiophores and thick-walled conidia. Clearly this suggestion can not be taken up. The fungus has all the characteristics of *Mycovellosiella*. The presence of assurgent conidiophore-bearing superficial hyphae is characteristic as is a tendency for the hyphae and conidiophores to intertwine.

*Phaeoisariopsis angustata* (Chupp and Solheim) comb. nov. (Fig. 4).

≡ *Cercospora angustata* Chupp and Solheim, apud Chupp, A monograph of the fungus genus *Cercospora*, 280, 1953.

Leaf spots brownish to grayish, 0.5 to 3mm in diameter, angular, on dried leaves almost invisible. Colonies effuse, amphigenous, brown. Mycelium immersed in the substratum, composed of branched, septate, subhyaline to very pale brown hyphae, 2 - 4μ wide. Stromata immersed, sometimes partly exposed, prosenchymatous, brown, subglobose to somewhat irregular, up to 40μ wide. Conidiophores macronematous, mononematous, fasciculate, simple, straight or flexuous, subhyaline to pale olivaceous brown, cylindrical, base somewhat inflated 0 to 1-septate, smooth, scars indistinct, 10 - 50 X 2 - 3.5μ. Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, dry, solitary, acropleurogenous, straight or moderately curved, cylindric to very narrowly obclavate, subhyaline to very pale olivaceous brown, base truncate, scars indistinct, 15 - 75 X 2 - 4μ.

On leaves of *Cassia hirsuta* L; South America.

Collection examined: on *C. hirsuta*, Finca "Las Cana", south of Jamundi, Colombia, May 15, 1929, C. E. Chandon and J. Nolla no. 269, CUP.

The conidiophores and conidia of *P. angustata* do not possess the distinct scars characteristic of *Cercospora*. It is perhaps not ideally classified in *Phaeoisariopsis* but a more satisfactory generic home for it is unavailable.

*Phaeoisariopsis nigricans* (Cooke) comb. nov. (Fig. 5).

≡ *Cercospora nigricans* Cooke, Grevillea 12:30, 1883.

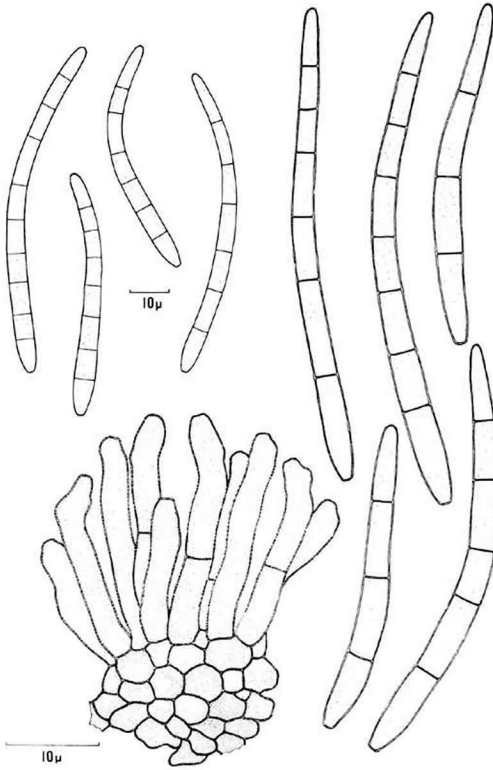


FIGURE 4. *Phaeoisariopsis angustata*.
Conidiophores and conidia.

= *Cercospora atromaculans* Ellis and Everhart, J. Mycol. 3:17, 1887.

= *Cercospora torae* Tharp, Mycologia 9:115, 1917.

Leaf spots indefinite at first, later becoming grayish brown, orbicular, up to 1cm in diameter. Colonies effuse. Mycelium immersed in the substratum, composed of branched, septate, pale brown hyphae, 3 - 4μ wide. Stromata immersed, substomatal, prosenchymatous, consisting of a few to several cells, olivaceous brown to brown. Conidiophores macronematous, mononematous, in loose fascicles, amphigenous or more often epiphyllous, occasionally branched, straight to slightly flexuous, geniculate above, smooth, pale brown, paler towards the tip, cylindrical, slightly broader towards the apex, 2 to 6-septate, bearing indistinct conidial scars, 30 - 100 X 4 - 5μ. Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, solitary, dry, acropleurogenous, straight to slightly curved, narrowly obclavate to cylindrical, very pale brown, 3 to 5-septate, somewhat truncate at the base, 18 - 80 X 3 - 5μ.

On leaves of *Cassia* spp.; North America, South East Asia, West Indies.

Collections examined: on *C. obtusifolia* L.; Aiken, South Carolina, November 1881, W. H. Ravenel no. 4023, K, type; on *C. tora* L., Natchitoches, Louisiana, September 23, 1886, A. B. Langlois no. 707, NY (type of *C. atromaculans*); on *C. tora* L., Palestine, Texas, October 30, 1914, Lewis and Tharp, BPI (type of *C. torae*).

*Phaeoisariopsis simulata* (Ell. and Everh.) comb. nov. (Fig. 6).

≡ *Cercospora simulata* Ellis and Everhart, J. Mycol. 1:64, 1885.

Leaf spots indistinct. Colonies hypophyllous, effuse, olivaceous brown. Mycelium immersed in the substratum, composed of branched, septate, subhyaline to pale brown, 3 - 4.5μ wide hyphae. A few hyphae composed of inflated, subhyaline cells aggregate in substomatal cavities and give rise to fascicles of conidiophores. Conidiophores macronematous, mononematous, fasciculate, simple, lower third straight to slightly flexuous, upper two thirds flexuous to geniculate, smooth, olivaceous brown, paler above, cylindrical, frequently slightly bulbous at the base, broader near the apex, septate, conidial scars indistinct, 140 - 300 X 3 - 4μ. Conidiogenous cells polyblastic, integrated, terminal or intercalary, somewhat denticulate, sympodial. Conidia

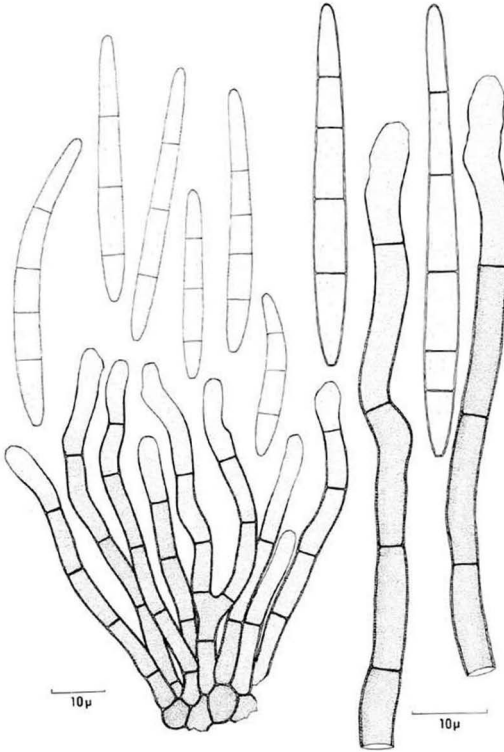


FIGURE 5. *Phaeoisariopsis nigricans*. Conidiophores and conidia.

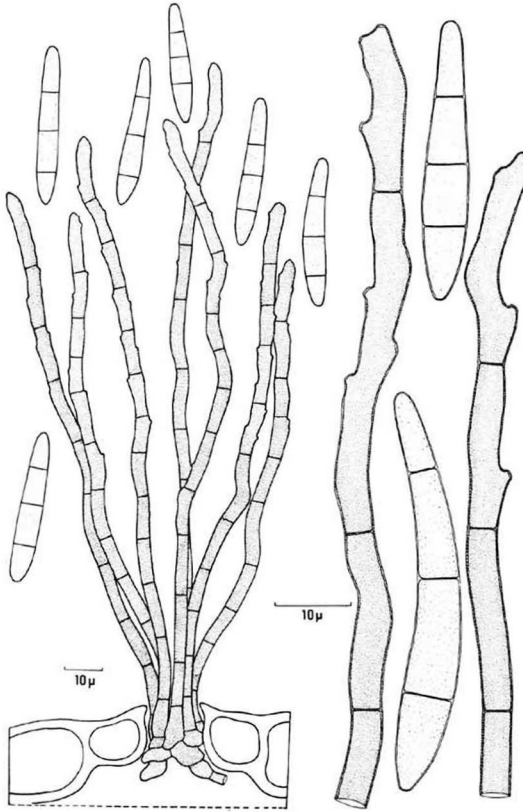


FIGURE 6. *Phaeoisariopsis simulata.*
Conidiophores and conidia.

holoblastic, solitary, dry, acropleurogenous, straight or gently curved, narrowly obclavate to cylindrical, somewhat truncate at the base, subhyaline to very pale brown, 1 to 3-septate, 20 - 45 X 4 - 5μ.

On leaves of *Cassia* spp.; Europe, North and South America, West Indies.

Collection examined: on *C. marylandica* L., Pine Hills, Union County, Illinois, September 22, 1884, F. S. Earle no. 117, NY, type.

Chupp (1953) records this species as occurring on *C. alata* L.

The relatively long, flexuous conidiophores bearing indistinct, unthickened conidial scars indicate affinity with *Phaeoisariopsis* rather than with *Cercospora*.

*Phaeoramularia occidentalis* (Cooke) Deighton apud Ellis, More Dematiaceous Hyphomycetes, Commonwealth Mycological Institute, 322, 1976 (Fig. 7).

≡ *Cercospora occidentalis* Cooke, Hedwigia 17:39, 1878.

≡ *Cercosporina occidentalis* (Cooke) Saccardo, Syll. Fung. 25:906, 1931.

= *Cercospora paulensis* P. Hennings, Hedwigia 48:18, 1909.

= *Cercospora occidentalis* Ellis and Kellerman apud Heald and Wolf, USDA Bur. Plant Ind. Bull. 226:101, 1912.

= *Ramularia cassiaecola* Heald and Wolf, USDA Bur. Plant Ind. Bull. 226:101, 1912.

= *Cercospora somalensis* Curzi, Bol. R. Staz. Patol. Veget. n.s. 12:158, 1913.

Leaf spots raised, orbicular or irregular in shape, cream to brownish, center sunken with a pale brown to brown border, sometimes coalescing, up to 40mm wide. Colonies limited, amphigenous, brown. Mycelium immersed in the substratum, composed of branched, septate, pale brown, 3 - 4μ wide hyphae. Stromata subglobose or somewhat flattened, composed of hyphae made up of swollen, pale brown cells closely appressed, 10-45μ wide. Conidiophores macronematous, mononematous, fasciculate, emerging through the stomata, simple, straight or curved, cylindrical, smooth, slightly inflated above, pale to mid brown, 0 to 1-septate, conidial scars distinct,

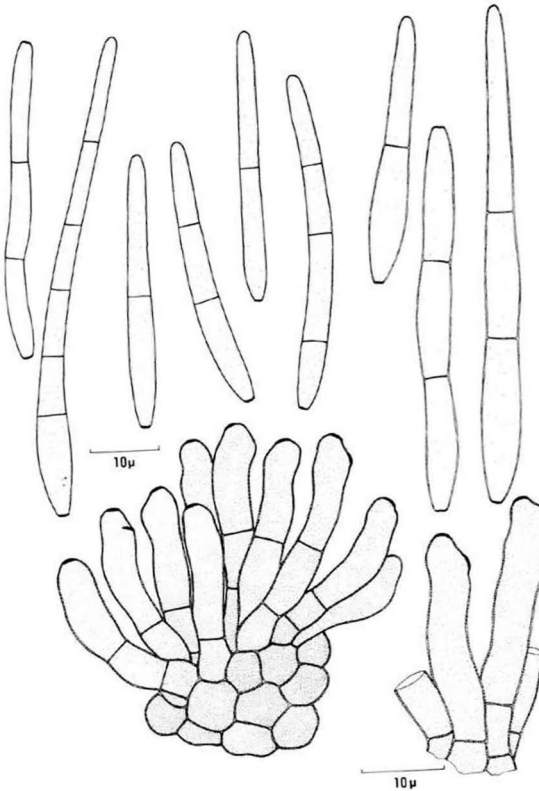


FIGURE 7. *Phaeoramularia occidentalis*. Conidiophores and conidia.

8 - 40 X 4 - 6μ. Conidiogenous cells polyblastic, integrated, terminal, sympodial. Conidia holoblastic, solitary or catenate, dry, acropleurogenous, straight or curved, cylindrical, slightly wider at the base, pale olivaceous brown, smooth, 1 to 6-septate, 30 - 140 X 4 - 7μ.

On leaves of *Cassia occidentalis* L.; North and South America, West Indies.

Collections examined: on *C. occidentalis*, Aiken, South Carolina, 1876, H. W. Ravenel, Fungi Am. Exsiccati 65, BPI, type; on *C. occidentalis*, Auburn, Lee County, Alabama, September 28, 1896, F. S. Earle, NY; on *Cassia* sp., Iponema, Sao Paulo, Brazil, November 4, 1903, P. Hennings, BPI (type of *C. paulensis*); on *C. occidentalis*, Cuero, Texas, September 3, 1909, F. D. Heald and F. A. Wolf, BPI (type of *Ramularia cassiaecola*); on *C. occidentalis*, Stockdale, Texas, September 4, 1911, F. D. Heald and F. A. Wolf, BPI.

## NOTES ON OTHER SPECIES

*Cercospora psoraleae-bituminosae* Savulescu and Sandu-Ville, Mem. Sec. St. Acad. Rom., ser. 3, 15:485, 1940.

An examination of the holotype of *Cercospora psoraleae* Ray (on *Psoralea digitata* Nutt., College Nursery, Stillwater, Oklahoma, U.S.A., March 7, 1940, W. W. Ray, CUP) which Constantinescu (1975) lists as a facultative synonym of *C. psoraleae-bituminosae*, shows it to be conspecific with *Cercosporidium cassiocarpum* (Sacc.) Brown and Morgan-Jones. The following names have been applied to this fungus:

*Cercosporidium cassiocarpum* (Sacc.) Brown and Morgan-Jones, Mycotaxon 4:299, 1976.

≡ *Cercospora occidentalis* Cooke var. *cassiocarpa* Saccardo, Ann. mycol. 11:557, 1913.

≡ *Cercospora cassiocarpa* (Sacc.) Chupp, A monograph of the fungus genus *Cercospora*, 290, 1953.

= *Cercospora latens* forma *europea* Fragosa, Boln. R. Soc. Esp. Hist. Nat. 21:97, 1921.

= *Cercospora europea* (Frag.) O. Const., Revue Mycol. 32:106, 1967.

= *Cercospora psoraleae-bituminosae* Savulescu and Sandu-Ville, Mem. Sec. St. Acad. Rom., ser. 3, 15:485, 1940.

= *Cercospora psoraleae* Ray, Mycologia 33:176, 1941 non *C. psoraleae* Petrak, Sydowia 4:572, 1950.

A detailed description and illustration of this fungus was published by Brown and Morgan-Jones (1976). *Cercospora canescens* Ellis and Martin is a similar fungus known to occur on a variety of leguminaceous hosts. Ellis (1976) records it on *Cassia*. It seems possible that *C. cassiocarpum* might be the same as *C. canescens* but examination of the type of the latter is needed to ascertain this. If they should be found to be conspecific the name *C. canescens* has priority.

*Cercospora cassiaecola* Roumeguere, Fungi selecti exsiccati 4866.

Examination of its type material (on leaves of *Cassia* sp., Cordillere de Peribebuy, Paraguay, March 1883, B. Balansa, NY) has revealed the collection to be in too poor a condition to permit evaluation. Chupp (1953) notes that a second packet in herb. FH is in a similar condition and that a third packet in herb K contains a piece of thick bark. It seems advisable to list this name as a *nomen dubium*.

*Cercospora lambareneensis* Yeh, Cah. La Maboke 9:33, 1971.

This was described from a collection on *C. occidentalis*. We have not examined the type.

*Cercospora pinnulaecola* Atkinson, J. Elisha Mitchell Sci. Soc. 8:64, 1892.

This was described from a collection on *C. nictitans* L. We have not examined the type.

ACKNOWLEDGEMENT

We thank the curators of the herbaria at Beltsville, Berlin, Ithaca, Kew, New York and Stockholm for making available for examination collections in their keeping.

REFERENCES

BROWN, L. G. and G. MORGAN-JONES. 1976. Notes on Hyphomycetes. XI. Additions to the genera *Cercosporidium*, *Passalora* and *Phaeoisariopsis*. Mycotaxon 4:229-306.

CHUPP, C. 1953. A monograph of the fungus genus *Cercospora*. Ithaca 1-667.

CONSTANTINESCU, O. 1975. Revision of *Cercospora* species (hyphomycetes) parasitic on *Psoralea*. Mycotaxon 3:119-125.

DEIGHTON, F. C. 1967. Studies on *Cercospora* and allied genera. II. *Passalora, Cercosporidium* and some species of *Fusicladium* on *Euphorbia*. Commonw. Mycol. Inst. Mycol. Pap. 112:1-80.

ELLIS, M. B. 1976. More Dematiaceous Hyphomycetes. Commonwealth Mycological Institue 1-507.

MYCOTAXON

Vol. VI, No. 2, pp. 277-336 October-December 1977

# LES GENRES *DICHOSTEREUM* ET *VARARIA* EN GUADELOUPE (BASIDIOMYCETES, LACHNOCLADIACEAE)

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*RESUME*

Descriptions are given of *Dichostereum peniophoroides*, *Vararia dussii* n. sp., *V. gomezii*, *V. intricata*, *V. minidichophysa*, *V. minispora* n. sp., *V. rhombospora* n. sp. and *V. tropica*. Cultural characters are given for all these species which occur in Guadeloupe, excepting *V. minidichophysa* for which the data has been published elsewhere, and *V. tropica*. Species of *Dichostereum* always are shown to be tetrapolar and to have a *Spiniger* stage. Autonomy of *D. peniophoroides* is confirmed as a result of its intersterility with other species, but interfertility of strains of *V. dussii* is demonstrated despite differences in spore size, and likewise interfertility of 5 strains of *V. intricata* with variable gloeocystidial characters. A key is provided to all species of *Vararia* occurring in Central America.

Un bref séjour en 1975, puis trois semaines de récoltes et d'études intensives des Aphyllophorales en septembre-octobre 1976 nous permettent d'apporter une première contribution à la connaissance de la Flore mycologique guadeloupéenne.

Afin de comparer, d'identifier ou de distinguer nos récoltes africaines, nous avions été amenés à étudier

de nombreuses espèces de *Vararia* subg. *Vararia* décrites du monde entier et avons donné de chacune une description illustrée (1976). Mais il n'avait pas été possible d'étudier alors les *Vararia* d'Amérique du Sud. Si depuis nous avons pu obtenir le prêt de deux espèces décrites par Viègas (1945), il ne nous a toujours pas été permis de disposer des espèces de J. Rick, malgré des demandes répétées. Il nous paraît hautement regrettable que l'accès à certaines collections soit rendu impossible aux spécialistes. Peut-être faudrait-il suggérer aux Comités internationaux de nomenclature de prendre des mesures, si nécessaire draconniennes, pour assurer l'accès à des collections qui, après publication, appartiennent en fait au patrimoine scientifique international. Nous aurions dû différer indéfiniment cette mise au point si notre collègue P.L. Lentz, directeur des "National Fungus Collections" américaines (Beltsville, Maryland), qui a eu la possibilité d'étudier antérieurement les *Vararia* de Rick, n'avait eu l'amabilité de nous faire savoir que nos descriptions illustrées ne correspondaient à aucune des espèces de J. Rick.

Malgré une prospection encore sommaire, il apparaît que le genre *Vararia* est bien représenté en Guadeloupe. Certaines récoltes ont pu être identifiées à des espèces décrites d'Amérique Centrale *(Vararia(Dichostereum) penioporoides, V. tropica)*, d'autres à des espèces d'Amérique du Sud *(V. gomezii)* ou même d'Afrique tropicale *(V.minidichophysa, V.intricata)*, d'autres enfin doivent être considérées comme nouvelles *(V.rhombospora, dussii, minispora)*. Comme nous l'avons fait dans la mise au point de 1976, nous donnerons une description illustrée des *V.splendida* et *ubatubensis* (Viègas 1945) espèces brésiliennes apparentées respectivement à *V. intricata* et *V. minispora*, regrettant une fois encore de ne pouvoir être plus complets à défaut de l'étude des spécimens de J. Rick.

Aucune espèce Nord-Américaine tempérée n'a été récoltée. Nous ne reprendrons pas l'étude d'espèces que Welden (1965) a décrites des Caraïbes et que nous n'avons pas rencontrées ; elles ont été illustrées dans notre mise au point précédente (1976) ; ce sont *V. fibra* Welden, de Jamaïque, et *V. trinidadensis* Welden *(ut trinidadense)* de Trinidad. Cet auteur signale en outre *V. pallescens* à Grenada, *V. investiens* à Porto-Rico, St Kitts et Jamaïque, *V. pectinata* en Dominique et au Surinam, et *V. phyllophila* en Jamaïque. Les citations *V. investiens* et de *V. pectinata* ne sont pas à retenir ; pour ce dernier voir à *V. splendida*.

L'accueil reçu à la Station de Pathologie végétale du Centre de Recherches Agronomiques des Antilles et de la Guyane de l'I.N.R.A. à Petit-Bourg (Guadeloupe) nous a permis non seulement l'étude journalière dans de bonnes conditions du matériel récolté et l'obtention de sporées, mais aussi la mise en culture polysperme et l'isolement de monocaryons. Les caractères culturaux pourront donc être décrits pour la presque totalité des espèces signalées, et notamment pour toutes les espèces proposées comme nouvelles Pour les conditions d'observation et l'expression des résultats, le lecteur se reportera à J. Boidin (1958), pour le décryptage du Code à Nobles (1965) et aux compléments proposés par J. Boidin (1966) et P. Lanquetin (1973 b). Les milieux de montage des préparations seront indiqués dans les légendes des figures sauf pour les cultures toujours observées dans le Rouge Congo ammoniacal à froid.

Rappelons que, sauf pour les spécimens d'herbier reçus en prêt, les spores sont toujours observées sur des sporées récoltées dans les heures qui suivent la cueillette, et les mesures effectuées dans la phloxine-KOH 3 %. Plusieurs trouvailles intéressantes n'ont pas sporulé ; elles ne seront pas décrites ici : nous considérons en effet que la sporulation nous assure du bon état du spécimen recueilli, et que, vu la valeur des critères forme et taille de la spore dans le genre *Vararia*, seules des mesures de spores naturellement projetées sont valables. Lorsque les hyphes génératrices sont peu abondantes et de forme irrégulière, la recherche des boucles nécessite la dissociation poussée de fragments de carpophores : pour cela, après un bain éventuel dans HCl N pour dissoudre les cristaux d'oxalate, coupes et fragments sont plongés quelques heures à 60° C dans le Rouge Congo ammoniacal. L'observation se fait dans ce même mélange, si besoin est, en contraste de phase. Il est parfois nécessaire pour se débarasser des contenus protoplasmiques de prolonger le traitement ammoniacal ou de remplacer l'ammoniaque par KOH à 3 ou 5 %. L'observation se fait encore dans le Congo ammoniacal. Ce colorant teinte en rouge les parois dextrinoïdes qui sont donc parallèlement congophiles ; on remarquera que les dichophyses jaunies ou brunâtres qui n'étaient plus dextrinoïdes ni congophiles à froid, retrouvent ces qualités après le traitement à 60° C par la potasse ou l'ammoniaque.

Nous avons pensé faire oeuvre utile en situant dans la clé du genre *Vararia*, à côté des espèces que nous

avons récoltées en Guadeloupe, les *V. ubatubensis* et *splendida* du Brésil, dont certaines récoltes guadeloupéennes sont affines, et les espèces signalées de la zone Caraïbe par Welden. Nous y ajouterons deux *Scytinostroma* tropicaux récoltés en Guadeloupe et qui au vu de leurs fibres dextrinoïdes à ramifications dichotomiques pourraient être recherchés dans le genre *Vararia*.

## CLES

A-Spores sphériques ou subsphériques, ornées, très amyloïdes ; conidiophores oedocéphaloïdes dans les cultures, notamment monocaryotiques ; boucles constantes..... genre DICHOSTEREUM

A-Spores non amyloïdes ou avec une bavette suprahilaire amyloïde, ou spores fusiformes à paroi mince tout amyloïde, lisse ou faiblement ornée ; pas de conidiophores oedocéphaloïdes en culture ; boucles présentes ou absentes ..... genre VARARIA

### Clé du genre *Dichostereum* :

a-Gloeocystides nombreuses, larges de plus de 10 µm (9 à 23 µm) au contenu devenant solidifié ; spores à grosses verrues amyloïdes, et paroi gonflant dans les solutions alcalines. Jamaïca, Dominica, Guadeloupe ..... *D. peniophoroides* (Burt)

a-Gloeocystides ne dépassant pas 10 µm de largeur ; spores moins fortement ornées et à paroi ne gonflant pas dans KOH 3 %. U.S.A., Grenada. ..... *D. pallescens* (Schw.)

### Clé du genre *Vararia* : (1)

a-Hyphes génératrices bouclées ..... b

b-Basidiomes minces à chair blanche ou pâle croissant généralement sur bois mort suspendu ; spores allongées (plus de deux fois plus longues que larges) ..... c

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1) portent un numéro d'ordre, les espèces qui seront décrites ci-après.

c-Spores fusiformes larges, losangiques de face, 15-17x5-6,2 µm; gloeocystides étroites, 20-33 x4-5 µm, sulfo-aldéhydes positives avec schizo-papille terminale. Guadeloupe.
..... 6- *V. rhombospora* n. sp.
c-Spores plus étroites, x3,2-4,2 µm..... d
d-Spores oblongues à subfusiformes, 9-15x3,5-4µm dichophyses toutes à rameaux ultimes longs et souples. Brésil, Surinam.
..... 8- *V. splendida* (Viégas)
d-Spores longuement naviculaires de profil, biapiculées, à zone apiculaire oblique longuement rétrécie, 15-18-(21)x3,2-4,2 µm; dichophyses profondes aux rameaux ultimes coniques droits, passant à des dichophyses aux rameaux extrêmes grêles et souples. Gabon, Guadeloupe ..... 3- *V. intricata* B.& L.
b-Basidiomes devenant épais (200 à 1000 µm), à chair rouille ou brune sauf en surface, croissant sur bois au sol ; petites spores ovoïdes ou oblongues courtes (rapport longueur sur largeur inférieur à 2).
..... e
e-Dichophyses hyméniales aux rameaux ultimes longs et souples ; gloeocystides sulfoaldéhydes positives ; spores ovoïdes oblongues 4-6,5x3-3,75 µm. Guadeloupe.
..... 1- *V. dussii* n. sp.
e-Dichophyses superficielles à rameaux ultimes très courts ..... f
f-Dichophyses les plus profondes en couche lâche, de 30-50 µm d'envergure, à branches étalées, raides et ultimes rameaux coniques ; dichophyses moyennes formées d'un tronc sinueux à paroi épaisse qui porte des branches peu développées, en partie simples (non divisées et comme avortées) ; dichophyses superficielles plus étalées à rameaux ultimes assez nombreux grêles et courts ; spores ovoïdes, 3-4x2-2,5 µm. Brésil..... 9- *V. ubatubensis* (Viégas)
f-Dichophyses toutes à branches bien développées, écartées, avec rameaux ultimes cylindriques courts, obtus, assez larges ; spores subovoïdes, 3-4x2,5-3,25 µm Guadeloupe ..... 5- *V. minispora* n. sp.

a-Hyphes génératrices sans boucles (cloisons simples) ..... g

g-Basidiome épais (1000 à 6000 µm); chair colorée, beige à brun fuligineux, s'assombrissant dans KOH ..... h

h-Spores sphériques lisses amyloïdes, 6-7,5 µm de diamètre; éléments dextrinoïdes de surface terminés par des rameaux longs, grêles, involutés. Sri Lanka, Aru island, Brésil, Guadeloupe.
..... voir *Scytinostroma albo-cinctum* (Berk. & Br.)

h-Spores subcylindriques courtes, un peu déprimées, 8-10x4-5,25 µm, non amyloïdes ; éléments dextrinoïdes de surface terminés par des rameaux cylindriques obtus.. Afrique intertropicale, Brésil, Guadeloupe.
..... voir *Scytinostroma phaeosarcum* B. & L.

g-Basidiome mince, généralement moins de 100 µm, à chair blanche ou très pâle ne s'assombrissant pas dans KOH ..... i

i-Spores ovoïdes ou oblongues courtes, moins de deux fois plus longues que larges ; gloeocystides étroites avec schizopapille terminale ..... j

j-Dichophyses supérieures aux rameaux ultimes courts ; spores ellipsoïdes très petites, 3-4x2-2,5 µm ; présence de rhizomorphes constitués en grande partie de fibres présentes aussi dans le subiculum. Jamaïque.
..... *V. fibra* Welden

j-Dichophyses supérieures aux branches courtes et aux rameaux ultimes longs et grêles (type capillaire) ..... k

k-Spores oblongues larges, 9-11x 7-8,5 µm ,sans bavette ; dichophyses supérieures de 15-25 µm d'envergure. Porto Rico, Guadeloupe, Arizona.
..... 7- *V. tropica* Welden

k-Spores ovoïdes, 6,5-8x4,75-5,5 µm avec mince bavette amyloïde ; dichophyses de faible envergure (8-13 µm). Côte d'Ivoire, Gabon, Centrafrique, Guadeloupe. ..... 4-*V.minidichophysa* B.& L.

i-Spores fusiformes plus ou moins biapiculées ..... l

l-Spores larges, 12,5-15x4,8-6 µm ; dichophyses supérieures aux rameaux ultimes nombreux et courts (type coralloïde) ; gloeocystides et pleurogloeocystides trapues à paroi épaisse.. Argentine, Guadeloupe. ..... 2- *V. gomezii* B. & L.

l-Spores étroites ne dépassant pas 3,5 µm de largeur ..... m

m-Dichophyses de type capillaire ; spores 16-17,5-(22) x2,5-3,25 µm . U.S.A., Jamaïque... *V. phyllophila* (Massee)

m-Dichophyses superficielles à rameaux ultimes courts, obtus; spores 10-13x2,5-3 µm. Trinidad... *V. trinidadensis* Welden

Nous décrirons ci-dessous les *Vararia* nouveaux et nous nous contenterons de donner quelques précisions complémentaires sur les autres *Vararia* rencontrés en Guadeloupe, plusieurs espèces n'étant précédemment connues que par la seule récolte type. Seules les cultures obtenues pour la première fois seront décrites.

## A - Le genre *DICHOSTEREUM* Pilát emend.

Il s'agit d'un ensemble regroupant au moins 8 espèces, que nous avons jusqu'ici traité comme sous-genre du genre *Vararia*. Particulièrement homogène et bien caractérisé, notamment par ses spores et ses conidiophores, cet ensemble mérite le rang de genre.

Pilát qui crée ce terme (1926) l'utilise dans un sens assez différent du nôtre pour des "Stereumartige Pilze welche ... stark gefärbte Dichophysen entwickeln...". Il

cite d'abord des espèces exotiques : *D. induratum* (Berk.), *D. albo-cinctum* (Bk. et Br.) et *D. duriusculum* (Bk. et Br.) qui sont pour nous des *Scytinostroma* (Boidin et Lanquetin 1976), et une seule espèce européenne qu'il décrit et pour laquelle il propose la combinaison : *D. durum* (Bourd. & Galz.) Pilát. Très logiquement Donk (1931, 1957) choisit cette dernière comme type ; Parmasto (1971, p. 83) ne croit pas faire autrement lorsqu'il indique comme type *V. pallescens* qu'il considère après Rogers et Jackson (1943) comme synonyme de *V. dura*. Seuls Clements et Shear (1931) ont suggéré de retenir *D. induratum*, première espèce citée. Tous les autres auteurs ont suivi Donk et son argumentation irréprochable. C'est pourquoi les règles nous font un devoir de reprendre ce nom de genre pour un ensemble d'espèces comprenant *Asterostromella dura* Bourd. & Galz., mais en en précisant le nouveau sens.

Caractères principaux du genre *Dichostereum* emend. :

Spores amyloïdes sphériques ou subsphériques, ornées de verrues et d'une bavette très amyloïdes, binucléées; gloeocystides sulfo-positives au moins dans la jeunesse ; dichophyses ; boucles constantes ; conidiophores oedocéphaloïdes produisant de petites conidies uninucléées sur mycéliums mono -comme sur mycéliums dicaryotiques ; comportement nucléaire subnormal ou hétérocytique ; tétrapolarité.

Espèce type : *Dichostereum durum* (Bourd. et Galz.) Pilát, 1926

Autres espèces : *Dichostereum brevisporum* (Rattan Resupinate Aphyllophorales of the North Western Himalaya, Cramer edit. 1977, *ut Vararia*) *NOV. COMB.* ; *Dichostereum effuscatum* (Cooke et Ellis, Grevillea, 9:103,1881, *ut Corticium*) *NOV. COMB.* : *Dichostereum granulosum* (Fr., Syst. Myc. 1:446,1821, *ut Thelephora*) *NOV. COMB.* ; *Dichostereum pallescens* (Schw., Tr. Amer. Phil. soc., 4:167,1832, *ut Thelephora*) *NOV. COMB.* ; *Dichostereum peniophoroides* (Burt, Ann. Missouri bot. Gard. 3:234,1916, *ut Hypochnus*) *NOV. COMB.* ; *Dichostereum ramulosum* (Boid. et Lanq., Bull. Soc. Linn. Lyon, 42:165,1973, *ut Vararia*) *NOV. COMB.* ; *Dichostereum rhodosporum* (Wakef., Kew Bull. Misc. Inf. 372,1915, *ut Asterostromella*) *NOV. COMB.*

*Dichostereum peniophoroides* (Burt) Boid. et Lanq.
fig. 1

Etalé, adhérent, peu à peu épaissi avec marge brusque ou localement atténuée et plus pâle, isabelle terne (7,5 YR 7/4) *(2)*. Surface mate, un peu bosselée, gris rosâtre (5 YR 5,8/2) ; aspect subfarineux sous la loupe, mais non pulvérulent.

En herbier la surface est beige (10 YR 6,8/3, vers vinaceous buff R.) comme le contexte. Elle apparaît sous la loupe comme semée de petites paillettes brillantes. Cohérent, il est cependant très tendre sous le rasoir.

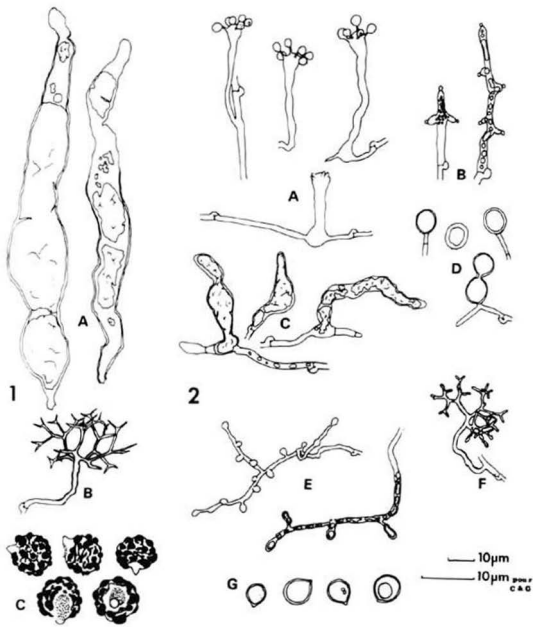
En coupe, épais de 250 à 700 µm. Il montre, à la base, une couche hyaline d'épaisseur variable (environ 100 µm) formée d'hyphes génératrices parallèles au support et qui englobent souvent des tissus de l'hôte ; ces hyphes x2-3 µm, bouclées, ont une paroi très mince et sont souvent vite flasques et peu distinctes. Cette couche est surmontée d'une zone de 100 µm de hauteur rappelant un contexte de *Scytinostroma*, elle est constituée de fibres enchevêtrées, bien dextrinoïdes, assez serrées, non raides, ramifiées dichotomiquement ; ces fibres, x1,2 µm environ, ont une paroi épaissie ; c'est parfois cette couche qui repose directement sur les cellules de l'hôte. On passe ensuite à une couche épaisse, formée surtout de gloeocystides verticales, serrées, auxquelles se mêlent des hyphes génératrices et des éléments dextrinoïdes, le tout densément constellé de spores enfouies. GLOEOCYSTIDES nombreuses, de forme irrégulière, subfusiformes à subcylindriques, 60-110-150x9-16-23 µm au contenu un moment densément guttulé, puis concrété en une ou plusieurs masses subhyalines réfringentes qui peuvent l'emplir toute et masquer la paroi qui les enveloppe ; cette paroi peut être mince ou sensiblement épaissie (0,8-1 µm, dans le Congo ammoniacal), cet épaississement étant le plus souvent situé dans la moitié inférieure, le sommet restant à paroi très mince et fragile. Nous n'avons

*(2)* Les références des couleurs sont celles de la Munsell Book Color Company (Baltimore, USA). Il s'y ajoute parfois des notations issues de Ridgway (R).

pu noter de réaction positive dans le sulfo-anisique ni voir de schizopapille sur ces grosses gloeocystides. Hyphes du sous-hyménium à paroi mince, vite flasques, bouclées. DICHOPHYSES superficielles dextrinoïdes à branches étalées, ayant une envergure de 35-45 µm; elles sont formées d'un stipe grêle, 18-40x2 µm à paroi submince à la base puis peu à peu épaissie ; branches de premier et deuxième ordre larges de 1,5-1,8 µm à paroi sensiblement épaissie ; les suivantes plus grêles et courtes, les ultimes rameaux peu raides, 2-4-5-10x0,8 µm, soit coniques soit, pour les plus longs,plus obtus avec paroi mince vers l'extrémité. BASIDES subcylindriques irrégulières, 40-55x7-8 µm à 4 stérigmates longs de 6 µm ; la paroi est mince et fragile. SPORES subsphériques, uniguttulées, de 6-8 µm de diamètre dans le Melzer sans les ornements, nettement teintées en masse (beige ombré, 10 YR 6/3 à 5/3), à paroi ornée de grosses verrues arrondies amyloïdes (elles peuvent atteindre 1,8 µm de diamètre) plus ou moins réunies par des trabécules étirés ; une très nette bavette amyloïde encercle partiellement l'apicule. Après traitement ammoniacal à 60° C, la paroi est gonflée et mesure 0,8-1 µm sans les ornements. La spore est binucléée.

Récoltes examinées :

Un fragment d'holotype d'*Hypochnus peniophoroides* Burt, Moretown, Jamaica, F.S. Earle 540, oct.-nov. 1902, in herb. Bourdot (*PC*) ; LY 7660, vertical à 20 cm du sol sur une racine échasse en place d'un arbre abattu près du parc du Carbet, Basse Terre, le 6 août 1975 ; LY 7663, à proximité du précédent sur une autre souche semblable, mêmes lieu et date ; LY 8112, sous un arbre tombé, près du sol, départ de la trace Victor Hughes au-dessus de Carrère, le 2 octobre 1976.




*Dichostereum peniophoroides*

Fig. 1 -Basidiome LY 7660 : A, grandes gloeocystides au contenu solidifié ; B, dichophyse (A & B in Congo ammoniacal 60° C) ; C, spores (in Melzer).

Fig. 2 -Cultures (LY 7660, 7663 et 8112) : A, conidiophores; B, sulfocystides à plusieurs schizopapilles ; C, gloeocystides au contenu solidifié ; D, chlamydospores ; E, hyphes porteuses de renflements ; F, dichophyse ; G, conidiospores.

La description a été faite d'après les trois exemplaires guadeloupéens interfertiles.

Caractères culturaux de *D. peniophoroides* :

MONOSPERMES (8112) : les spores germent rapidement ; les hyphes sans boucles sont formées d'articles en très grande majorité à 1-2-3 noyaux, sauf le terminal qui en contient de 8 à 25. Conidiophores oedocéphaloïdes à tête renflée, x(5)-7-(10) µm, portant 4 à 8 pointes ; conidies subsphériques de 3,5-5,5 µm de diamètre ou piriformes, 4-5x3-4,5 µm, uninucléées. Des sulfocystides, des chlamydospores et des dichophyses congophiles.

POLARITE : la confrontation de 10 monocaryons a permis de démontrer la tétrapolarité de l'espèce :

$A_1B_1$ : 1 - 2
$A_1B_2$ : 4 - 6 - 8
$A_2B_2$ : 3 - 7 - 9
$A_2B_1$ : 5 - 10

MONOCONIDIENS : la germination de conidies prélevées sur les cultures dicaryotiques de 7660 et 7663 donne naissance à des cultures monocaryotiques intercompatibles *(3)* avec les monospermes de 8112. Par acquis de conscience ont été effectuées des confrontations avec les 4 pôles des *D. rhodosporum*, *pallescens* (parfois considérés comme synonymes de *peniophoroides*) et *ramulosum*. Tous les résultats sont négatifs (Tableau I). Ces données complètent les essais d'interfertilité dans le genre *Dichostereum* effectués par P. Lanquetin (1973, tableau I, p. 171).

*(3)* Nous employons habituellement les termes de "interfertile" et "interfertilité".
Le mot "fertilité" peut laisser croire que ces appariements donnent naissance à une descendance, chose possible, mais qui n'est généralement pas obtenue ni même recherchée. Nous emploierons ci-après les termes d'"intercompatible" et d'"intercompatibilité" quand les monocaryons de deux récoltes distinctes appariés se dicaryotisent l'un l'autre.

*Dichostereum peniophoroides*

| | | LY 8112 | | | | 7660 | | | | 7663 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $A_1B_1$ | $A_1B_2$ | $A_2B_2$ | $A_2B_1$ | 1 | 2 | 3 | 4 | 1 | 2 |
| LY 8112 | $A_1B_1$ | - | - | + | - | + | + | + | + | + | + |
| | $A_1B_2$ | | - | - | + | + | + | + | + | + | + |
| | $A_2B_2$ | | | - | - | + | + | + | + | + | + |
| | $A_2B_1$ | | | | - | + | + | + | + | + | + |
| T 433 | $A_1B_1$ | - | - | - | - | - | - | - | - | - | - |
| | $A_1B_2$ | - | - | - | - | - | - | - | - | - | - |
| | $A_2B_2$ | - | - | - | - | - | - | - | - | - | - |
| | $A_2B_1$ | - | - | - | - | - | - | - | - | - | - |
| FP 90120 | $A_1B_1$ | - | - | - | - | - | - | - | - | - | - |
| | $A_1B_2$ | - | - | - | - | - | - | - | - | - | - |
| | $A_2B_2$ | - | - | - | - | - | - | - | - | - | - |
| | $A_2B_1$ | - | - | - | - | - | - | - | - | - | - |
| LY 6242 | $A_1B_1$ | - | - | - | - | - | - | - | - | - | - |
| | $A_1B_2$ | - | - | - | - | - | - | - | - | - | - |
| | $A_2B_2$ | - | - | - | - | - | - | - | - | - | - |
| | $A_2B_1$ | - | - | - | - | - | - | - | - | - | - |

Tableau I : confrontations de monocaryons de pôles connus, et de mono-conidiens (en chiffres arabes). LY 8112, 7660 et 7663 sont les trois récoltes guadeloupéennes de *D.peniophoroides* ; T 433 est un *D.rhodosporum* isolé par Warcup en Australie ; FP 90120 est un *D.pallescens* du Maryland (USA) déterminé par R.L. Gilbertson ; LY 6242 est *D. ramulosum* type, originaire du Gabon.

POLYSPERME : (7660 - 7663 - 8112)

Croissance : rapide (boites couvertes en trois semaines).

Aspect : la marge est régulière, peignée ; le mycélium aérien jeune est blanc pur, élevé, un peu peigné. A six semaines, sublaineux - pelucheux dans la partie jeune, il devient tassé, feutré avec surface ruguleuse dans la moitié âgée. D'abord blanc pur, il se tache par plages de saumon jaunâtre (7,5 YR 8/6) tendant à saumon (5 YR 7/6) et même à fauve (5 YR 6/8) sur le bourrelet qu'il forme à la périphérie contre le verre. Le revers est inchangé, l'odeur est nulle.

Microscopie : (fig. 2)

mycélium aérien : les hyphes axiales régulières, x3,5-4-(6) µm, et les rameaux, x(1)-2,5-3 µm, ont un contenu homogène, une paroi mince et des boucles constantes. On observe en outre :

1) à côté de nombreuses sulfo-cystides formées par un article terminal étroit, x1,5-2-3 µm, portant de 2 à 5 et même 7 protubérances surmontées d'une schizopapille, d'autres éléments plus renflés, 27-35x6-10 µm, dont le contenu paraît solidifié et ne réagit pas dans le sulfo-anisique tout comme les gloeocystides au contenu concreté du basidiome (fig. 2 C).

2) d'abondantes chlamydospores subsphériques, x8-12 µm à paroi pouvant atteindre 2 µm d'épaisseur.

3) de nombreuses dichophyses géométriques de grande envergure (40-50 µm), souples, à branches étroites, x1-1,5 µm, congophiles et à rameaux ultimes grêles, x1-1,5 µm.

4) quelques conidiophores élancés, à paroi d'abord mince mais pouvant paraître nettement épaissie dans les cultures âgées, à tête élargie, x(5)-6-8 µm, produisant (4)-6-8-(10) conidies subsphériques, x3,5-5 µm, à légèrement piriformes, (3,75)-4-5-(6)x3,5-4-(5,5) µm, à paroi épaissie et apicule très peu marqué. Les conidiophores sont beaucoup plus nombreux dans le mycélium aérien jeune.

mycélium submergé : sur les hyphes régulières, en majorité larges de 1-2,5 µm, sauf quelques axes de 3-4,5 µm, à paroi mince, bouclées, on observe un grand nombre de rameaux au contenu réfringent morcelé et porteurs de nombreux renflements courts (fig. 2 E).

Cytologie : articles et chlamydospores binucléées ; conidies uninucléées.

Oxydases :

| | |
|---|---|
| ac.gallique : ++++,tr. | gaïacol : +++++,tr. |
| p.-crésol : - ou très faible | tyrosine : - ou ++,10mm |

CODE : 2a-(2b)-3c-15-25 d -33-34-36-38-43-54-60-63

Remarques : A l'oeil nu son mycélium blanc pur teinté de saumon se distingue de celui de *D. ramulosum* taché de cannelle et de celui de *D. pallescens* entièrement cannelle. Plus proche de *D. rhodosporum* par sa couleur, il se reconnaît à sa croissance nettement plus rapide. Microscopiquement, il est surtout reconnaissable à ses gloeocystides renflées au contenu solidifié sulfo-négatif et aux articles submergés porteurs de nombreuses protubérances arrondies, caractères qui n'apparaissent pas dans le code.

La tétrapolarité démontrée pour *D. peniophoroides*, est un caractère de tous les *Dichostereum* ; si Maxwell (1954) a signalé *Vararia granulosa* bipolaire, c'est pour avoir disposé d'un trop faible nombre de cultures monocaryotiques. Grâce à R. Siepmann qui obtint la fructification d'un dicaryon dû à R.L. Gilbertson (n° 4426, sur *Abies lasiocarpa*, Montana 1964) nous avons pu reprendre cette étude : la confrontation de 20 monospermes a donné le résultat suivant :

$A_1B_1$ : 1-3-5-9-13-16-20
$A_2B_2$ : 2-6-14-17
$A_2B_1$ : 4-12-15-19
$A_1B_2$ : 7-8-10-11-18

La souche de Maxwell est intercompatible avec celle de Gilbertson.
De même, le *Dichostereum ramulosum* africain, dont la culture type (LY 6242) a fructifié chez R. Siepmann, s'est révélé tétrapolaire :

$A_1B_1$ : 1-2-3-8-13-14
$A_1B_2$ : 4-5-7-16-19
$A_2B_2$ : 11-12-17-20-21-22
$A_2B_1$ : 6-9-10-15-18

B - Le genre *VARARIA* Karst.

Tous les représentants appartiennent à la section *Vararia*.

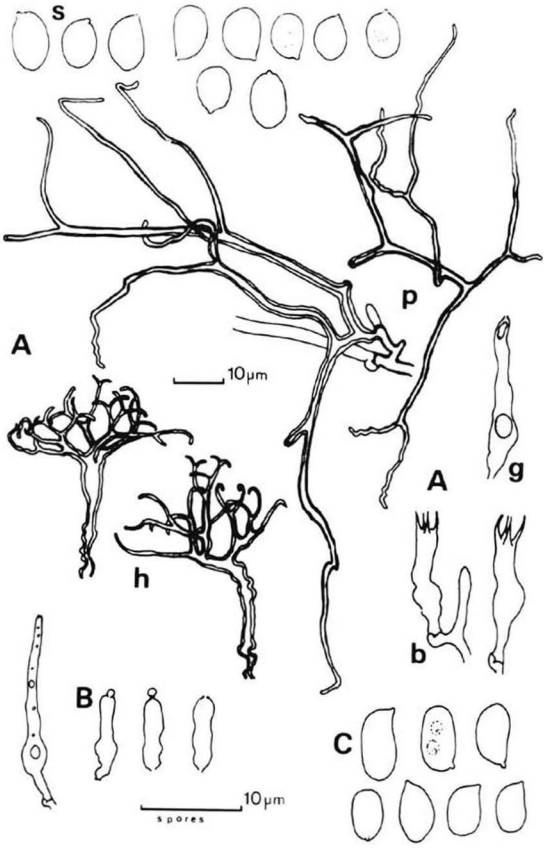
I - *Vararia dussii* nov. sp. ☆ fig. 3

*Expansa, haerens, duriuscula, mox crassa, cinnamomea vel brunnea, carne brunneola. Hyphis genetricibus fibulatis. Dichophysibus immersis, e brunneis luteis ; dichophysibus superis dextrinoideis trunco pariete saepe incrassata, et ramis ultimis longis lentisque. Gloeocystidiis variis, saepe schizopapilla globosa superatis, per S.A. parum coloratis. Basidiis utriformibus, tetrasporis. Sporis ovatis* 4 - 6 x 3,25-3,75 µm, *in massa albis, haud amyloideis, uninucleatis. Nuclei rite dividuntur ; culturae mono- vel polyspermaticae oidia edunt. Tetrapolaris. Humi in ligno.* Guadeloupe. *HOLOTYPUS* LY 8115.

Petites taches très adhérentes, brunes en bonne sporulation (7,5 YR 5 à 5,5/4), cannelle (7,5 YR 6/6 à 5,5/6) à testacé pâle (de 5 YR 5,5/6 à 6,5/6) à la récolte, parfois ocre (8,5 YR 7,5/6), mates, coriaces, avec marge similaire amincie très adhérente concolore ou parfois plus

☆ en hommage au Père A. DUSS, pionnier de la mycologie aux Antilles françaises.

fig. 3 : *Vararia dussii*. Basidiome A) LY 8115 (TYPE) : dichophyses profondes (p), deux dichophyses hyméniales superficielles (h), basides (b), une gloeocystide à schizopapille cassée (g) et spores (s) ; B, LY 7638 : gloeocystides à schizopapille en place ou cassée ; C, LY 8020 : spores. In Congo ammoniacal 60° C, sauf spores in KOH-Phloxine.


s
p
A
10µm
h
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g
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C
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spores

pâle (p.ex. 10 YR 7/4 à 8/6) ; d'abord mince, il est rapidement plus épais (jusqu'à 500 µm), même sur des taches de faible diamètre qui ont alors un bord brusque ; sa chair est alutacée, puis brunit ; il peut confluer en d'assez larges plaques.

En herbier, très adhérent et très mat, alutacé pâle (9 YR 8/6) à isabelle (7,5 YR 7/6, 8 YR 7/4), brun souris (9 YR 6/4) sur les spécimens plus épais, avec marge parfois un peu plus sombre. La chair est brune.

Dans les cellules de l'hôte, ou lorsque la base du champignon est mêlée à des débris du support, on peut voir des dichophyses, isolées ou en amas, de grande envergure (dépassant 100 ou même 120 µm), à paroi dextrinoïde, aux ramifications espacées, aux branches longues et souples rappelant en plus grêle les hyphes dextrinoïdes des *Scytinostroma* ; elles ont des ultimes rameaux mesurant 30-40 x 0,75 µm.

En coupe épais de 80 à 500 µm. Dès la base, il est constitué de dichophyses enchevêtrées avec fréquents amas de cristaux hyalins ; les dichophyses immerses ne sont, le plus souvent, que peu ou pas dextrinoïdes contrairement aux dichophyses de surface, mais toutes sont bien congophiles à chaud. DICHOPHYSES profondes jaune-brunâtre de 20-45 µm d'envergure, ayant un tronc 17-25 x 2-3-(4) µm à paroi épaisse à très épaisse, des premières branches écartées et des rameaux ultimes grêles, peu ou pas incurvés. Les dichophyses superficielles arborescentes aux rameaux ultimes grêles et souples présentent un stipe subcylindrique assez long (20-35 µm) parfois élargi, x2-5 µm, à paroi mince ou épaissie dans la moitié supérieure (peut atteindre 1 µm), ou sur une plus grande longueur, formant alors un tronc noueux, difforme ; le stipe ou le tronc porte une ramure groupée au sommet, de 10-20-35 µm d'envergure, terminée par des rameaux grêles, souvent longs et souples,

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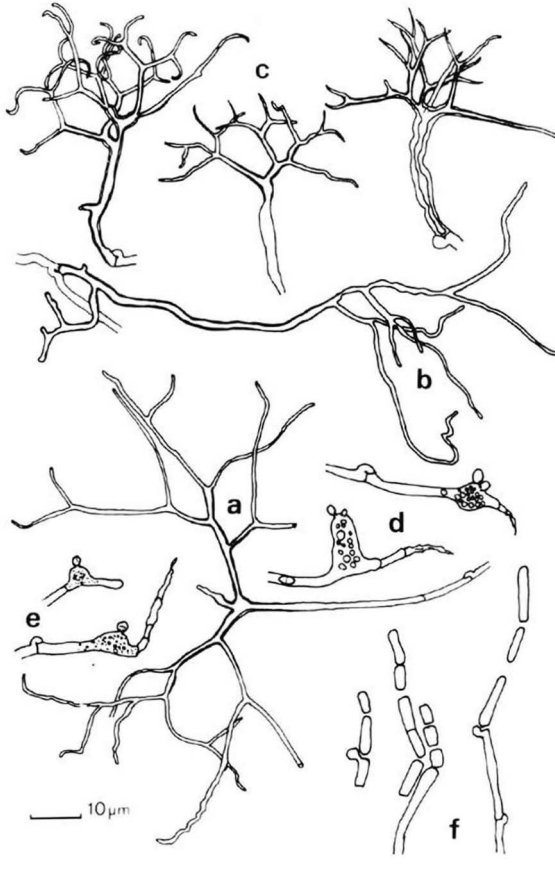
fig. 4 : *Vararia dussii* : Cultures. LY 8020 : dichophyse à la marge d'une culture sur Hagem (a), dichophyse en milieu de Nobles submergée (b), trois dichophyses de la couche brune superficielle sur Nobles à 6 semaines (c), gloeocystides sur Nobles (d) ; LY 7638 : gloeocystides sur Hagem (e), oïdies sur Hagem (f).


c
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involutés, pouvant atteindre 15 et parfois 25 x 0,6 µm ; elles ne diffèrent des dichophyses profondes que par leurs branches moins écartées et leurs ultimes rameaux plus longs et involutés. HYPHES génératrices x 1,5-3,2 µm à paroi mince, bouclées. Assez rares GLOEOCYSTIDES soit subcylindriques, 15-17 x 3-3,5 µm, parfois élargies vers le bas (x 4,5 µm), soit fusiformes longuement atténuées, 38 x5,5-6µm par exemple ; elles ne sont pas beaucoup plus évidentes dans les sulfo-aldéhydes, bien qu'elles réagissent quelque peu ; elles sont généralement terminées par une schizopapille sphérique de 1,5 µm de diamètre. BASIDES utriformes, 20-25 x 3,5-4,2 µm au sommet, renflées jusqu'à 5,5µm dans la partie inférieure, étranglées (x 2,5 µm) à mi-hauteur, à 4 stérigmates longs de 4 µm. SPORES ovoïdes ou un peu oblongues, 4-6x(3)-3,25-3,75-(4)µm chez le type, blanches en masse, à petit apicule, à paroi non amyloïde et sans bavette, uninucléées. Si les spores ont des dimensions analogues dans 3 autres récoltes, celles du 8020 sont plus élancées, 5,25-7,25x3-3,75 µm, et 10,9 % d'entre elles sont binucléées (se reporter à la discussion).

Récoltes :

LY 7638, sur petite branchette au sol, départ de la trace Victor Hugues, au dessus de Carrère, 2 août 1975 ; LY 8020, branche au sol, domaine Duclos, Petit Bourg, 24 sept. 1976 ; LY 8115, *HOLOTYPE*, sur branche morte de *Sloanea* sp., Bras David, Parc Naturel, 4 octobre 1976 ; LY 8167, à l'intérieur d'une racine rampante creusée de galeries de termites, chemin forestier de Jules, Petit Bourg, 8 octobre 1976 ; LY 8184, sur *Philodendron giganteum* mort en place, Domaine Duclos, Petit Bourg, 10 octobre 1976.

Parmi les espèces bouclées à petite spore, il est notamment reconnaissable à ses dichophyses aux rameaux ultimes longs et souples.

Caractères culturaux de *V. dussii* :

GERMINATIONS.- La spore émet en 48 heures un filament de quelques articles uninucléés.

MONOSPERMES.- (LY 8020, 8115, 8167, 8184) Les jeunes germinations peuvent être prélevées au bout de 24 heures ; elles donnent des cultures sans boucles, aux articles ré-

gulièrement uninucléés ; elles forment de petites oïdies (arthrospores) uninucléées.

MONOOIDIENS.- La dispersion d'oïdies nées sur le mycélium dicaryotique (LY 7638) a permis d'obtenir des cultures monocaryotiques semblables aux haplontes des autres récoltes.

POLARITE.- Les monocaryons de l'holotype (LY 8115) se répartissent en 4 groupes

$A_1B_1$ : 1-9-10
$A_1B_2$ : 3
$A_2B_2$ : 2-4-8
$A_2B_1$ : 5-6-7

Des fausses boucles apparaissent dans la majorité des confrontations de monocaryons ayant le facteur B commun.

INTERCOMPATIBILITES (3).- Les 32 appariements de monospermes 8115 avec ceux des 8020, 8167 et 8184 et avec les monooïdiens de 7638 sont totalement positifs. Ils permettent de savoir que les différences observées (spores, couleur des mycéliums) sont du domaine de la variation intraspécifique.

POLYSPERME.- (7638-8020-8115-8167) fig. 4

Croissance : rapide (boites couvertes en 3 semaines).

Aspect : la marge est régulière, le mycélium aérien très pauvre et bas, est surmonté de plages pelucheuses irrégulièrement développées. Initialement blanc, le mycélium prend avec l'âge une coloration dont l'intensité et l'étendue varie beaucoup avec les souches. Chez 7638, seul le mycélium contre le verre se teinte très légèrement ; chez 8167, la bouture et ses abords sont saumon jaunâtre (7,5 YR 8/6) à cannelle (6/6) ; chez 8115, les zones pelucheuses sont saumon jaunâtre (7,5 YR 8/6) tandis que la bouture et la périphérie sont fauve (5 YR 6/8 à 5/8) et parfois noisette (5/6) ; enfin chez 8020, à six semaines, la coloration est partout cannelle (7,5 YR 6/6). Le revers incolore chez 7638 est nettement et irrégulièrement bruni chez les autres sous le mycélium teinté. Odeur nulle.

Microscopie :

Mycélium aérien : il présente 1) des hyphes génératrices étroites, x1,5-3-(4)µm , régulières, à paroi mince et boucles constantes, et quelques hyphes plus larges, x 4 - 6 µm,

2) d'innombrables gloeocystides petites, renflées, x 3 - 5 - (6) µm, de forme variable, et portant 1 à 3, le plus souvent 2 schizopapilles (fig. 4 d) ; leur contenu, densément guttulé, est nettement violet-noir dans le sulfo-anisique.

3) de petites oïdies rectangulaires, très abondantes dans les cultures jeunes.

4) des bulbilles, rares dans 7638 et 8020, fréquentes dans 8115 et 8167 ; ce sont des vésicules subsphériques, x(8)-9-12-(15)µm portant 8 à 10 rameaux très courts.

5) des dichophyses de plusieurs types, surtout nombreuses dans les zones colorées. Celles de surface sont géométriques, de 20-40-(60)µm d'envergure, avec un stipe large de 2-3 µm, assez court, naissant d'une boucle ; leurs rameaux terminaux assez grêles sont souples ; elles sont brunâtres dans l'eau. Celles qui, sous-jacentes, se mêlent aux hyphes génératrices ont un très long stipe à paroi régulièrement épaissie comme une fibre et des ramifications cylindriques obtuses. 7638, qui se colore peu, n'a pas montré les dichophyses de surface.

Mycélium submergé : les hyphes généralement étroites, x 2-4 µm, peu régulières ont un contenu guttulé, tandis que des hyphes axiales, x 5-7µm régulières ont un contenu homogène, une paroi souvent mince mais qui peut s'épaissir localement (0,5 à 1µm ) ; les boucles sont constantes.

Cytologie : articles binucléés ; les oïdies sont soit à un soit à deux noyaux.

Oxydases :

| | | | |
|---|---|---|---|
| ac.gallique | : +++++, 0 | gaïacol | : +++++,20 mm |
| p.-crésol | : TF (8115 et 8167) - (8020 et 7638) | tyrosine | : +, 10 mm |

CODE : 2a-(2b)-3c-15-22-25 d-35-36 et 38 ou 37 et 39-43-54-60-61.

2 - *Vararia gomezii* Boid. et Lanq., Bull. soc. Mycol. France, 91 : 493,1975 (1976).

Cette espèce décrite récemment d'Argentine sur une seule récolte a été retrouvée en Guadeloupe.

Elle se présente en petites taches à marge nette à l'oeil, atténuée poruleuse sous la loupe, confluentes en une membrane adhérente ou seulement détachable par petits fragments, alutacé pâle (10 YR 8/3,5). En herbier, elle est fragile sous l'aiguille mais non pulvérulente, un peu fendillée, alutacé pâle (10 YR 8,5/3,5 à 4).

Sa microscopie est tout à fait semblable à celle du type (voir fig. 5), avec hyphes sans boucles, GLOEOCYSTIDES ou pleurogloeocystides à paroi épaissie à épaisse, les unes courtes, d'autres plus allongées, 14-50 x 8-14 µm, au contenu sulfo-anisique négatif. Les DICHOPHYSES inférieures non dextrinoïdes sont en couche lâche ; leurs branches sont raides mais à paroi peu épaissie, et les rameaux ultimes sont longs. En s'élevant dans le basidiome, on passe très vite à des dichophyses aux rameaux ultimes nombreux, courts (type coralloïde) et obtus ; les supérieures sont très dextrinoïdes. BASIDES utriformes à paroi mince, 34-45 x 7,5 µm au sommet, tétrasporiques. SPORES largement fusiformes, biapiculées, 13-14,8 x 4,8-6,25 µm($\bar{x}$ = 13,73 ± 0,69 x 5,64 ± 0,62 pour N = 17).

Récolte :

LY 8062, sur branchette, chemin forestier de Jules, Petit-Bourg, le 27 septembre 1976.

Parmi les espèces sans boucles, *V. gomezii* est bien caractérisé par ses spores larges, ses dichophyses coralloïdes et ses gloeocystides à paroi épaisse. Il existe en Guadeloupe au moins un autre *Vararia* à dichophyses coralloïdes ; il ne sera pas décrit ici, le matériel étant trop pauvre et n'ayant pas sporulé ; signalons cependant qu'il diffère de *V. gomezii* par ses boucles, ses spores plus grêles ... (à rechercher).

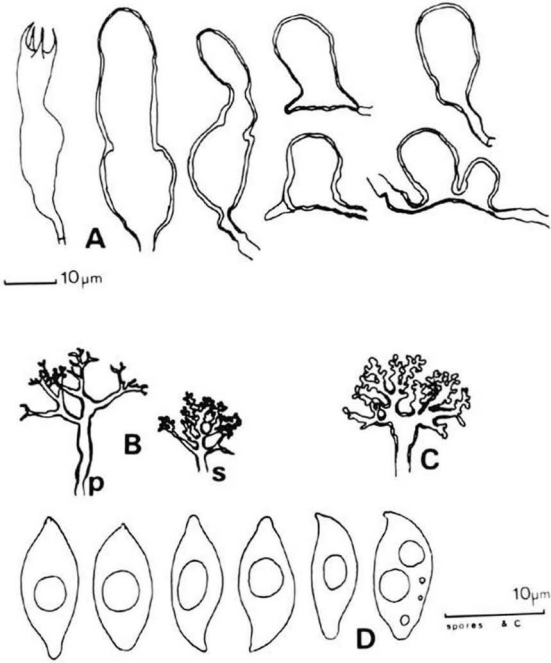


Fig. 5 - *Vararia gomezii* LY 8062 : A, baside à paroi mince et gloeocystides à paroi gonflée (in Congo ammoniacal 60° C) ; B, une dichophyse semi-profonde (p) non dextrinoïde et une dichophyse superficielle (s) dextrinoïde ; C, dichophyse superficielle deux fois plus grossie (B et C, in Melzer) ; D, spores (KOH-phloxine).

Caractères culturaux de *V. gomezii* :

MONOSPERMES.- Ils peuvent être isolés 24 heures après l'ensemencement ; leurs hyphes, sans boucles, sont constituées d'articles en majorité binucléés, de quelques articles isolés de 1, 3, 4, ou même 5 noyaux, et de quelques séries d'articles trinucléés. Les six cultures colorées ont montré cette même répartition nucléaire, semblable d'ailleurs à celle du polysperme ; l'espèce est donc vraisemblablement homothalle.

POLYSPERME.-

Croissance : rapide (boîte couverte en 3 semaines).

Aspect : la marge très régulière est appliquée. Lâche, duveteux, élevé quand il est jeune, le mycélium aérien blanc à 6 semaines, est appliqué sur toute la surface de la boîte ; toutefois dans les deux tiers jeunes il est recouvert par un aranéum régulier, réticulé, à points d'intersection en relief. Dans le tiers âgé, le mycélium appliqué montre des amas et des petites veinules blanc pur. Ce n'est que localement et contre le verre que le mycélium se teinte d'alutacé (10 YR 8/4) à chamois pâle (7/6).

Microscopie :

Mycélium aérien : hyphes sans boucles, en majorité régulières, étroites, x 1,5-2-3µm , à paroi mince parfois collapse, et des hyphes plus larges, x 4-(6) µm, irrégulières, à paroi mince ou épaissie (jusque 1 µm) portant de très nombreux éléments renflés, x 7-15 µm, qui emprisonnent des masses réfringentes ; leur paroi est très épaisse (1 à 3 µm).

Le mycélium aérien teinté est porteur de masses huileuses. Sur milieu de Hagem, on peut observer de très rares mais belles dichophyses géométriques aux rameaux ultimes courts ; leur envergure est de 20-35 µm.

Mycélium submergé : hyphes très irrégulières, certaines étroites, x 1-3 µm, à paroi mince, d'autres plus larges, x 3,5-4-(6) µm, à paroi très épaisse avec renflements nombreux. Dans la partie âgée, ces hyphes forment une couche très coriace de un millimètre d'épaisseur (fig. 6).

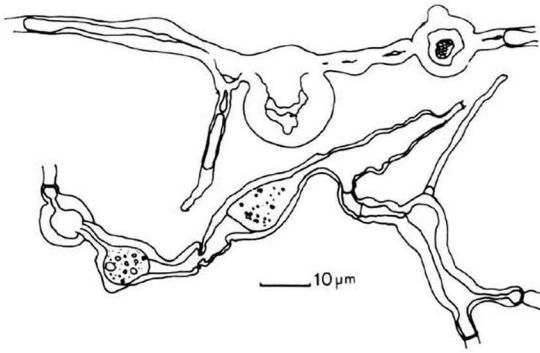


Fig. 6 - *Vararia gomezii*, Culture LY 8062 : hyphes à paroi très épaissie, caractéristiques de cette espèce.

Boucles : absentes.

Cytologie : articles binucléés ; on observe quelques suites d'articles trinucléés et quelques rares articles isolés à 4 ou 5 noyaux.

Oxydases :

| | | | |
|---|---|---|---|
| ac.gallique | : +++++, 0 | gaïacol | : +++, 0 |
| p.-crésol | : M | tyrosine | : +, tr. |

CODE : 2-6-(25 d)-32-36-38-43-54-57-(62).

3 - *Vararia intricata* Boid. et Lanq., Bull. Soc. Mycol. France, 91 : 473, pl. III fig. B, 1975 (1976)

Nous avons plusieurs récoltes de cette espèce connue seulement à ce jour du Gabon par la récolte type. Cinq d'entre elles ont permis d'isoler des cultures monospermes qui se sont montrées intercompatibles, ce qui nous permet de beaucoup mieux connaître les variations microscopiques de cette espèce, notamment au niveau des gloeocystides (voir fig. 7 et 8).

Basidiome à marge mince, pruineuse, puis discontinu-poruleux sous la loupe, enfin en membranule détachable par petits lambeaux avec l'aiguille quand il est très frais, mais devenant vite très adhérent en séchant. Surface mate gris crème (2,5 Y 8/2) puis crème alutacé (2,5 Y 8/4) ou un peu plus sombre (7,5/4), passant ensuite à chamois clair (8/5, puis 8/6 et même 7,5/6).

Très mince, 30 à 65 µm, il est formé dès la base de dichophyses mêlées à quelques hyphes génératrices à paroi très mince, x 1,8-3,8 µm, bouclées, mais peu distinctes. Les DICHOPHYSES inférieures non dextrinoïdes apparaissent jaunâtres à jaune brunâtre dans KOH ; elles ont une envergure de 25-40 et même 70 µm avec stipe hyphiforme atteignant 40 x 3,5 µm à paroi toujours mince sauf au sommet; les branches de premier et deuxième ordre, très écartées, ont une paroi rigide, épaissie à très épaisse mais gardant un large lumen et sont de longueur variable, 3-8 x 1,8-2,5 µm pour les premières ; les rameaux ultimes sont coniques soit courts et raides, soit parfois plus longs, grêles et souples. De très rares dichophyses ont des rameaux ultimes courts et obtus (en croissance ?). En surface, les dichophyses dextrinoïdes sont plus ou moins nombreuses parfois éparses ; sur un stipe toujours indifférencié et non dextrinoïde sauf au sommet, elles portent des branches à paroi épaissie mais souvent courtes tandis que les ultimes rameaux s'allongent, 3-9-(17) µm et se recourbent ; leur envergure est de 20-40 µm.

Si, de la base au sommet du basidiome les dichophyses dominantes ont des rameaux ultimes courts puis de plus en plus allongés et grêles, on peut cependant voir dès la base quelques dichophyses à rameaux ultimes longs

et, en surface, quelques dichophyses aux rameaux ultimes relativement courts.

GLOEOCYSTIDES variables : elles sont souvent peu remarquables, subcylindriques et plus fréquemment élargies vers le bas et longuement rétrécies, exceptionnellement claviformes, 24-60 x 6-10-(15) µm, à paroi très mince ; il est parfois possible d'observer une schizopapille au sommet de certaines gloeocystides faiblement émergentes ; leur contenu peu remarquable se limite souvent à quelques amas réfringents. Dans les spécimens plus âgés on ne voit par contre que des gloeocystides immerses, trapues, à paroi épaissie, 25-40 x 8-12-14 µm, pouvant laisser voir un sommet vide et affaissé, flétri ; elles contiennent une grosse masse résinoïde insensible à l'iode. Toutes se sont montrées sulfo-aldéhydes négatives.

Basidioles d'abord ovoïdes, larges de 8-9 µm, puis étirées en col, irrégulièrement subcylindriques un peu étranglées au milieu, à paroi très mince et contenu finement guttulé ; BASIDES, 25-35 x 5,5-6,5 µm au sommet, à 4 stérigmates atteignant 6,5 µm de longueur.

SPORES allongées, étroites, longuement naviculaires de profil, biapiculées, à zone apiculaire longuement et obliquement rétrécie, (14,5)-15,5-17-(21) x 3,2-4,2 µm, non amyloïdes ($\bar{x}$ = 16,8 ± 1,4 x 3,85 ± 0,34, pour N = 77). Elles sont blanches en masse et uninucléées.

Récoltes :

LY 8036, sur branchette morte en l'air, Domaine Duclos, Petit Bourg, le 25 septembre 1976 ; LY 8098, sur branchette morte suspendue, forêt mésophile de la Lézarde, Petit-Bourg, le 30 septembre 1976 ; LY 8123, sur branchettes et feuilles mortes ne touchant pas le sol, Bras David, le 4 octobre 1976 ; LY 8166, au pied d'un arbuste mort, chemin forestier de Jules, le 8 octobre 1976 ; LY 8173-8174 et 8175, sur branchettes en l'air, Domaine Duclos, Petit-Bourg, le 8 octobre 1976.

Dans les gros vaisseaux du bois support, on voit, chez LY 8175, mêlées aux hyphes génératrices bouclées, des hyphes à paroi épaissie mais lumen large, plus ou moins dextrinoïdes, x 1,2-2,5 µm, ramifiées de temps à autre, souvent flasques, rappelant en plus grêles des fibres de *Scytinostroma*.

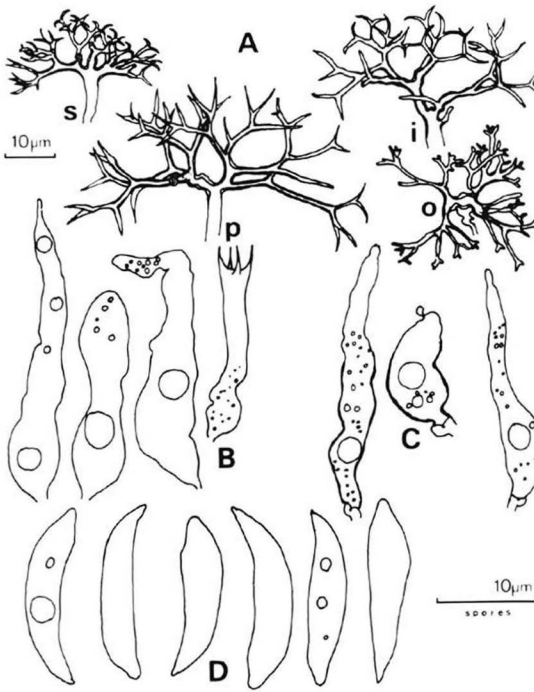


Fig. 7 - *Vararia intricata* A, LY 8175 : dichophyses superficielle (s), intermediaire (i), et profonde (p) et une à extrémités obtuses, vue par dessus (o). B, LY 8166 et C, LY 8174 : gloeocystides (A, B, C in Congo 60° C). D, spores de LY 8174 (in KOH-phloxine).

Nos récoltes guadeloupéennes rappellent bien le *Vararia intricata* gabonnais ; nous aurions cependant souhaité, pour affirmer sans réserve cette identification, confronter des cultures monocaryotiques africaines et américaines. Malheureusement nous n'avons pu, en 1968, à l'arrivée de la sporée de l'holotype à Lyon, obtenir la germination des spores et à ce jour nous ne disposons pas de monocaryons africains.

Ce champignon n'est pas sans ressemblances avec *V. splendida* (Viègas) qui diffère par ses spores bien plus courtes, ses gloeocystides et ses dichophyses toutes à rameaux ultimes longs et souples.

Nous avons récolté sur tronc au sol, et non sur branches en l'air, un *Vararia* apparenté à *V. intricata*. Il est sans boucles, à spores un peu plus étroites, 15-19 x 3-3,5-(3,8) µm, non biapiculées ; il est très riche en gloeocystides à tous niveaux, irrégulièrement subcylindriques à paroi un peu épaissie dans la moitié inférieure ; les dichophyses profondes ne sont pas géométriques raides à rameaux ultimes coniques, mais toutes à rameaux ultimes longs et grêles. A rechercher.

Caractères culturaux de *V. intricata* :

GERMINATIONS.- (LY 8098) au bout de 3 jours, la spore émet un filament aux articles uninucléés.

MONOSPERMES.- Hyphes irrégulières dépourvues de boucles, constituées de longs articles uninucléés. Fibres congophiles.

POLARITE.- L'espèce est tétrapolaire. Des fausses boucles et des crochets apparaissent dans la majorité des confrontations de monocaryons à facteur B commun chez 8098, tandis que ceux-ci sont rares (vus seulement dans 1 x4,1 x 15,1 x 16 et 1 x 17, en petit nombre) chez 8166.

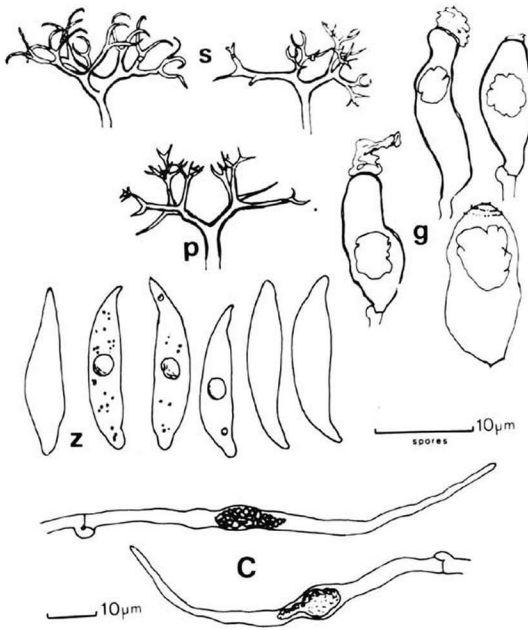


Fig. 8 - *Vararia intricata*, LY 8098 : dichophyses superficielles (s) in Melzer et une dichophyse profonde (p) in Congo ammoniacal, quatre gloeocystides (g) in Congo, spores (z) in KOH-phloxine, et (C) éléments gloeocystidiformes sulfo-nëgatifs en culture.

| LY 8098 : | LY 8166 : |
|---|---|
| $A_1B_1$ : 1-4-7-9 | $A_1B_1$ : 1*-3-5-9-14-20-21 |
| $A_1B_2$ : 3-8-10 | $A_1B_2$ : 2*-6-7-8-10-11-13-18-22 |
| $A_2B_2$ : 2-6 | $A_2B_2$ : 12-18-19-23 |
| $A_2B_1$ : 5 | $A_2B_1$ : 4*-15-16-17 |

INTERCOMPATIBILITES (3).- Les 38 appariements faits entre les monocaryons 8166 d'une part et 8036, 8098, 8174 et 8175 d'autre part ont été entièrement positifs après 10 jours.

POLYSPERME.- (LY 8098 et 8166)

Croissance : moyenne (boîtes couvertes en moins de 4 semaines).

Aspect : marge peu régulière. Duveteux, pelucheux à l'état jeune, le mycélium aérien âgé de 6 semaines est blanc, laineux à finement alvéolaire dans la partie jeune, il forme dans la moitié âgée soit des masses cotonneuses ou flocons saumon jaunâtre (7,5 YR 8/6 à 7/8) à isabelle (7/6) chez 8166, soit, chez 8098 une plage cotonneuse continue uniformément saumon jaunâtre pâle (8/4) pouvant atteindre contre le verre 8/6. Le revers, non coloré pour 8166, est isabelle (7,5 YR 6,5/6) pour 8098. Odeur nulle.

Microscopie :

mycélium aérien : il montre à côté de quelques hyphes étroites, x 1,5-2-(3) µm assez régulières, une majorité d'hyphes très irrégulières au contenu densément guttulé et à paroi mince ; ces hyphes portent des renflements nombreux et variés, x 5-15 µm contenant souvent une masse réfringente. Les boucles sont constantes. De très rares éléments terminaux légèrement renflés au contenu granuleux sont peut-être des gloeocystides sulfo-négatives ; ils montrent parfois un sommet vide avec quelques cloisons de retrait, mesurent 70-95 x 3,5-6-(8) µm et ne portent pas de papille (fig. 8 c). Dans le mycélium coloré accolé au verre, on peut observer des fibres régulières, x 2 µm environ, peu ou pas ramifiées, à paroi uniformément épaissie et congophile.

mycélium submergé : hyphes irrégulières, x 1,5 - 6 (8) µm, à boucles constantes, au contenu très guttulé, à paroi mince à nettement épaissie. Elles possèdent les mêmes renflements avec masses réfringentes, en outre des rameaux aux formes tourmentées peuvent s'enrouler et former de petits amas cérébriformes.

Cytologie : articles binucléés.

Oxydases :

| | |
|---|---|
| ac.gallique : +++++,0 | gaïacol : +++++, 0 |
| p.-crésol : L (8098), M (8166) | tyrosine : -,10-20 mm. |

CODE : 2-3c-(8d)-(15)-32-(38 ou 39)-44-54-60-61.

4 - *Vararia minidichophysa* Boid. et Lanq., Bull. Soc. Mycol. France, 91 : 510, pl. XII B, 1975 (1976).

Etendu, très mince, a l'aspect d'une grosse pruine blanc grisâtre à l'oeil nu, discontinu sous la loupe.

Epais de 15-20 µm si l'on excepte les basides mûres émergentes. Sur quelques hyphes régulières, étroites, x 1-2 µm, à cloisons simples, des basidioles subsphériques, x 7-8 µm, et des DICHOPHYSES de 9-13 µm d'envergure, la plupart bien dextrinoïdes, plus nombreuses en surface ; elles ont un stipe indifférencié, non dextrinoïde, grêle, des branches de premier et deuxième ordre courtes peu distinctes et des rameaux ultimes longs, très grêles, souples, souvent incurvés ou involutés (ils atteignent 7x0,3 µm) (type capillaire). Parfois une dichophyse (immature ?) à rameaux obtus. GLOEOCYSTIDES assez nombreuses, bien visibles parce que longuement rétrécies et émergentes, 24-30 x4-5 µm, au contenu huileux sulfo-anisique négatif, terminées par une courte schizopapille cylindrique. BASIDES utriformes larges de 5-5,5 µm au sommet, à 4 stérigmates. SPORES ovoïdes, (5,2)-6,5-8 x (4)-4,75-5,5 µm, avec bavette amyloïde surtout visible sur spores flétries, au contenu uniguttulé réfringent, binucléées. (voir fig. 9).

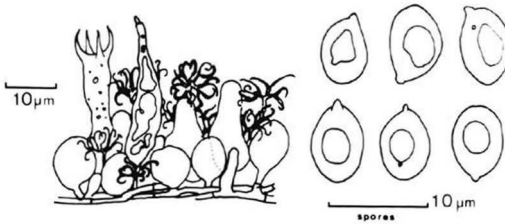


Fig. 9 - *Vararia minidichophysa* LY 8187 : vue générale en coupe in Melzer et spores in KOH-phloxine.

Récoltes :

LY 8187, sur rachis de *Cyathea arborea* morts verticaux, rive du Grand étang par St Sauveur, le 10 octobre 1976 ; on peut y ajouter sans doute LY 8052, sur arbuste mort debout, chemin forestier de Jules, Petit-Bourg, le 27 septembre 1976, qui n'a pas sporulé mais montre sur l'hyménium des spores de même type, un peu plus grandes (p. ex. 10 x 6 µm) toutefois.

Nous avons obtenu 8187 en culture ; nous n'en donnons pas la description car elle correspond à celle donnée pour le type Ivoirien (1976 p. 266). Il n'est malheureusement pas possible de confronter des haplontes africains et guadeloupéens, l'espèce étant homothalle.

Nous avons récolté (Domaine Duclos, le 28 septembre 1976, sur branchettes mortes en l'air) une espèce affine, elle aussi sans boucles et aux petites dichophyses capillaires (envergure 8-15 µm) ; ses spores sont plus grandes, 9-12 x 5-6-(6,5) µm, oblongues à tendance amygdaliforme, souvent plus larges dans la moitié apiculaire, et nous n'avons pu y déceler de gloeocystides ; le spécimen est aussi plus épais, 40-45 µm, poudreux à subpulvérulent, jaunâtre (2,5 Y 8/4). A retrouver !

5 - *Vararia minispora* nov. sp. fig. 10 et 11.

*Expansa, haerens, tenere ceracea, mox crassa* (500-1000 µm) *pallide e roseola brunnea, vel gilva ; carne rubiginosa, deinde brunnea, praeter stratum superficiale. Hyphis genitricibus fibulatis. Dichophysibus e brunneis luteolis, tramo pariete saepe incrassata, et ramis ultimis obtusis, saepe brevibus. Gloeocystidiis forma irregulari, saepe schizopapilla sursum praeditis, per S.A. incoloribus. Basidiis parvis,* 19-25 x 3-3,5 µm, *tetrasporis. Sporis subovatis,* 2-4 x 2,5-3 µm, *haud amyloideis, uninucleatis. Nuclei rite dividuntur ; culturae mono- et dicaryoticae oidia edunt. Tetrapolaris. Humi in ligno,* Guadeloupe, HOLOTYPE LY 8078.

Etalé, très adhérent, céracé, tendre sous l'aiguille, pruineux, pouvant devenir épais avec marge amincie assez brusquement ; bien développé et en bonne végétation, sa surface est brun rosâtre pâle (5 YR 6/3), cannelle terne (7,5 YR 6/4) ou encore beige (10 YR 7/3 lavé de 7/2), il montre alors un cerne cannelle à la marge (7,5 YR 6,5/6). Il tire beaucoup plus sur le jaune quand il est mince (ou rongé en surface par une larve), il apparaît alors argillacé (2,5 Y 7/4). Avec l'âge ou en moins bonne végétation il devient alutacé (10 YR 8/4 à 7,5/4). Sa substance apparaît rouille puis brune, sauf en surface.

En herbier, sa couleur est beige (10 YR 7/3, vinaceous buff R.), ocre argillacé (1 Y 7/4), alutacé sale (vers 2,5 Y 7,5/4) et peut présenter un cerne plus sombre à la marge, beige brunâtre (10 YR 7/3 à 6,5/3 et même 6/3). La chair est brune (7,5 YR 5/4), stratifiée sous la loupe dans les exemplaires épais.

Epais couramment de 120 à 500 µm, il peut atteindre 1000 µm. Sur quelques hyphes à paroi mince, montrant des boucles, se dressent de suite des DICHOPHYSES jaune brunâtre, intriquées, ne s'assombrissant pas sensiblement dans KOH, congophiles à chaud mais non dextrinoïdes sauf dans la partie supérieure. Celles nées tout à la base ont un stipe cylindrique assez long et large, 20-40 x 2,8-4,5 µm, à paroi congophile mince dans la moitié inférieure et peu à peu épaissie (pouvant atteindre 0,8 µm au sommet),

et portent des branches naissant simultanément à 2 ou même 3 niveaux, ou au contraire regroupées en une tête sommitale. Les branches sont raides, à paroi épaissie, à disposition géométrique ; les rameaux ultimes sont subcylindriques obtus. Toutes les autres dichophyses ont un tronc plus étroit, 15-23 x 1,8-3,2 µm, sinueux irrégulier, à paroi souvent épaisse presque dès la base, portant au sommet des branches étalées (envergure 25-32 µm) à paroi épaisse ; les rameaux ultimes sont généralement courts et toujours obtus (aspect subcoralloïde). S'y mêlent par endroit des éléments à paroi mince : hyphes génératrices peu régulières, x 1,8-2,5-(4) µm, bouclées, des basides flétries et parfois des amas de spores.

GLOEOCYSTIDES peu remarquables pouvant naître dès la base, mais plus visibles en surface où elles sont parfois nombreuses et émergentes d'une dizaine de µm; elles sont subcylindriques irrégulières, ou renflées dans la moitié inférieure et subfusiformes, parfois obtuses mais souvent à sommet conique terminé par une petite schizopapille, 25-42 x 5-7-(10) µm ; leur paroi est mince ou à peine plus ferme que celle de l'hyphe porteuse ; elles montrent parfois une cloison de retrait qui isole le sommet flétri ; leur contenu peu remarquable ne réagit pas dans le sulfo-anisique. Les BASIDES sont petites, 19-25 x 3-3,5 µm au sommet, un peu utriformes, atteignant 4,2-4,5 µm dans la moitié inférieure, généralement à 4 stérigmates, et peuvent émerger de 6-8 µm à maturité ; quelques basides à 2 ou 3 stérigmates. SPORES petites (d'où le nom) 3-4-(4,5)x2,5-3-(3,25) µm, ($\bar{x}$ = 3,6 ± 0,38 x 2,88 ± 0,23 pour N = 54), subovoïdes courtes de face, à profil ventral aplati, à paroi un peu ferme, lisse, non amyloïde et sans bavette, au contenu homogène, uninucléé.

Récoltes :

LY 7702, sous un tronc couché au sol, aire de Petit David, Parc National, le 13 août 1975 ; LY 7648, sous un tronc au sol, Bras David, Parc National, le 4 août 1975 ; LY 7694, sur branche au sol et s'étalant dans les galeries de termites, départ de la trace Victor Hugues, au dessus de Carrère, le 12 août 1975 ; LY 8078, sur grosse branche tombée, Domaine Duclos, Petit-Bourg, le 28 septembre 1976, HOLOTYPE.

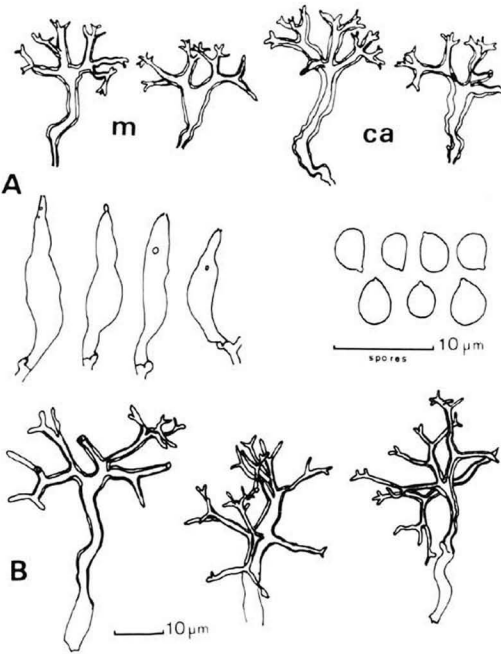


Fig. 10 - *Vararia minispora* A, LY 8078 TYPE : deux dichophyses superficielles in Melzer (m) et deux in Congo ammoniacal 60° C (ca), quatre gloeocystides (in Congo 60° C) et des basidiospores (in KOH-phloxine) ; B, LY 7702 : trois dichophyses profondes.

*V. minispora* est étroitement apparenté à *V. ubatubensis* dont il a notamment les petites spores, la tendance à l'épaisseur avec chair brunâtre à brune. Il en diffère par sa couleur plus terne, ses dichophyses superficielles aux rameaux ultimes plus trapus, courts et obtus, l'absence de dichophyses basales géométriques en couche plus lâche et de dichophyses intermédiaires aux branches avortées. Il serait cependant souhaitable de disposer d'autres récoltes de *V. ubatubensis* pour en étudier les variations, et de cultures notamment monospermes pour d'éventuels appariements.

*V. dussii* se distingue de ces deux espèces par ses spores plus allongées et ses dichophyses superficielles à rameaux ultimes souples.

Caractères culturaux de *V. minispora* :

GERMINATIONS.- (8078) les spores émettent, en 48 heures, un à 3 filaments aux articles régulièrement uninucléés.

MONOSPERMES.- hyphes sans boucles aux articles uninucléés ; ils peuvent se désarticuler en d'innombrables arthrospores uninucléées.

POLARITE.- l'espèce est tétrapolaire :

$A_1B_1$ : 1-3-10
$A_1B_2$ : 2-4-7-8
$A_2B_2$ : 6-9
$A_2B_1$ : 5

La diploïdisation totale des monocaryons compatibles est lente (deux mois environ). Quelques fausses boucles dans les confrontations 2 x 9, 7 x 9 et 8 x 9.

INTERCOMPATIBILITE (3).- 7702 et 8078 sont intercompatibles

POLYSPERME.- (LY 7702 et 8078).

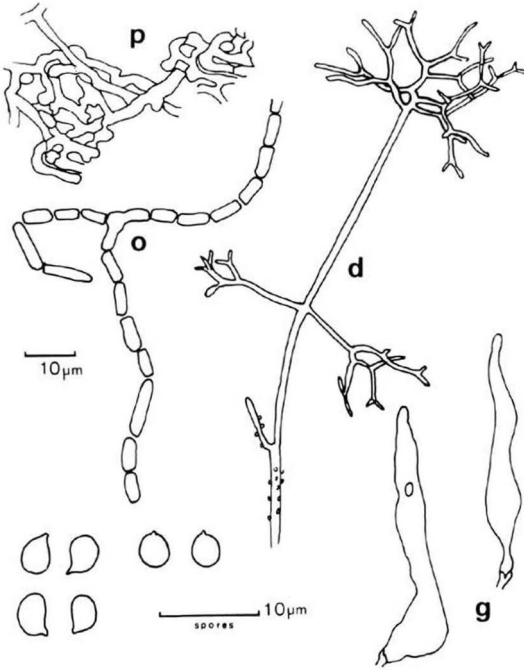


Fig. 11 - *Vararia minispora* LY 7702 Basidiome : deux gloeocystides sans schizopapille (g), six basidiospores ; Culture : dichophyse (d) et oïdies (o) sur Hagem; hyphes submergées formant puzzle (p) dans culture de 6 semaines sur Nobles.

Croissance : moyenne (boîtes juste couvertes en 4 semaines)

Aspect : la marge est peu régulière, dressée, formée d'hyphes rayonnantes raides, élevées. Jeune, le mycélium aérien est par endroit lâche et élevé, fragile (il rappelle les soies d'un capitule de *Taraxacum*), ailleurs bas, réduit à quelques filaments. A 6 semaines le mycélium aérien est subfeutré, alutacé (vers 10 YR 8/4 à 8/6) dans la partie âgée ; dans la partie jeune il est pratiquement nul et la culture a un aspect nuageux ou marbré caractéristique ; parfois le mycélium aérien de la partie jeune est pelucheux et montre de fins granules ocre pâle (10 YR 8/8) à chamois (7/8). Dessous inchangé, pas d'odeur.

Microscopie :

Mycélium aérien : très fragile, il s'affaisse au toucher ; on y distingue :

1) des hyphes axiales régulières, x 4-6 µm avec rameaux plus étroits, x 1,5-3 µm, à paroi mince, contenu homogène et boucles constantes.

2) des dichophyses assez nombreuses, hyalines ou jaunâtres dans l'eau, de (12)-25-50-(70)µm d'envergure, à paroi plus ou moins épaissie aux rameaux ultimes courts. On observe fréquemment deux éléments assez symétriques disposés de part et d'autre d'une longue fibre large de 1,5-2 µm, terminée elle-même par une dichophyse bien dichotome (fig. 11, d).

3) des articles oléifères jaunâtres, 180-380 x 5-8µm.

4) des hyphes se désarticulant en arthrospores rectangulaires, parfois un peu renflées (x 6-7 µm). Ces oïdies se forment en très grand nombre à l'obscurité ; la lumière semble avoir un effet inhibiteur.

5) de nombreuses masses huileuses sont accolées aux hyphes ; malgré de longues recherches aucune gloeocystide différenciée n'a pu être observée. Ce n'est que dans les granules ocre pâle que l'on peut voir des éléments renflés, 25-45 x 6-9-(10)µm pouvant être dénommés gloeocystides, mais ils sont alors associés à quelques basides à 4 stérigmates ; c'est un début de fructification.

Mycélium submergé : des hyphes régulières, x (1,5)-2-4-(6)µm à boucles constantes et à paroi mince, qui peuvent donner naissance à des rameaux compliqués, à paroi épaisse, imbriqués les uns dans les autres en forme de puzzle ; cette sorte de plectenchyme, dont la structure rappelle celle des crêtes du *V. insolita*, est ici submergée formant des

bandes plus opaques responsables de l'aspect marbré caractéristique des cultures (fig. 11, p).

Cytologie : articles binucléés.

Oxydases :

| | |
|---|---|
| ac.gallique : +++++, 0-tr. | gaïacol : ++++,0 |
| p.-crésol : M | tyrosine : (+) à ++,10 mm. |

CODE : 2-3c-21-25d-35-36-38-44-54-60-61.

6 - *Vararia rhombospora* nov. sp. fig. 12

*Expansa, tenuis, haerens, fragilis, e gilva murina. Hyphis genetricibus fibulatis. Dichophysibus superis dextrinoideis, ramis ultimis gracilibus et lentis. Gloeocystidiis per S.A. coloratis, schizopapilla globosa praeditis. Basidiis utriformibus,* 30-38 x 5-7 µm. *Sporis a fronte rhomboideis, biapiculatis,* 15-17 x 5-6,2 µm , *haud amyloideis, sine macula, uninucleatis. Nuclei rite dividuntur. In ligno emortuoso suspenso.* Guadeloupe, HOLOTYPUS LY 7634.

Largement étalé, très mince, adhérent, fragile mais non pulvérulent sous l'aiguille, uniformément gris beigeâtre, à marge nette.

En herbier, aride, crème pâle (5 Y 9,25/3,2).

En coupe ne dépasse pas 100 µm d'épaisseur ; il est formé dès la base de dichophyses enchevêtrées subhyalines non dextrinoïdes, mêlées à des amas cristallins parmi lesquels les hyphes génératrices grêles, x 1-2 µm, rares, bouclées, sont très difficiles à observer. Les DICHOPHYSES inférieures ont un stipe étroit, à paroi un peu épaissie dans la moitié supérieure, des branches raides, bien dichotomes et des rameaux ultimes souples ; l'envergure de ces dichophyses est de 30-35 µm. Au dessus de celles-ci, les dichophyses diminuent d'envergure et leurs ramifications sont plus nombreuses et serrées tandis que les rameaux ultimes sont fréquemment, c'est le cas très largement dominant près de la surface, étroits, effilés, sinueux, involutés, toutefois certains restent obtus ; les deux types de

rameaux ultimes peuvent coexister sur une même dichophyse. En surface, les dichophyses sont nettement dextrinoïdes, de faible envergure (8-17 µm), compactes par la multiplicité des ramifications aux ultimes rameaux le plus souvent effilés, sinueux enroulés, longs de 2-5 µm en général, mais pouvant atteindre parfois 10 à 12 µm ; elles tendent à prendre le type capillaire, mais la longueur des rameaux extrêmes n'étant pas nettement supérieure à celle des branches de premier ordre, leur type sera dit "subcapillaire". Assez abondantes GLOEOCYSTIDES étroitement claviformes ou subcylindriques à base grêle, 21-33 x 4-5 µm, avec une schizopapille terminale subsphérique de 1,5-1,8 µm de diamètre ; leur paroi est mince ou submince, leur contenu pailleté dans le Melzer, est sulfo-aldéhyde positif ; elles peuvent émerger légèrement. Basidioles ovoïdes larges jusqu'à 8-9 µm, donnant des BASIDES utriformes à paroi un peu ferme, 31-38 x 5-6-7 µm au sommet, x 6,5 à 9 µm vers le bas, avec 4 stérigmates atteignant 8,5 µm de longueur. SPORES losangiques de face (d'où le nom), à tendance biapiculée, sublosangique de profil avec apicule un peu oblique, (14)-15-17 x 5-6,2 µm, ($\bar{x}$ = 15,59 ± 0,68 x 5,74 ± 0,36 pour N = 17), non amyloïdes et sans bavette, au contenu partiellement multiguttulé, et uninucléé. De face, la spore est symétrique par rapport à ses deux axes perpendiculaires, base et sommet sont pratiquement superposables.

Récolte :

LY 7634, sur liane morte en l'air, chemin reliant Grand Etang à l'As de Pique, le 31 juillet 1975, *HOLOTYPE*. Plusieurs récoltes faites en 1976 n'ont pas sporulé et ne peuvent être citées comme paratypes.

Par la taille de ses spores, ses boucles et ses dichophyses aux ultimes rameaux longs et souples, il pourrait dans une clé de détermination voisiner avec *V. firma* et *V. gillesii*. Toutefois ses spores losangiques sont très caractéristiques, et il n'a pas l'aspect et la couleur de ces derniers. Au microscope, *V. gillesii* s'en distingue de suite par ses grandes gloeocystides huileuses sulfo-aldéhydes négatives, et *V. firma* par ses grandes dichophyses, notamment celles de la couche inférieure. Sa ressemblance serait plutôt avec *V. minidichophysa* dont il a les gloeocystides étroites à papille terminale (mais chez ce dernier, elles sont sulfo-aldéhyde négatives) et à peu de chose près, les dichophyses. En présence d'exemplaires immatures, il n'y a que l'existence ou l'absence de boucles pour les différencier à coup sûr.

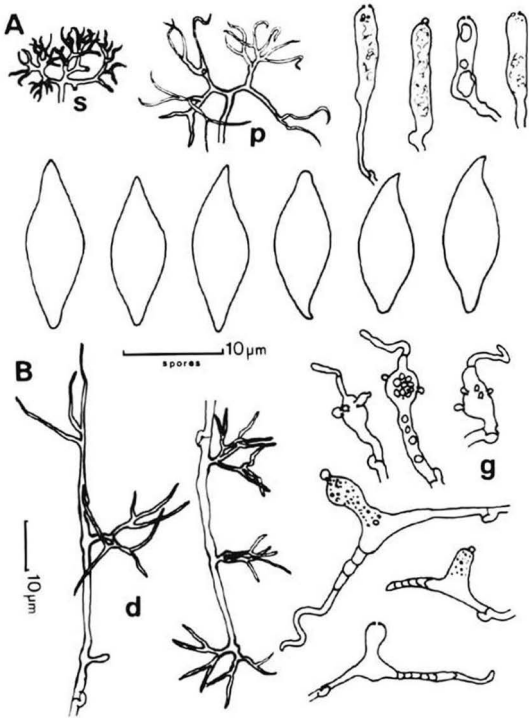


Fig. 12 - *Vararia rhombospora* LY 7634, TYPE ; A, Basidiome : une dichophyse superficielle (s) et une profonde (p) in Melzer ; quatre gloeocystides à schizopapille dont une seule reste en place (in Congo ammoniacal 60° C), deux spores de face et quatre de profil (in KOH-phloxine). B, culture : gloeocystides à 1-5 schizopapilles (g) et dichophyses sur Hagem (d).

Caractères culturaux de *V. rhombospora* :

MONOSPERME.- Ils ont été obtenus, un an après la récolte, grâce à la fructification de la culture polysperme. Les spores germent lentement. Les hyphes sont formées d'articles uninucléés sans boucles, et possèdent les mêmes différenciations que le dicaryon, notamment les sulfocystides faciles à observer.

POLARITE.- Les 30 monocaryons appariés se sont répartis en 3 groupes ; l'espèce est vraisemblablement tétrapolaire :

$A_1B_1$ : 3-10*-13-14-15-19-26-28-29

$A_2B_2$ : 2*-4-5-6-7-8-9-11-16-18-20-21-22-23-24-25-27-30

$A_2B_1$ : 1*-12-17

Des fausses boucles sont observées en 1x3, 1x19, 10x12.

POLYSPERME.-

Croissance : rapide (boîtes couvertes en 3 semaines)

Aspect : la marge est régulière, appliquée ; le mycélium aérien totalement blanc, peu abondant, ne cache pas entièrement le milieu. La surface de la culture, mate et opaque est uniformément recouverte par un maigre aranéum. Le mycélium aérien est un peu plus abondant sur la bouture et contre le verre où, exceptionnellement et très localement, il peut se teinter d'alutacé (10 YR 8/3 à 8/4). Revers inchangé. Odeur aromatique légère.

Microscopie :

Mycélium aérien : hyphes régulières, quelques-unes larges de 3-4 µm, la plupart étroites, x 1-2-(3) µm, bouclées.. De très nombreuses petites gloeocystides de forme variée, x 4-7 µm, montrent une, ou le plus souvent plusieurs (2 à 5) schizopapilles (fig. 12, g), leur contenu est riche en gouttes jaune vif qui passent au violet-noir dans le sulfoanisique. Contre le verre on peut trouver de rares dichophyses subcapillaires grêles de 10-25 µm d'envergure (fig. 12, d), et surtout de nombreuses fibres larges de 2-2,5 µm, à paroi épaisse congophile.

Mycélium submergé : les hyphes sont irrégulières, larges de 1-2-(3) µm , à paroi mince, bouclées. Parmi les nombreuses confrontations de monocaryons effectuées pour déterminer la polarité, on a pu remarquer parfois des grumeaux blancs submergés, très coriaces ; ils sont essentiellement constitués de fibres.

Cytologie : tous les articles sont binucléés et bouclés.

Oxydases :

| | |
|---|---|
| ac. gallique : +++++,0 | gaïacol : +++++, 0 |
| p.-crésol : - | tyrosine : + à ++,0 |

CODE : 2-3c-8d-15-(25d)-32-36-38-43-54-(60)-61.

7 - *Vararia tropica* Welden, Mycologia, 57 : 516, fig. 1, 1965.

Décrit de Porto-Rico sur une récolte de 1913, ce *Vararia* a été retrouvé par C.E. Gomez en Argentine (cf. Boidin et coll. 1976), puis par R.L. Gilbertson et coll. sur *Prosopis juliflora* en Arizona (1976). Nous en avons récolté un spécimen typique en Guadeloupe :

Les données microscopiques ayant été figurées par Welden, par Boidin et Lanquetin (1976, pl. II fig. A) et Gilbertson et coll. (1976 fig. 35 p. 535) nous rappellerons seulement que c'est un champignon étalé très mince, adhérent, mat, ruguleux et un peu fendillé sous la loupe en séchant, beige à ocre (10 YR 6,5/3 7/3 à 7/4) à marge similaire ou localement poudreuse concolore. Ses hyphes sont dépourvues de boucles. Les DICHOPHYSES supérieures de type capillaire ont une envergure de 15-20-(25) µm, leurs ultimes rameaux longs et grêles pouvant atteindre 13 x 0,6 µm. Les GLOEOCYSTIDES généralement longuement rétrécies, atteignent 50 x 10 µm et sont terminées par une schizopapille subcylindrique ; elles contiennent quelques gouttes huileuses sulfo-aldéhyde négatives. Les BASIDES ont une paroi qui peut s'épaissir dans la moitié inférieure et alors gonfle et se délite par traitement alcalin à 60° C ; elles mesurent 35-45 x 7-7,5 µm au sommet, 10 µm au tiers inférieur.

Les spores que nous avons pu cette fois mesurer sur sporée, sont oblongues larges, 9-10,8 x 7-8-(8,5) µm , ($\bar{x}$ = 10,00 ± 0,47 x 7,71 ± 0,35, pour N = 20), ce qui cadre plus étroitement avec les mesures de A.L. Welden que les nôtres faites sur le carpophore type et publiées antérieurement. La paroi, un peu épaisse, n'est pas amyloïde, (fig. 13, A). La spore contient 2 noyaux. La sporée est rosâtre en masse.

Récolte :

LY 8069, sur branchettes ne touchant pas le sol, Domaine Duclos, Petit-Bourg, le 28 septembre 1976.

Il s'agit d'une espèce bien caractérisée, déjà reconnaissable à ses seules spores.

8 - *Vararia splendida* (Viègas) Boid. et Hallenberg, nov. comb.

Syn. : *Asterostromella splendida* Viègas, Bragantia, 5 : 256, pl. IV, 1945.

Après étude du type et communication des notes d'étude de N. Hallenberg, nous proposons la combinaison ci-dessus, et donnons une description :

En herbier, champignon étalé à marge brusque sans rhizomorphes, appliquée ; hyménium lisse, fragile sous l'aiguille, uniformément alutacé (10 YR 7,8/5,8 à 8/6).

Epais de 50 à 120 µm, il est essentiellement formé de dichophyses présentes dès la base ; elles sont jaune-brunâtre en surface. Hyphes génératrices rares, x 1,5-2 µm dans le sous-hyménium, montrant des boucles. DICHOPHYSES inférieures de 30-45-(60) µm d'envergure, formées d'un stipe long, 25-30 x 2,5-4 µm, à paroi un peu épaissie dans sa partie supérieure ; elle peut cependant parfois atteindre 0,5 µm à mi-hauteur ; branches de premier ordre raides à paroi épaissie (par exemple 3-6 x 1,8 µm avec paroi de 0,4 µm) ; branches de deuxième ordre semblables mais plus courtes ; ultimes rameaux longs, souples, souvent incurvés ou même un peu enroulés à l'extrémité, 6-14 x 0,3-0,4 µm (type "arborescent capillaire). On passe vers la surface à des dichophyses parfois bien dextrinoïdes, à stipe plus

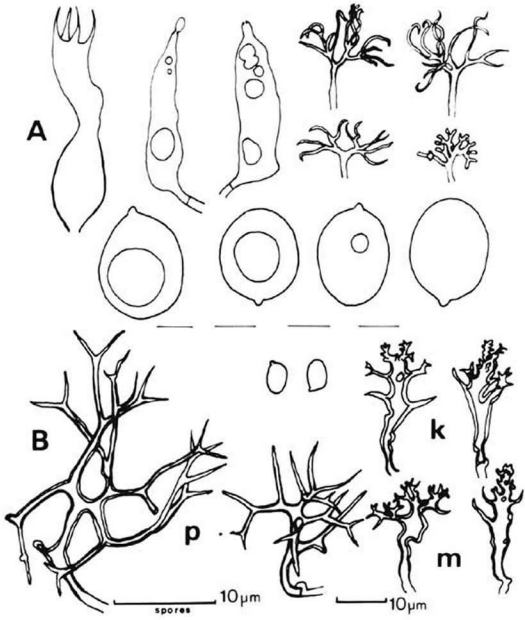


Fig. 13 - A-*Vararia tropica* LY 8069 : une baside et quatre dichophyses dont une aux rameaux courts (immatures ?) in Melzer ; deux gloeocystides à schizopapille (in Congo ammoniacal 60° C) ; quatre basidiospores (in KOH-phloxine).
B-*Vararia ubatubensis* (Viègas), HOLOTYPE : deux dichophyses profondes (p) (in Congo ammoniacal 60° C) et quatre dichophyses moyennes et superficielles (k in KOH-phloxine, m in Melzer) ; deux basidiospores (in KOH-phloxine).

grêle à paroi mince sauf au sommet, aux branches de premier et deuxième ordre plus courtes mais aux ultimes rameaux toujours longs et souples (type "subcapillaire"). GLOEOCYSTIDES peu différenciées, irrégulièrement subcylindriques, obtuses, 40-58 x 5,5-6,5 µm, au contenu partiellement réfringent ; elles n'ont pas montré de schizopapille. BASIDES à 4 stérigmates, un peu resserrées à mi-hauteur, environ 20-35 x 5,5-6 µm, bouclées à la base.

Selon l'auteur de l'espèce, les SPORES sont oblongues allongées, 9-15 x 3,5-4 µm. Nous en avons vu peu, fusiformes à apicule un peu oblique, ou apparaissant subcylindriques, 9-12 x 3-4 µm, non amyloïdes et sans bavette. N. Hallenberg a pu en voir d'un peu plus grandes : 12-14,5 x 3-4 µm. (fig. 14).

Récoltes examinées :

BRESIL : sobre madeira caida na mata, Ubatuba, Est. Sao Paulo, 9 juin 1936, leg. A.S. Costa, det. A.P. Viègas, Instituto Agronomico Campinas (*IACM*) n° 1843, *HOLOTYPE*. En accord avec N. Hallenberg, il faut ajouter des spécimens cités sous le nom de *V. pectinata* par A.L. Welden (1965) : SURINAME : NO 3002, Brokobakka, cacao plants between Affobakaka and Boko pongo, 6 juill. 1961, leg. A.L. Welden 2380 qui ne nous a pas montré de spores, mais elles mesurent selon le sachet d'herbier : 10-15 x 3-6 µm ; NO 3001, near Suriname River on Paramaribo side, 3 juill. 1961, leg. A.L. Welden 2310. Welden (1965, p. 513) fait d'ailleurs remarquer que ses récoltes "differs in some degree from the type "de *V. pectinata*," lack the amyloïd fragments so prominent in the type". Nous avons montré (1976) que *V. pectinata* a sa place dans la section *Fusamyspora* distinguée de la section *Vararia* par l'amyloïdie de la paroi sporique lisse ou très faiblement ornée.

9 - *Vararia ubatubensis* (Viègas) Boid. et Hallenberg, nov. comb.

Syn. : *Asterostromella ubatubensis* Viègas, Bragantia, 5 : 257, fig. 1, 1945.

En herbier, étalé, adhérent, lisse, mat, uniformément cannelle testacé (6,5 YR 5,5/6), assez épais, avec

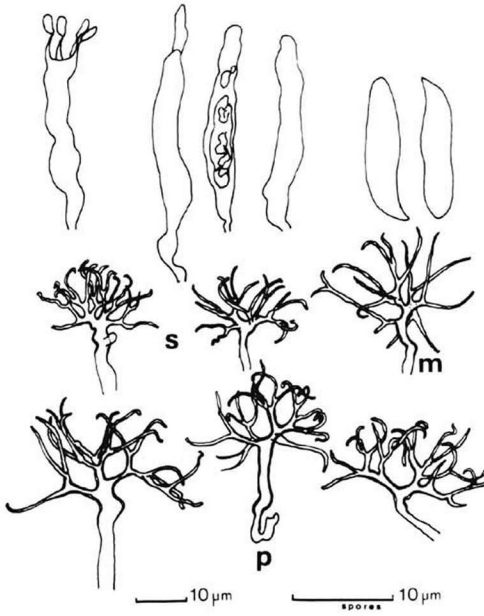


Fig. 14 -*Vararia splendida* (Viègas), HOLOTYPE : une baside et trois gloeocystides (in KOH-phloxine) ; deux spores d'après Hallenberg ; deux dichophyses superficielles (s), une dichophyse moyenne (m) et trois dichophyses posées sur le support (P) (in Melzer).

contexte de même couleur ; consistance de liège, cependant il se fend aisément à la suite de son support.

En coupe, épais de 200-300 µm ; dans toute l'épaisseur apparaissent des dichophyses jaune-brunâtre. Une zone inférieure d'épaisseur variable, mais ne dépassant pas 40 µm, apparaît plus lâche (elle est bien représentée sur la figure 1 de Viègas) et formée d'éléments intriqués en tous sens ; : ce sont de rares hyphes génératrices bouclées, x 1,8-2 µm, à paroi mince ou faiblement épaissie non congophiles et des DICHOPHYSES géométriques assez raides, de 30-50 µm d'envergure, aux branches étalées rigides à paroi épaissie et congophile ; seuls les rameaux ultimes ont une paroi mince ; le stipe subcylindrique est à paroi un peu épaisse, plus faiblement que les branches de premier ordre. Dans le bois sous-jacent on peut observer des dichophyses semblables. Au dessus de cette couche, les éléments dichophytiques verticaux sont serrés, jaune-brunâtre, en partie seulement dextrinoïdes, mais toujours congophiles à chaud : ils possèdent généralement un tronc allongé sinueux, à paroi un peu à très épaisse (1,2 µm dans KOH 3 % p.ex.), s'élargissant peu à peu de la base au sommet. Beaucoup de troncs portent d'abord quelques appendices coniques et vers le sommet de courtes branches terminées par quelques diverticules courts ; ces dichophyses ont couramment une longueur totale de 25-45 µm et une largeur de 8-13 µm Quelques autres, surtout en surface, forment des branches écartées, à nombreux rameaux ultimes courts (type "coralloïde") ; leur envergure est de 15-25 µm. Tous les passages existent entre ces deux types.

La diagnose originale signale des GLOEOCYSTIDES flexueuses rares, 24-30 x 4-5 µm, des BASIDES à 4 stérigmates, mais de taille curieuse : 12 x 4-5 µm, et l'absence de spores. Nous avons pu toutefois observer une dizaine de spores après de longues observations de scalps dans le Melzer, dont une fois 4 spores en place sur une baside flétrie. Ce sont de petites SPORES ovoïdes, 3-3,5-4 x 2-2,5 µm, à paroi lisse non amyloïde et sans bavette (*).(Voir fig. 13 B).

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(*) Il nous semble indispensable que le Code international de Nomenclature botanique recommande désormais l'adjonction de sporées à tout spécimen type d'espèce nouvelle.

Récolte :

Sobre casca de planta indeterminada, Ubatuba, Est. Sao Paulo, Brésil, 9 juin 1936, col. A.S. Costa, det. A.P. Viègas, *IAMC* n° 1856, *HOLOTYPE*.

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Discussion :

Ayant choisi d'orienter nos efforts sur les *Lachnocladiaceae*, nous avons tenté, après une première étude des *Vararia* centrafricains, ivoiriens et gabonnais, une incursion dans le nouveau monde. Elle est beaucoup trop ponctuelle et brève pour mener à des conclusions. Nous nous contenterons d'exprimer quelques remarques.

Le mycologue, même en déplacement lointain, ne doit plus se contenter d'accumuler et de faire sécher un matériel hâtivement étiquetté qu'il étudiera mort après son retour. Il a désormais la possibilité de déplacements rapides, et peut en général au cours de ceux-ci faire aisément sur place un minimum d'observations sur le frais (couleurs codées, réactions aux sulfo-aldéhydes, étude microscopique rapide...) et obtenir des sporées pour dessins et mesures précises ultérieures, ou mieux encore des sporées aseptiques qui envoyées rapidement au laboratoire d'origine pourront en outre servir à la mise en culture. Avec les *Vararia* aux spores souvent fragiles supportant mal une dessiccation, il est prudent de tenter sur place, dès la sporulation, un ensemencement polysperme ; quelques tubes de milieu gélosé (par exemple les petits tubes vissés dits tubes à échantillons de 4 ml. de Wheaton Scientific) sont forts commodes en voyage ; il suffit d'y adjoindre une aiguille à ensemencer et une lampe à alcool. En 1976, les installations de l'INRA et un partage méthodique des tâches ont permis aux auteurs l'obtention de nombreuses cultures monocaryotiques.

Comme aura pu le remarquer le lecteur, les cultures permettent souvent beaucoup mieux que l'étude des carpophores désséchés certaines observations. Par exemple, la

recherche des boucles, souvent fort difficile sur exsiccata est très aisée en culture, et nous pouvons affirmer sans réticence qu'elles sont totalement absentes chez *V.gomezii*, comme elles le sont chez *V. minidichophysa* et *tropica*, autres *Vararia* homothalles. L'étude des gloeocystides, de la réaction de leur contenu aux sulfo-aldéhydes, la recherche des schizopapilles, peuvent être faites à loisir en culture.

En outre certaines données sont propres aux mycéliums ; soulignons la constance des conidiophores oedocéphaloïdes, que Stalpers (1974) réfère au genre *Spiniger*, chez les *Dichosterewm*, et la présence, notée pour la première fois, d'oïdies ou arthrospores chez certains *Vararia (V.dussii* et *V. minispora)* ; il s'agit de deux espèces poussant sur des bois au sol, souvent perforés de galeries; les insectes pourraient avoir un rôle dans leur dispersion, l'obtention des cultures monocaryotiques a non seulement servi à établir la tétrapolarité des *Vararia dussii, intricata, minispora* et *rhombospora*, mais surtout a permis de très utiles essais d'intercompatibilité (3) :

1 - Cas des *Vararia dussii* :

Nous avons signalé des spores un peu différentes entre la récolte type LY 8115 et la récolte 8020 cependant intercompatibles. Nous présentons ci-après les mesures et calculs concernant les spores des 5 récoltes intercompatibles, spores mesurées in KOH 3 %-phloxine, sur sporées.

| | moyenne±écart-type $\bar{x} \pm s$ | N | coef. de variation $s/\bar{x}$ | extrêmes |
|---|---|---|---|---|
| 8115 | 4,90±0,4 x3,5 ±0,30 | 60 | 0,08 0,09 | 4 -6 x3 -4 |
| 8020 | 6,27±2,6 x3,23±0,23 | 60 | 0,42 0,07 | 5,2-7,2x3 -3,7 |
| 8167 | 4,42±0,43x3,0 ±0,22 | 24 | 0,09 0,07 | 3,8-5,2x2,7-3,7 |
| 8184 | 4,82±0,55x3,17±0,20 | 17 | 0,11 0,06 | 4 -6 x3 -3,7 |
| 7638 | 5,45±0,50x3,64±0,37 | 16 | 0,09 0,10 | 4,7-6,2x3 -4 |

On voit que l'écart-type est très important chez 8020 ; la variabilité ainsi soulignée est sans doute liée aux 10,90 % de spores à 2 noyaux ; elle est également bien mise en évidence par une courbe de Gauss à deux maximum (vers 5,9 et 6,8). Si l'on fait abstraction des spores incluses dans la deuxième partie de la courbe (et donc vraisemblablement des spores binucléées), la longueur moyenne

est alors de 5,92, taille encore sensiblement supérieure à la longueur moyenne des spores du type. La table de l'écart réduit montre nettement que nous avons deux populations différentes (X = 4,12 alors que la table indique une valeur limite de 1,96 au risque de 5 %).

Par ailleurs nous avons noté d'importantes variations de coloration des mycéliums entre les cinq souches : tandis que la récolte de 1975 (LY 7638) se montre pratiquement blanche sur Nobles à 6 semaines, les 4 autres souches se colorent plus ou moins intensément. Puisque toutes les souches appariées bouclent, ces différences (spores, couleurs des cultures) restent dans les limites des variations intraspécifiques.

2 - Cas des *Vararia intricata* :

Connu par une seule récolte africaine (Gabon LY 6272), ce champignon était dit "caractérisé par ses spores élancées et l'aspect particulier de ses gloeocystides" (Boidin et Lanquetin 1976). Si les spores et les dichophyses superficielles des 7 récoltes guadeloupéennes correspondent bien à celles du type, nous avons remarqué, selon l'âge des spécimens (?), de grandes variations dans la forme des gloeocystides. LY 8098, comme 8036, a les gloeocystides larges à sommet flétri, et paroi épaissie du type gabonnais; LY 8166 a, au contraire, des gloeocystides allongées subfusiformes à paroi mince ; LY 8173 - 8174 et 8175 ont des gloeocystides de ce dernier type, mais montrant parfois une schizopapille terminale, associées à quelques gloeocystides plus courtes à paroi un peu épaissie. A l'exception du 8173 dont nous n'avons pas de mycélium monocaryotique, toutes les autres souches appariées avec 8166 ont rapidement formé des boucles.

Ces données sont à verser à l'actif des tests d'interfertilité-interstérilité et auraient pu illustrer l'exposé fait récemment à Lausanne dans le cadre du Symposium Herbette sur la notion d'espèce chez les champignons supérieurs (Boidin 1977).

Si nous avons pu utiliser les tests d'intercompatibilité entre souches guadeloupéennes et nous assurer que les variations constatées restaient dans les limites de l'espèce, nous n'avons pu, à notre grand regret disposer simultanément de cultures monocaryotiques africaines et américaines pour les quelques *Vararia* hétérothalles récoltés sur ces

deux continents. C'est ainsi que *V. intricata* type originaire du Gabon n'a pu être cultivé à l'arrivée des spores à Lyon en 1968, et qu'il n'existe pas de cultures américaines de *V. sphaericospora* Gilbertson ni de *V. pectinata* (Burt) Rog. & Jacks., espèces décrites d'Amérique du Nord, mais retrouvées en Afrique et obtenues en culture, la première du Gabon, la seconde de Côte d'Ivoire. Par contre, *V. minidichophysa*, dont nous avons des cultures originaires des deux rives de l'Atlantique est homothalle et ne peut être utilement apparié.

Pour progresser rapidement dans la connaissance d'un ensemble comme celui des *Lachnocladiaceae*, il serait très souhaitable que s'établisse, notamment pour les sporées et les cultures, une coopération très étroite entre mycologues éloignés.

Remerciements

Notre gratitude s'adresse tout d'abord à Monsieur Coleno, directeur de la Station de Pathologie végétale de l'INRA de Petit Bourg, ainsi qu'à Monsieur Fournet botaniste éminent, pour leur accueil très cordial.

Pour effectuer au mieux cette mise au point, nous avons mis à contribution de nombreux collègues : le Dr Siepmann d'Hann-Münden (Allemagne) a obtenu à notre intention la fructification de plusieurs *Dichosterewm* ; Niels Hallenberg de Göteborg (Suède) nous a communiqué divers renseignements et notamment des notes et dessins concernant les espèces de Viègas ; P.L. Lentz de Beltsville (Maryland) a bien voulu comparer nos descriptions aux notes qu'il possède sur les spécimens de J. Rick. ; A.L. Welden nous a aimablement prêté divers spécimens de la zone Caraïbe ; qu'ils soient tous sincèrement remerciés.

Enfin nous exprimons notre reconnaissance au Professeur J. Eriksson de Göteborg (Suède) et au Dr Derek A. Reid des Royal Botanic Gardens de Kew (Angleterre) pour la lecture critique de ce manuscrit ; ainsi qu'à Monsieur H. Romagnesi pour les traductions latines.

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Following interesting collections in Guadeloupe in 1975-76, a detailed account is presented of all species actually known to date in Central America.

The genus *Dichostereum* Pilát, type *Asterostromella dura* Bourd. & Galz., is resurrected for those species of *Vararia* with warted and amyloid, subglobose spores, showing in cultures conidiophores of the *Spiniger* Stalpers (1974) type. *D. peniophoroides* (Burt) is intersterile with the closely related *Dichostereum* species already studied by Lanquetin (1973).

In the genus *Vararia*, three new species, *V.dussii*, *minispora* and *rhombospora* are proposed, and four others are notified : *V. tropica* Welden, *minidichophysa* Boid. & Lanq., *intricata* Boid. & Lanq. and *gomezii* Boid. & Lanq., *V. tropica* which is now known from Puerto-Rico, Argentina, Arizona and Guadeloupe seems to be restricted to America. On the other hand, *V. minidichophysa* and *V. intricata* of tropical Africa and *V. gomezii* of North Argentina and perhaps also of Africa have been collected for the first time in Central America. These species may have a wider distribution in Neotropica.

The authors emphasize the importance of making a few observations during field trips on the fresh material (colours, sulfuric-aldehyde reaction...) and above all of collecting each time aseptic spore prints for accurate measurements and cultures.

The cultural characters are indicated for the three new species as well as for *V. gomezii* and *intricata*.

The principal microscopic characters are :

SPORES : shape and size when mature (on spore prints), amyloidity, "bavette" (= adaxial plaque), number of nuclei, color of print.

DICHOPHYSES : differentiation of the stipe, of the branches and ultimate ramifications (short or long and flexible), spread, variations in the basidiocarp between the base and the surface.

GLOEOCYSTIDIA : shape, reaction of the content in sulfuric-aldehydes, presence or lack of schizopapilla.

CLAMP-CONNECTIONS : presence or absence, eventually inconstancy.

These characters have enabled us to differentiate the species and to make a key for their determination. If, in the French text, we have initially distinguished the species with or without clamp-connections, we give below a key where the character appears later, and where initial separation is made on spore characters.

KEY to *VARARIA* and *DICHOSTEREUM*
actually known in Central America

1-Spores globose amyloid ..... 2
1-Spores not amyloid (or only small adaxial amyloid plaque or "bavette") ..... 4
2-Spores globose smooth ; superficial dextrinoid hyphae with final ramifications long, slender and enrolled
..... see *Scytinostroma albo-cinctum* *
2-Spores globose or subglobose, warted .....
..... (g.*Dichostereum*) 3
3-Gloeocystidia large and broad ( > 10 µm), finally with solid content ; spores strongly warted, the wall of which swells in KOH
..... *D. peniophoroides* (Burt), p. 285
3-Gloeocystidia narrower (< 10 µm) ; spores with smaller warts, and wall remaining thin in KOH 3 % ..... *D. pallescens* (Schw.)
4-Spores small, ovoid or shortly oblong, 3-6, 5 x 2-3,5 µm..... 5
4-Spores larger ; basidiocarps thin with white or pale context (except *S. phaeosarcum*)..... 8
5-Rhizomorphs and fiber hyphae present ; basidiocarps thin without clamp-connections
..... *V. fibra* Welden
5-Without rhizomorphs or thick walled hyphae; basidiocarps thick (500 to 3000 µm) with brownish context ; hyphae with clamps..... 6

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* Pour *Scytinostroma albo-cinctum* (Berk. & Br.) Boid. & Lanq. et *S. phaeosarcum* Boid. & Lanq. voir Boidin et Lanquetin (1976)

6-Superficial dichophyses with final ramifications long and flexible ; gloeocystidia positive in sulfuric-aldehyde ; spores 4-6,5 x 3-3,75 µm ..... *V. dussii* B. & L., p. 292

6-Superficial dichophyses with final ramifications very short ..... 7

7-Dichophyses with branchs well developped, divergent with final ramifications cylindric, short, obtuse ; spores subovoid, 3-4 x 2,5-3,25 µm ..... *V. minispora* B. & L., p. 311

7-Dichophyses in the depth in loose layer, with final branchs conical ; dichophyses in the middle with sinuous trunk with more and less abortive ramifications ; spores ovoid, 3-4 x 2-2,5 µm ... *V. ubatubensis* (Viègas) p. 324

8-Spores ovoid or oblong, 6,5-11 x 4-8,5 µm; hyphae without clamp-connections ..... 9

8-Spores elongated fusiform ; hyphae with clamp-connections or not .....11

9-Basidiocarps thick with brown flesh ; dichophytic hyphae with final ramifications cylindric obtuse ; spores subcylindric short, 8-10 x 4-5,25 µm ..... see *Scytinostroma phaeosarcum* ✲

9-Basidiocarps very thin, with pallid flesh ; hair-like dichophyses (final ramifications very slender, long flexible) ..... 10

10-Spores oblong wide, 9-11 x 7-8,5 µm .....*V. tropica* Welden p. 321

10-Spores ovoid, 6,5-8 x 4,75-5,5 µm ..... *V. minidichophysa* B. & L., p. 309

11-Spores narrow, x 2,5-4,2 µm..... 12

11-Spores wider, x 4,8-6,2 µm ..... 15

12-Final ramifications of the dichophyses very short, obtuse ; spores 10-13x2,5-3 µm ..... *V. trinidadensis* Welden

12-Final ramifications of the superficial dichophyses long, slender and flexible.. 13

13-Hyphae without clamp-connections ; spores 16-17,5-(22) x 2,5-3,25 µm ..... *V. phyllophila* (Mass.)

13-Hyphae with clamp-connections ..... 14

14-Spores oblong to fusiform, 9-15 x 3,5-4 µm ; all dichophyses with final ramifications long and flexible ..... *V. splendida* (Viégas), p. 322

14-Spores lengthly navicular, biapiculate, 15-18-(21) x 3,2-4,2 µm ; deep dichophyses with final ramifications conic straight ..... *V. intricata* B. & L., p. 303

15-Superficial dichophyses with final ramifications numerous and short (coralloid type) ; gloeocystidia sulfuric aldehyde negative with thickened wall ; spores 12,5-15 x 4,8-6 µm ; hyphae without clamps .. *V. gomezii* B. & L., p. 299

15-Superficial dichophyses with final ramifications slender and flexible ; gloeocystidia narrow, x 4-5 µm positive in sulfuric-aldehyde, with schizopapilla ; spores 15-17 x 5-6,2 µm , rhombic in front ; hyphae with clamp-connections .. *V. rhombospora* B. & L., p. 317

Though our knowledge is still very fragmentary it seems that the genus *Vararia* is very well represented in tropical America as it is in similar parts of Africa. We had already noted (1976) that *V. sphaericospora* Gilberts. and *V. pectinata* (Burt) and perhaps *V. gomezii* are common to both continents and to these we must now add *V. intricata* and *minidichophysa*. Unfortunately it has not been possible to mate cultures from these two continents : as in the case of homothallic species (*V. minidichophysa, gomezii*) or because we have been unable to dispose simultaneously cultures of the heterothallic species from the two sides of the Atlantic.

A plea is made for international collaboration, not only for the loan or exchange of specimens, but especially for the exchange of viable spore prints or cultures. In effect, the rapid progress of the study of *Lachnocladiaceae* (as of other families) make it indispensable for the future that there should be collaboration between mycologists throughout the world. Any collaboration in this direction would be most welcome and could form the basis of common publication.

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# BIBLIOGRAPHIE


Boidin J. 1958. Essai biotaxinomique sur les Hydnés résupinés et les Corticiés. Etude spéciale du comportement nucléaire et des mycéliums. Mem.hors série n° 6, Revue Mycologie (Paris) 387 p.

Boidin J. 1966. Basidiomycètes *Corticiaceae* de la République Centrafricaine, I. Le genre *Gloeocystidiellum* Donk. Cah. Maboké 4 : 5-17.

Boidin J. 1977. Intérêt des cultures dans la délimitation des espèces chez les Aphyllophorales et les Auriculariales. in Clémençon, Symposium sur la notion d'espèce chez les champignons supérieurs (Cramer edit.) sous presse.

Boidin J. et P. Lanquetin, 1976. *Vararia* subgenus *Vararia* (Basidiomycetes *Lachnocladiaceae*) : étude spéciale des espèces d'Afrique intertropicale. Bull. Soc. Mycol. France, 91 : 457-513 (1975).

Boidin J., P. Lanquetin, P. Terra et C.E. Gomez, 1976. *Vararia* subg. *Vararia* (Basidiomycetes *Lachnocladiaceae*) deuxième partie : caractères culturaux. Bull. Soc. Mycol. France, 92 : 247-277.

Boidin J. et P. Lanquetin, 1976 : *Scytinostroma albo-cinatum* (Berk. et Br.) et *phaeosarcum* nov. sp. (Basidiomycetes *Lachnocladiaceae*). Kew Bull, 31 : 621-628.

Clements F.E. et C.L. Shear. 1931. The genera of fungi, New-York.

Donk M.A. 1931. Revisie van de Nederlandse *Heterobasidiomycetae* en *Homobasidiomycetae-Aphyllophoraceae*. I. Meded Ned. mycol. Ver. 18-20 : 65-200.

Donk M.A. 1957. The generic names proposed for Hymenomycetes VII. "*Thelephoraceae*" Taxon, 6 : 68-85.

Gilbertson R.L., H.H. Bursdall et E.R. Canfield. 1976. Fungi that decay mesquite in Southern Arizona. Mycotaxon, 3 : 487-551.

Lanquetin P. 1973. Utilisation des cultures dans la systématique des *Vararia* Karst. subg. *Dichosterewm* (Pilát) Boid. (Basidiomycetes *Lachnocladiaceae*). Bull. Soc. Linnéenne Lyon, 42 : 167-192.

Lanquetin P. 1973 b. Interfertilités et polarités chez les *Scytinostroma* sans boucles (Basidiomycètes *Lachnocladiaceae*). Naturaliste Canad. 100 : 33-49.

Maxwell M.B. 1954. Studies of Canadian *Thelephoraceae* XI Conidium production in the *Thelephoraceae*. Can. J. Bot. 32 : 259-280.

Nobles M.K. 1965. Identification of cultures of wood-inhabiting Hymenomycetes. Can. J. Bot. 43 : 1097-1139

Parmasto E. 1971. The *Lachnocladiaceae* of the Soviet Union. Acad. Sc. Estonian S.S. R., Tartu (1970), 168 p.

Pilát A. 1926. Monographie der mitteleuropäischen Aleurodiscineen. Ann. Mycol. 24 : 203-230.

Rogers D.P. et H.S. Jackson. 1943. Notes on the synonymy of some North American *Thelephoraceae* and other resupinate. Farlowia, 1 : 263-328.

Stalpers J.A. 1974. *Spiniger*, a new genus for imperfect states of Basidiomycetes. Proc. Koninkl. Nederl. Akad. Wetensch., Amsterdam, C 77 : 402-407.

Viègas A.P. 1945. Alguns fungos do Brasil. VII-VIII *Cyphellaceae* et *Thelephoraceae*. Bragantia, 5 : 239-252.

Welden A.L. 1965. West Indian species of *Vararia* with notes on extralimital species. Mycologia, 57 : 502-520.

MYCOTAXON

Vol. VI, No. 2, pp. 337-340 October-December 1977

# TYPE STUDIES IN THE GENUS PEZIZA: SPECIES DESCRIBED BY BERKELEY AND CURTIS FROM THE UNITED STATES NORTH PACIFIC EXPLORING EXPEDITION (1853-1856)

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The genus *Peziza*, once used inclusively for almost all large Discomycetes, is now restricted to the fleshy, operculate Discomycetes which have iodine-positive asci and complex excipules built primarily of large globose cells and interwoven hyphae. Because of the former broad application of this generic name there are thousands of species referred to it. Of these, only a small proportion are truly *Peziza* in the restricted sense of contemporary authors (Korf 1972, Rifai 1968). Moreover, many species referred to *Peziza* have not been critically reexamined.

A set of Pezizas, described by Berkeley and Curtis (1860), were collected by Charles Wright on the United States North Pacific Exploring Expedition. The expedition visited Hong Kong, the Bonin Islands, Japan, and the Siberian side of the Bering Straits. The original descriptions are scanty, in part because the official report of the expedition was never published and in part because of Berkeley's style and habit. None of the species described by Berkeley and Curtis in *Peziza* can remain in the genus as currently circumscribed. The specimens studied are deposited in the Farlow Herbarium. They are presumed to be isotypes.

*Peziza japonica* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 127. 1860.

≡ *Plectania japonica* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 163. 1889.

On roots upon hillsides. Tokunosima, Japan. April 30, 1855.

Berkeley and Curtis compared the external appearance of this species with *Peziza melaena* Fr., now *Pseudoplectania*, and noted its elliptical spores. *Peziza japonica* agrees in all respects with *Plectania melastoma* (Sow. ex Fr.) Fuckel and should be considered a synonym.

*Peziza boninensis* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 127. 1860.
≡ *Humaria boninensis* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 139. 1889.

On dead leaves on hillsides. Bonin Islands. Oct. 23, 1854.

Ito and Imai (1937) synonymized this species with *Phillipsia domingensis* (Berk.) Berk. It differs from that species and all others reported in the genus in occurring on leaves rather than on dead wood. *Phillipsia domingensis* is quite variable morphologically, but *Peziza boninensis* agrees with the description of it given by Denison (1969). The occurrence of a *Phillipsia* on leaves suggests a relationship with *Nanoscypha*.

*Peziza insititia* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 127. 1860.

On dead wood covered with leaves. Bonin Islands. Oct. 23, 1854.

Ito and Imai (1937) based the genus *Boedijnopeziza* on this species. Rifai (1968) gives complete synonymy. I have previously (Pfister 1973) stated the arguments for and against recognition of the genus *Boedijnopeziza*. Until accurate field observations are carried out to determine the mode of apothecial development and the origin of the marginal hairs, there is little justification for placing this species in a separate genus.

I have recently examined a collection of this species from India (BPI). It is the only collection of this species I have seen from the Indian subcontinent.

*Peziza lepida* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 127. 1860.
≡ *Sarcoscypha lepida* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 154. 1889.

On burnt earth of hillsides. Japan. Sept. 8, 1855.

Rifai (1968) synonymized this species with *Geopyxis carbonaria* (Alb. & Schw. ex Pers.) Sacc. My studies

confirm Rifai's conclusions.

*Peziza verruculosa* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 127. 1860.

≡ *Geopyxis verruculosa* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 68. 1889.

On stony hills. Bering Straits. Aug. 11, 1855.

This is the arctic-alpine form of *Helvella acetabulum* (Fr.) Quél. described by Dissing (1966). Berkeley and Curtis described it as being violet-tinged. In dried condition it has whitish pustules at the margin. Berkeley and Curtis's comparison of this species with *Peziza nigrella* Pers. ex Fr. (≡ *Pseudoplectania nigrella* (Pers. ex Fr.) Fuckel) seems only to have been based on the dark pigmentation of the two species.

*Peziza porphyra* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 128. 1860.

≡ *Sphaerospora porphyra* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 188. 1889.

On banks by the roadside, Simoda, Japan. May 25, 1855.

The fungus was collected on twigs and soil. It is identical to *Pseudoplectania nigrella* (Pers. ex Fr.) Fuckel.

*Peziza leucophaea* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 128. 1860.

≡ *Erinella leucophaea* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 509. 1889.

On dead sticks, Simoda, Japan. May 14, 1855.

This is a species of *Dasyscyphus* S. F. Gray. It has filiform ascospores and lanceolate paraphyses. The hairs are brown-walled, rough, septate, and more or less blunt. *Peziza leucophaea* (Pers.) Nyl. (1869) is a later homonym.

*Peziza inconspicua* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 128. 1860.

≡ *Trichopeziza inconspicua* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 430. 1889.

On dead wood. Bonin Islands. Nov. 1854.

Berkeley and Curtis did not mention microscopic features. I found neither asci nor ascospores but saw scattered encrusted clavate structures which appear to be cystidia. It appears to be a cyphellaceous fungus.

*Peziza Hongkongensis* Berk. & Curt., Proc. Amer. Acad. Arts *4*: 128. 1860.

≡ *Helotium honkongense* (Berk. & Curt.) Sacc., Syll. Fung. *8*: 223. 1889.

On dead twigs. Hong Kong.

This short stalked yellow-orange fungus is a *Hymenoscyphus* species. Its excipular structure is similar to that of *Hymenoscyphus miniatus* (Pat.) Dennis. The ascus pore is iodine-positive. The ascospores are 23-27 x 4-5 µm and multiguttulate. The paraphyses are filiform.

## LITERATURE CITED

Berkeley, M. J., and M. A. Curtis. 1860. Characters of new fungi collected in the North Pacific Exploring Expedition by Charles Wright. Proc. Amer. Acad. Arts *4*: 111-130.

Dissing, H. 1966. The genus *Helvella* in Europe, with special emphasis on the species found in Norden. Dansk. Bot. Ark. *25*(1): 1-172.

Ito, S., and S. Imai. 1937. Fungi of the Bonin Islands II. Trans. Sapporo Nat. Hist. Soc. *15*(2): 52-59.

Korf, R. P. 1972. Synoptic key to the genera of the Pezizales. Mycologia *64*: 937-994.

Nylander, W. 1869. Observationes circe Pezizas Fenneae. Not. Sällsk. Fauna Fl. Fenn. Förh. *10*: 3-91, 403-404.

Pfister, D. H. 1973. Notes on Caribbean Discomycetes. IV. *Cookeina venezuelae*, *C. colensoi*, and the genus *Boedijnopeziza*. Phytologia *27*(1): 57-61.

Rifai, M. A. 1968. The Australasian Pezizales in the Herbarium of the Royal Botanic Gardens, Kew. Verh. Kon. Akad. Wetensch. Afd. Natuurk., II *57*(3): 1-295.

MYCOTAXON

Vol. VI, No. 2, pp. 341-355 October-December 1977

# SECTIONAL NOMENCLATURE IN THE GENUS COPRINUS

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Summary

Twelve sections are presently recognized by the author in the genus *Coprinus* s.l. (Basidiomycetes, Agaricales, Coprinaceae). The nomenclature associated with them and its status is critically reviewed. One new taxon is proposed: *Coprinus* section *Insignes*. New sectional status is proposed for the *Domestici* and *Auricomi* groups. Section *Veliformes* is emended in circumscription. *Coprinus stercoreus* and *Coprinus congregatus* are designated species lectotypicae for sections *Veliformes* and *Glabrati* respectively. As an aid to stabilization of infrageneric nomenclature in the genus, lectotypes are also designated for fifteen taxa listed in synonomy.

Résumé

A présent douze sections sont acceptées par l'auteur pour le genus *Coprinus* s.l. (Basidiomycetes, Agaricales, Coprinaceae). La nomenclature y associée est considéré d'une manière critique. Un nouveau taxon est proposé: *Coprinus* section *Insignes*. Un nouveau rang sectionnel est proposé pour les groupes *Domestici* et *Auricomi*. Section *Veliformes* est réduite en circonscription. *Coprinus stercoreus* et *Coprinus congregatus* sont nommés species lectotypicae pour sections *Veliformes* et *Glabrati* respectivement. Au bénéfice de stabilisation de nomenclature chez le genus, lectotypes sont nommés aussi pour quinze taxa en synonymie.

In preparing a monograph of the genus *Coprinus* for North America, it became apparent to me that the infrageneric nomenclature for *Coprinus* has been confused. To

help remedy this situation, this paper details the use of most names which have been published for subdivisions of the genus. It also provides the correct names for twelve sections, three of which are new. Correct infrasectional nomenclature will be presented in subsequent publications.

Fries (1821) initially treated *Coprinus* as a unit within the genus *Agaricus*. There, he did not further group the species. Soon, however, Fries (1825) raised *Coprinus* to generic status, and in the Epicrisis (1838) he divided it into two artificial assemblages, tribe *Pelliculosi* and tribe *Velliformes*. The former includes *C. comatus*, the type species of the genus. These names are not valid, contravening Article 33 paragraph 3 of the International Code (Stafleu et al. 1972). Also, they are not exempted by Article 33 paragraph 4; it being restricted to relevant components of Fries' Systema (1821, 1828).

Without specification of rank, the genus was further subdivided by Fries (1838) into the *Comati*, *Atramentarii*, *Picacei*, *Tomentosi*, *Micacei*, *Glabrati*, *Cyclodei*, *Lanatuli*, *Furfurelli*, and *Hemerobii*. Fries (1849, 1874) sustained this classification in later treatises.

Among the subsequent authors who in some way provided an infrageneric classification for *Coprinus*, many for the most part followed the Friesian system and nomenclature (Cooke 1871; Morgan 1883; Quélet 1886; Stevenson 1886; Massee 1892; Patouillard 1900; McIlvaine 1902; W. G. Smith 1908; Pennington in Kauffman 1918). Berkeley (1860) and Rea (1922) also employed Friesian subdivisions, but deleted his nomenclature. Others, however, as well as some of those cited above in other of their works, provided new (to varying degrees) infrageneric classifications with partially to completely different nomenclature (Karsten 1876; Patouillard 1887; Quélet 1888; Hennings in Engler & Prantl 1897; Ricken 1910-1915; Bigeard & Guillemin 1913; J. E. Lange 1915; Killermann in Engler & Prantl 1928; Konrad & Maublanc 1930). In his revision, Massee (1896) numbered, without naming, his six subdivisions of the genus. More recently, compilations such as those of Singer (1951, 1962b, 1975), Kühner & Romagnesi (1953), and Moser (1967) have employed, in various combinations, some Friesian and some non-Friesian nomenclature. The latter has been primarily taken up from the *Coprinus* studies of Jakob Lange (1915, 1939).

The acceptance by the 1975 International Botanical Congress at Leningrad (Voss 1976; see also Comments Rapporteurs [p. 219] in Stafleu & Voss 1975) of Proposal 107 by Brummitt et al. (1974) is important to stabilization of infrageneric nomenclature. This addition to Article 35 of the International Code makes it possible to determine priority, if it has been established, for early names which were validly published, but without

clear indication of rank. As will be noted below, this is the status of most of the names in *Coprinus* which often have been considered sectional or subsectional. It will also be noted that Leigh Pennington (in Kauffman 1918) is the principal author to have assigned rank to the valid infrageneric names of Fries. Fortunately, though eighty years intervened, most of these Friesian names were not superseded, and from 1918 have priority at the sectional level.

Summarized below is most of the nomenclature associated with the sections in *Coprinus* which are presently recognized. Because of doubt about its status in the Coprinaceae, *Coprinus* section *Psathyrellopsis* Locquin (1955) is not acknowledged as a distinct taxon or included in synonomy. This is also the case with two unranked groups in the genus which were proposed by Patouillard (1900) and W. G. Smith (1908) respectively. On the other hand, certain obviously invalid sectional names, such as those recently circulated again by Shaffer (1968), have been included due to the notice they have received. The latter names were previously used in Smith & Shaffer (1964), where the junior author recommends they be ignored. I would suggest, however, that in order to avoid possible nomenclatural confusion, one should follow the botanical code's Recommendation 34A (Stafleu et al. 1972). In addition, Locquin's (1956) apparently purposely invalid names are also inserted. Full bibliographic citation for abbreviated references (e.g., 1838:242) is given in the list of references (p.

1. COPRINUS section COPRINUS

Type species: *C. comatus* (Müll. ex Fr.) S.F.Gray [Lectotype of *Coprinus* [Pers.] S.F.Gray, selected by Earle (1909).]

*Coprinus* tribe *Pelliculosi* Fr. 1838:242. [Invalid, Art. 33 par. 3.]

*Coprinus* sect. *Pelliculosi* Fr. ex Cooke 1871: 161. [Invalid, Art. 32 & 22 par. 1.]

*Coprinus* tribe *Pelliculosi Comati* Fr. 1838:242. [Validly published name (*Coprinus Comati*) without rank or priority, Art. 35 (Leningrad Code; typified by *C. comatus*, Art. 22 par. 4.]

*Coprinus Pelliculosi* sect. *Comati* (Fr.) Penn. in Kauff. 1918:207,209. [Invalid, Art. 32 & 22 par. 1.]

*Coprinus* sect. *Eucoprinus* Pat. 1887:126. [Invalid, Art. 32, 21 par. 3, 22 par. 1.]

*Coprinus Pelliculosi Annulati* Quél. 1888:52 non Karst. 1876 nec J.Lange 1915. [Illegitimate name (*Coprinus Annulati*), par. 2 of Art. 45 & 64; species lectotypica: *C. comatus* (Müll. ex Fr.) S.F.Gray]

*Coprinus* subg. *Volvocoprinus* sect. *Annulati* Henn. in E.&P. 1897:208. [Invalid, Art. 32 & 22 par. 1.]

*Coprinus Comati Annulati* J.Lange 1915:36 non J. Lange 1915:37 nec Karst. 1876 nec Quél. 1888. [Illegitimate name (*Coprinus Annulati*), Art. 64 par. 2; species lectotypica: *C. comatus* (Müll. ex Fr.) S.F.Gray.]

*Coprinus* sect. *Comati* subsect. *Annulati* Sing. 1951: 459. [Subsectional epithet should be treated as if new, Art. 72; illegitimate, Art. 64 par. 2; typified by *C. comatus* fide Singer (1951).]

*Coprinus* subg. *Volvocoprinus* sect. *Volvati* Henn. in E.& P. 1897:208. [Species lectotypica: *C. sterquilinus* (Fr.) Fr.]

*Coprinus Volvocoprinus* Rick. 1910:56. [Validly published name without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. comatus* (Müll. ex Fr.) S.F.Gray.]

*Coprinus* subg. *Volvocoprinus* sect. *Annulati Psalliophora* Killerm. in E.&P. 1928:233. [Validly published name (*Coprinus Psalliophora*) without rank or priority, Art. 35 (Leningrad Code); based on *Psalliophora* Karst. 1879 (illegitimate, Art. 63 par. 1), infrasectional epithet treated as if new, Art. 72; typified by *C. comatus* fide Earle (1909).]

I do not consider the *Comati* of J. E. Lange (1915), as well as his other principal divisions of the genus (*Farinosi* and *Nudi*), to have definite rank. Lange calls them his "three main groups or tribes" in the introduction, but does not specify rank for them (or any other of his subdivisions) in the key and other descriptive portion. In the reiteration of his classification of *Coprinus* (Lange 1939), no mention at all is made of tribes.

Lectotypes are chosen for four of the names in synonomy, *Coprinus* section *Volvati*, the *Volvocoprinus* group, the *Annulati* of Quélet, and the first *Annulati* of Lange.

2. COPRINUS section ATRAMENTARII (Fr.) Penn. in Kauff. 1918:207,212.

Type species: *C. atramentarius* (Bull. ex Fr.) Fr.

*Coprinus* tribe *Pelliculosi Atramentarii* Fr. 1838:243. [Validly published name (*Coprinus Atramentarii*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. atramentarius*, Art. 22 par. 4.]

*Coprinus* sect. *Comati* subsect. *Atramentarii* (Fr.) Sing. 1951:459. [Subsectional rank assigned by Singer (1951) non Konrad & Maublanc (1930).]

*Coprinus Coprinus* Rick. 1910:62. [Invalid, Art. 22 par. 3.]

*Coprinus Comati Exannulati* J.Lange 1915:36 non J.Lange 1915:37 nec Karst. 1876. [Illegitimate name (*Coprinus Exannulati*), Art. 64 par. 2; species lectotypica: *C. atramentarius* (Bull. ex Fr.) Fr.]

*Coprinus Comati Exannulati Subglabri* J.Lange 1915:36. [Validly published name (*Coprinus Subglabri*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. atramentarius* (Bull. ex Fr.) Fr.]

*Coprinus atramentarius* is designated lectotype species for *Coprinus* [group] *Subglabri*, and the first *Exannulati* of Lange.

3. COPRINUS section PICACEI (Fr.) Penn. in Kauff. 1918:207, 213.

Type species: *C. picaceus* (Bull. ex Fr.) S.F.Gray

*Coprinus* tribe *Pelliculosi Picacei* Fr. 1838:244. [Validly published name (*Coprinus Picacei*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. picaceus*, Art. 22 par. 4.]

*Coprinus Velocoprinus* Rick. 1910:58. [Illegitimate, Art. 64 par. 2; species lectotypica: *C. picaceus* (Bull. ex Fr.) S.F.Gray.]

*Coprinus Comati Exannulati Tomentosi Atrospori* J.Lange 1915:36. [Validly published name (*Coprinus Atrospori*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. picaceus* (Bull. ex Fr.) S.F. Gray.]

*Coprinus* sect. *Impexi* Romag. 1947:80. [Invalid, Art. 32.]

*Coprinus* sect. *Quadrifidi* A.H.Sm. & Shaf. 1964:78. [Invalid, Art. 32.]

*Coprinus picaceus* is selected as lectotype for both the *Velocoprinus* and *Atrospori* groups listed above. The former is a later homonym of Hennings' (in Engler & Prantl 1897) subgenus.

4. COPRINUS section HERBICOLAE Pil. & Svr. 1967:136.

Type species: *C. urticicola* (Berk. & Br.) Buller

*Coprinus* sect. *Coprinopsis* (Karst.) Pat. 1887:126. [Invalid, Art. 32 & 21 par. 3.]

*Coprinus Comati Exannulati Tomentosi Phaeospori* J.Lange 1915:37. [Validly published name (*Coprinus Phaeospori*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. phaeosporus* Karst., Art. 22 par. 4.]

*Coprinus* sect. *Coprinus* subsect. *Alachuani* Sing. 1962a: 67. [Typified by *C. alachuanus* Murr. fide Singer (1962a).]

This rather recently recognized section in *Coprinus* is presently considered distinct from the preceding group, section *Picacei*.

5. COPRINUS section LANATULI (Fr.) Penn. in Kauff. 1918: 207,220.

Type species: *C. lagopus* (Fr.) Fr.

*Coprinus* tribe *Veliformes Lanatuli* Fr. 1838:250. [Validly published name (*Coprinus Lanatuli*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. lagopus* fide Singer (1975).]

*Coprinus* sect. *Coprinus* subsect. *Lanatuli* (Fr.) Sing. 1975:494. [Invalid, Art. 33 par. 2.]

*Coprinus* tribe *Pelliculosi Tomentosi* Fr. 1838:245. [Validly published name (*Coprinus Tomentosi*) without rank or priority, Art. 35 (Leningrad Code; typified by *C. tomentosus* (Bull. ex Fr.) Fr., Art. 22 par. 4.]

*Coprinus Pelliculosi* sect. *Tomentosi* (Fr.) Penn. in Kauff. 1918:207,214.

*Coprinus* sect. *Veliformes Exannulati* Karst. 1876:157 non J.Lange 1915. [Validly published name (*Coprinus Exannulati*) without priority except for homonymy, Art. 35 (Leningrad Code); species lectotypica: *C. lagopus* (Fr.) Fr.]

*Coprinus Pelliculosi Velati* Quél. 1888:50. [Validly published name (*Coprinus Velati*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. velatus* Quél., Art. 22 par. 4.]

*Coprinus* sect. *Lagopodes* Romag. 1947:76. [Invalid, Art. 32.]

The *Tomentosi* and *Lanatuli* groups of Fries (1838) contain species which for the most part should be placed in the same section. This is more or less current practice (Singer 1975; Orton 1957; Kühner & Romagnesi 1953) with authors recognizing only the *Lanatuli* as a section or subsection.

*Coprinus lagopus* is the lectotype of the *Lanatuli* and is likewise chosen lectotype species for Karsten's *Exannulati* group.

6. COPRINUS section INSIGNES Patrick, sect. nov.

Typus sectionis: *C. insignis* Peck

Sectio sporis anthracinis in deposito novo sicut in sicco; sub microscopio sporis plus minusve limoniformibus et rostratis versus apicem truncatum, pariete incrassato et conspicue verrucoso ob grossos et irregulares projecturas.

Haec sectio interjacet duas sectiones laevisporas quae *Lanatuli* et *Picacei* appellantur. Structura veli saltem in specie typo indicat cognationem propinquiorem priori quam posteriori.

7. COPRINUS section VELIFORMES Fr. ex Cooke 1871:166 emend. Patrick

Type species: *C. stercoreus* Fr.

*Coprinus* tribe *Veliformes* Fr. 1838:250. [Invalid, Art. 33 par. 3.]

*Coprinus* tribe *Veliformes Cyclodes* ["*Cyclodei*"] Fr. 1838:250. [Validly published name (*Coprinus Cyclodes*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. cyclodes* [Mich.] Fr., Art. 22 par. 4.]

*Coprinus Veliformes* sect. *Cyclodes* ["*Cyclodei*"] (Fr.) Penn. in Kauff. 1918:207,220.

*Coprinus* sect. *Cyclodes* ["*Cyclodei*"] (Fr.) Sing. 1975:494. [Illegitimate, Art. 64 par. 1; typified

by *C. hendersonii* (Berk.) Fr. fide Singer (1975).]

*Coprinus* tribe *Veliformes Furfurelli* Fr. 1838:251. [Validly published name (*Coprinus Furfurelli*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. stercoreus* Fr.]

*Coprinus Veliformes* sect. *Furfurelli* (Fr.) Penn. in Kauff. 1918:207,223.

*Coprinus* sect. *Veliformes Annulati* Karst. 1876:157 non Quél 1888 nec J.Lange 1915. [Validly published name (*Coprinus Annulati*) without priority except for homonymy, Art. 35 (Leningrad Code); typified by *C. ephemeroides* (Bull. ex Fr.) Fr., ICBN Guide Det. Types, No. 1.]

*Coprinus Farinosi Annulati* J.Lange 1915:37 non J.Lange 1915:36 nec Karst. 1876 nec Quél. 1888. [Illegitimate name (*Coprinus Annulati*), Art. 64 par. 2; typified by *C. ephemeroides*, ICBN Guide Det. Types No. 1.]

*Coprinus Farinosi* J.Lange 1915:37. [Validly published name without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. niveus* (Pers. ex Fr.) Fr.]

*Coprinus* sect. *Farinosi* (J.Lange) Kon. & Maub. 1930:68.

*Coprinus* sect. *Vestiti* gr. *Farinosae* Locq. 1956:276. [Invalid, Art. 32.]

*Coprinus Farinosi Exannulati* J.Lange 1915:37 non J. Lange 1915:36 nec Karst. 1876. [Illegitimate name (*Coprinus Exannulati*), Art. 64 par. 2; species lectotypica: *C. stercoreus* Fr. ("*stercorarius*" in Lange).]

*Coprinus Farinosi Exannulati Vestiti* J.Lange 1915:37. [Validly published name (*Coprinus Vestiti*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. stercoreus* Fr. ("*stercorarius*" in Lange).]

*Coprinus* sect. *Vestiti* (J.Lange) Kühn & Romag. 1953: 383. [Invalid, Art. 33 par. 2.]

*Coprinus* sect. *Vestiti* gr. *Narcoticae* Locq. 1956:276. [Invalid, Art. 32.]

Section *Veliformes* of Cooke (1871) contains the Friesian (1838) subunits *Cyclodei*, *Furfurelli*, *Lanatuli*, and *Hemerobii*. Together, these comprise an unnatural group for a section in *Coprinus*. Therefore, the *Veliformes* are restricted for the most part to the species of the closely related first two, and the *Lanatuli* and *Hemerobii* (sectiones exclusae) are treated separately elsewhere.

*Coprinus atercoreus* Fr. is hereby designated species lectotypica for *Coprinus* section *Veliformes*. Lectotypes are also selected for the names of the *Furfurelli*, *Farinosi*, and *Vestiti* groups, as well as the second *Exannulati* of Lange.

8. COPRINUS section MICACEI (Fr.) Penn. in Kauff. 1918: 207,218.

Type species: *C. micaceus* (Bull. ex Fr.) Fr.

*Coprinus* tribe *Pelliculosi Micacei* Fr. 1838:247. [Validly published name (*Coprinus Micacei*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. micaceus*, Art. 22 par. 4.]

*Coprinus* sect. *Micacei* subsect. *Exannulati* Sing. 1951:460. [Subsectional epithet should be treated as if new, Art. 72; illegitimate, Art. 64 par. 2; typified by *C. micaceus* fide Singer (1951).]

9. COPRINUS section DOMESTICI (Singer) Patrick, stat. nov.

Type species: *C. domesticus* (Bolt. ex Fr.) S.F.Gray

Basionym: *Coprinus* subsect. *Domestici* Sing. 1948:36. [Typified by *C. domesticus* fide Singer (1948).]

Though closely related to section *Micacei*, this section is presently considered distinct. Interestingly, the type species, *C. domesticus*, comes from the *Furfurelli* of Fries (1838) rather than Fries' *Micacei* group.

10. COPRINUS section GLABRATI (Fr.) Penn. in Kauff. 1918:207.

Type species: *C. congregatus* (Bull. ex St.Amans) Fr.

*Coprinus* tribe *Pelliculosi Glabrati* Fr. 1838:248. [Validly published name (*Coprinus Glabrati*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. congregatus* (Bull. ex St.Amans) Fr.]

*Coprinus Coprinellus* Rick. 1911:65. [Validly published name without rank or priority, Art. 35 (Leningrad Code); typified by *C. disseminatus* (Pers. ex Fr.) S.F.Gray fide Donk (1962).]

*Coprinus Nudi* J.Lange 1915:38. [Validly published name without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. ephemerus* (Bull. ex Fr.) Fr.]

*Coprinus* sect. *Nudi* (J.Lange) Kon. & Maub. 1930:70.

*Coprinus* subsect. *Nudi* (J.Lange) Sing. 1948:36.

*Coprinus Nudi Setulosi* J.Lange 1915:38. [Validly published name (*Coprinus Setulosi*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. ephemerus* fide M. Lange & A. H. Smith (1953).]

*Coprinus* sect. *Nudi* subsect. *Setulosi* (J.Lange) M. Lange 1952:12.

*Coprinus* sect. *Setulosi* (J.Lange) Kühn. & Romag. 1953:377. [Invalid, Art. 33 par. 2.]

*Coprinus* sect *Hemerobii* subsect. *Setulosi* (J.Lange) Sing. 1962b:502. [Illegitimate, Art. 64 par. 1; typified by *C. disseminatus* fide Singer (1962).]

*Coprinus* sect. *Salebrosi* Kühn & Romag. 1948:170. [Invalid, Art. 32.]

*Coprinus* sect. *Setulosi* gr. *Carbonicolae* Locq. 1956: 276. [Invalid, Art. 32.]

*Coprinus* sect. *Setulosi* gr. *Disseminatae* Locq. 1956: 276. [Invalid, Art. 32.]

*Coprinus* sect. *Setulosi* gr. *Ephemerae* Locq. 1956:276. [Invalid, Art. 32.]

*Coprinus* sect. *Ephemeri* A.H.Sm. & Shaf. 1964:77. [Invalid, Art. 32.]

*Coprinus* sect. *Setulosi* gr. *Mixtae* Locq. 1956:276. [Invalid, Art. 32.]

Donk (1962 p. 72) may or may not be interpreted as having assigned rank to the *Coprinellus* group of Ricken (1911; non *Coprinellus* Karst. 1879). In my opinion, he probably did not. Instead, he may have considered the *Coprinellus* as already of subgeneric rank in Ricken. (See also "Velocoprinus", Donk l.c. p. 295.) This may be due to the fact that the names of two of Ricken's other unranked infrageneric groups (*Volvocoprinus* and *Velocoprinus*) previously were published as subgenera by Hennings (in Engler & Prantl 1897). Hennings had a subgenus *Eucoprinus* in addition to *Volvocoprinus* and *Velocoprinus*, but had no subgenus *Coprinellus*.

*Coprinus congregatus* is designated lectotype of *Coprinus* section *Glabrati*. In synonomy, a lectotype is also chosen for the *Nudi* group.

11. COPRINUS section HEMEROBII (Fr.) Penn. in Kauff. 1918: 207,224.

Type species: *C. hemerobius* Fr.

*Coprinus* tribe *Veliformes Hemerobii* Fr. 1838:253. [Validly published name (*Coprinus Hemerobii*) without rank or priority, Art. 35 (Leningrad Code); typified by *C. hemerobius*, Art. 22 par. 4.]

*Coprinus Nudi Glabri* J.Lange 1915:38. [Validly published name (*Coprinus Glabri*) without rank or priority, Art. 35 (Leningrad Code); species lectotypica: *C. plicatilis* (W.Curt. ex Fr.) Fr.]

*Coprinus* sect. *Hemerobii* subsect. *Glabri* (J.Lange) Sing. 1962b:502. [Invalid, Art. 33 par. 2.]

*Coprinus* sect. *Plicatiles* A.H.Sm. & Shaf. 1964:77. [Invalid, Art. 32.]

A lectotype species is selected for *Coprinus* [group] *Glabri*.

12. COPRINUS section AURICOMI (Singer) Patrick, stat. nov.

Type species: *C. auricomus* Pat.

Basionym: *Coprinus* subsect. *Auricomi* Sing. 1948:36. [Typified by *C. auricomus*, Art. 22 par. 4.]

Section *Auricomi* falls between the closely related section *Hemerobii* in *Coprinus*, and the *Subatratae* series (A. H. Smith 1972) in the genus *Psathyrella*.

## TAXA SEDIS INCERTAE

*Coprinus Veliformes Basipedes* W.G.Sm. 1908:203. [Validly published name (*Coprinus Basipedes*) without rank or priority, Art. 35 (Leningrad Code); based on *C. platypus* Berk. sens. Cooke (1883).]

*Coprinus* sect. *Psathyrellopsis* Locq. 1955:20. [Typified by *C. heimii* Locq. fide Locquin (1955).]

*Coprinus Pelliculosi Rigidi* Pat. 1900:175. [Validly published name (*Coprinus Rigidi*) without rank or priority, Art. 35 (Leningrad Code); based on "*C. Barbeyi* Kalch., *C. involucratus* Dur. et Lév., etc."]

ACKNOWLEDGMENTS

The author wishes to thank Alexander H. Smith and Edward G. Voss of the University Herbarium at the University of Michigan and Kent H. McKnight of the National Fungus Collections at Beltsville for reading and making many helpful suggestions toward improvement of the manuscript. Dr. Voss was particularly helpful because of his expert understanding of the code. A portion of this paper is included in a doctoral dissertation being submitted to the Rackham School of Graduate Studies at Michigan. The participation of Peter B. Kaufman (Department of Botany) and Harrison L. Morton (School of Natural Resources) as committee members, in addition to Drs. Smith and Voss, is also appreciated. R. D. Fraser and H. D. Cameron of the University of Michigan kindly checked the résumé and latin diagnosis.

REFERENCES

Berkeley, M. J. 1860. Outlines of British Fungology. London. 442 p.

Bigeard, R. & H. Guillemin. 1913. Flore des Champignons Supérieurs de France. Vol. II. Paris. 791 p.

Brummitt, R. K., A. O. Chater & W. Greuter. 1974. A Further Attempt to Clarify Article 35. Taxon 23: 859-861.

Cooke, M. C. 1871. Handbook of British Fungi. Vol. 1. London. 488 p.

_____. 1883. Handbook of British Fungi. Ed. 2. London. 398 p.

Donk, M. A. 1962. The Generic Names Proposed for Agaricaceae. Beih. Nova Hedwigia 5:1-320.

Earle, F. S. 1909. The Genera of the North American Gill Fungi. Bull. New York Bot. Gard. 5:373-451.

Engler, A. & K. Prantl. 1897["1900"]. Die Natürlichen Pflanzenfamilien 1(1**):204-209.

_____ & _____. 1928. Die Natürlichen Pflanzenfamilien. Ed. 2. 6:231-234.

Fries, E. M. 1821. Systema mycologicum. Vol. 1. Uppsala. 520 p.

_____. 1825. Systema orbis vegetabilis. Pars I. Lund. 374 p.

_____. 1828. Elenchus fungorum. Vol 1. Gryphiswald. 238 p.

_____. 1838. Epicrisis systematis mycologici... Uppsala. 610 p.

_____. 1849. Summa vegetabilium Scandinaviae. Uppsala. 572 p.

_____. 1874. Hymenomycetes europaei... Uppsala. 755 p.

Gillot, F. X. & L. Lucand. 1891. Catalogue Raisonné des Champignons Supérieurs. Paris. 482 p.

Karsten, P. A. 1876. Dispositio systematica Basidiomycetum. Mycologia Fennica (Pars Tertia). Helsingfors. 377 p.
_____. 1879. Rysslands..Skifsvampar. Bidr. Finl. Nat. Folk 32:1-571.
Kauffman, C. H. 1918. The Agaricaceae of Michigan. Vol. 1. Mich. Geol. and Biol. Survey. Publ. 26. Biol. Ser. 5. Lansing. 924 p.
Konrad, P. & A. Maublanc. 1930. Icones selectae Fungorum 6:64-74.
Kühner, R., H. Romagnesi & H. C. Yen. 1948["1947"]. Différences morphologiques entre plusieurs souches de Coprins de la section *Micacei* et confrontation de leurs haplontes. Bull. Soc. Mycol. Fr. 63:169-186.
_____ & H. Romagnesi. 1953. Flore Analytique des Champignons Supérieurs. Paris. 557 p.
Lange, J. E. 1915. Studies in the Agarics of Denmark. II. Dansk Bot. Art. 2:32-50.
_____. 1939. Flora Agaricina Danica. Vol. 4. Copenhagen. 119 p.
Lange, M. 1952. Species Concept in the Genus *Coprinus*. Dansk Bot. Ark. 14(6):1-164.
_____ & A. H. Smith. 1953. The *Coprinus ephemerus* Group. Mycologia 45:747-780.
Locquin, M. 1955. *Coprinus Heimii* sp. nov. Rev. Mycol. (Paris) 20:18-20.
_____. 1956. Petite Flore des Champignons de France. I. Paris. 382 p.
Massee, G. 1892. British Fungus Flora. Vol. I. London. 432 p.
_____. 1896. A Revision of the Genus *Coprinus*. Ann. Bot. (London) 10:123-184.
McIlvaine, C. 1902. One Thousand American Fungi. Ed. 2. New York. 729 p.
Morgan, A. P. 1883. The Mycologic Flora of the Miami Valley, O. Jour. Cincinnati Soc. Nat. Hist. 6:173-177.
Moser, M. 1967. Die Röhrlinge und Blätterpilze, in H. Gams, ed., Kleine Kryptogamenflora, II(b/2). Stuttgart. 443 p.
Orton, P. D. 1957. Notes on British Agarics 1-5 (Observations on the Genus *Coprinus*). Trans. Brit. Mycol. Soc. 40:263-276.
Patouillard, N. 1887. Les Hyménomycètes d'Europe. Paris. 166 p.
_____. 1900. Essai taxonomique...Hyménomycètes. Paris. 184.
Pilát, A. & M. Svrček. 1967. Revisio specierum sectionis *Herbicolae* Pil. et. Svr. generis *Coprinus* (Pers. ex) S.F.Gray. Česká Mykol. 21:136-145.
Quélet, L. 1886. Enchiridion fungorum. Lutetiae. 352 p.
_____. 1888. Flore mycologique de la France... Paris. 492 p.
Rea, C. 1922. British Basidiomycetae. Cambridge. 799 p.
Ricken, A. 1910-1915. Die Blätterpilze. VI lief. Leipzig. 480 p.

Romagnesi, H. 1947["1945"]. Etude de quelques Coprins. II. Rev. Mycol. (Paris) 10:73-89.
Shaffer, R. L. 1968. Keys to Genera of Higher Fungi. Ed. 2. Ann Arbor, 131 p.
Singer, R. 1948. Diagnoses fungorum novorum Agaricalium. Sydowia 2:26-42.
_____. 1951["1949"]. The Agaricales (Mushrooms) in Modern Taxonomy. Lilloa 22:1-832.
_____. 1962a["1961"]. Diagnoses fungorum novorum Agaricalium II. Sydowia 15:45-83.
_____. 1962b. The Agaricales in Modern Taxonomy. Ed. 2. Weinheim. 915 p.
_____. 1975. The Agaricales in Modern Taxonomy. Ed. 3. Vaduz. 912 p.
Smith, A. H. & R. L. Shaffer. 1964. Keys to Genera of Higher Fungi. Ann Arbor. 120 p.
_____. 1972. The North American Species of *Psathyrella* Mem. New York Bot. Gard. 24:1-633.
Smith, W. G. 1908. Synopsis of the British Basidiomycetes. London. 531 p.
Stafleu, F. A., E. G. Voss et al., eds., 1972. International Code of Botanical Nomenclature, XI International Botanical Congress, Seattle, Regnum Veg. 82:1-426.
_____ & E. G. Voss. 1975. Synopsis of Proposals on Botanical Nomenclature, Leningrad 1975. Taxon 24:201-251.
Stevenson, J. 1886. British Fungi. Vol. I. London. 372 p.
Voss, E. G. 1976. XII International Botanical Congress: Mail Vote and Final Congress Action on Nomenclature Proposals. Taxon 25:169-174.

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Vol. VI, No. 2, pp. 356-358 October-December 1977

# NOTES ON HYPHOMYCETES. XXI. *SPORIDESMIUM CARRII* SP. NOV.

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## ABSTRACT

*Sporidesmium carrii* Morgan-Jones, a new species, is described and illustrated from a collection made on twigs of *Buxus sempervirens* L. var. *suffruticosa* L. in Alabama.

## INTRODUCTION

Material of a species of *Sporidesmium* Link ex Fr. sporulating abundantly in close proximity to colonies of *Helminthosporium velutinum* Link ex Ficinus and Schubert on dead twigs of *Buxus sempervirens* var. *suffruticosa* collected in Alabama has been determined to represent an undescribed taxon. A name is established for it herein.

## TAXONOMIC PART

*Sporidesmium carrii* sp. nov. (Fig. 1).

Coloniae effusae, pilosae, atrae. Mycelium plerumque in substrato immersum, ex hyphis ramosis, septatis, subhyalinis vel pallide brunneis, levibus, 2 - 3μ crassis compositum. Conidiophora macronemata, mononemata, singula vel fasciculata, recta vel curvata, simplicia, cylindrica, septata, laevia, brunnea, per usque ad 3 proliferationes successivas ampulliformes elongascentia, ex basibus interdum bulbois, 32 - 81 X 4 - 6μ. Cellae conidiogenae monoblasticae, terminales. Conidia singula, recta vel curvata, obclavata, saepe rostrata, ad basim conico-truncata, pallide brunnea, 8 - 16 septata, laevia, 50 - 120 - 9 x 10μ.

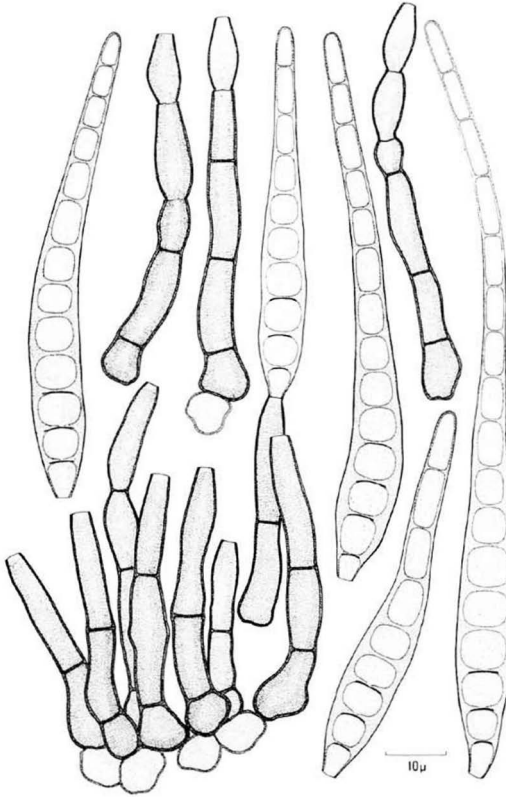


FIGURE 1. *Sporidesmium carrii*.

In ramulis emortuis Buxi sempervirentis, Auburn, Lee County, Alabama, March 1977, C.A. Carr, BPI, holotypus.

The new species is named in honor of Ms. Carolyn Ann Carr, its collector.

Colonies broadly effuse, hairy, black. Mycelium mostly immersed in the substratum, composed of branched, septate, subhyaline to pale brown, smooth, 2 - 3μ wide hyphae; superficial hyphae giving rise to subglobose, pale brown, 5 - 6μ wide cells, from which the conidiophores arise. Conidiophores macronematous, mononematous, gregarious or scattered, frequently aggregated in loose fascicles, straight or slightly flexuous, simple, smooth, brown, extreme apex paler, thick-walled, 1 to 3-septate, mostly 1-septate, cylindrical, sometimes proliferating percurrently two or three times, proliferations ampulliform, 32 - 81 X 4 - 6μ, bulbous at the base and up to 8μ wide, attenuating gradually towards the apex which is 3 - 4μ wide. Conidiogenous cells integrated, terminal, monoblastic or producing up to three conidia by proliferation. Conidia solitary, single, straight or more usually curved, obclavate, often rostrate, base conico-truncate, pale brown, 8 to 16-septate, with a narrow dark band immediately above the lower three or four cells, 50 - 120 X 9 - 10 , 3μ wide at the extreme base.

On dead twigs of *Buxus sempervirens* L.; North America.

Collection examined: on *B. sempervirens* var. *suffruticosa*, Auburn, Lee County, Alabama, March 1977, C.A. Carr, BPI, AUA, type.

The colonies of *S. carrii* sometimes overgrow those of *H. velutinum* and its superficial hyphae entwine old conidiophores of the latter. Numerous conidiophores are frequently produced in extended fascicles from these hyphae. When material collected from nature is incubated in moist chambers in the laboratory the conidia produced become increasingly rostrate.

*S. carrii* most closely resembles *S. ehrenbergii* M.B. Ellis, *S. eupatoricola* M.B. Ellis and *S. jasminicola* M.B. Ellis. It differs from them in conidium dimensions and pigmentation, sparser conidiophore septation as well as substrate. A fungus described by Matsushima (1975) and designated *Sporidesmium* sp. MFC-2075 appears to be closely similar to *S. carrii*. It might well be conspecific with it.

## REFERENCE

MATSUSHIMA, T. 1975. Icones microfungorum a Matsushima lectorum. Kobe. Published by the author.

MYCOTAXON

Vol. VI, No. 2, pp. 359-366 October-December 1977

# THREE NEW ENDOGONACEAE: *GLOMUS CONSTRICTUS*, *SCLEROCYSTIS CLAVISPORA*, AND *ACAULOSPORA SCROBICULATA*

by

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In the course of collecting hypogeous fungi in Mexico, I sampled soils for Endogonaceae by the wet-sieving and decanting method (Gerdemann and Nicolson 1963). The three species described here were among the many found. Drs. G. Zentmyer and J. Menge of the University of California at Riverside subsequently found one of them, *Glomus constrictus*, in southern California orchards and provided specimens for examination. I then found another, *Acaulospora scrobiculata*, in the United States and Japan. Collections are deposited in the herbaria of Oregon State University (OSC), the Farlow Herbarium (FH), and Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional (ENCB).

*SCLEROCYSTIS CLAVISPORA* Trappe sp. nov. Fig. 1

Sporocarpia globosa vel subglobosa, 460-750 x 590-780 µm fusca vel atra, minute verrucosa, e strato chlamydosporarum uno medullam e hyphis intertextam obducente constantia; peridium destitutum. Chlamydosporae brunneae, 140-185 x (20-) 25-40 (-50) µm, clavatae vel subcylindricae, parietibus lateralibus 1.5-5 µm, parietibus apicalibus 17-25 µm, parietibus basalibus 5-8 µm. TYPUS: Mexico, Veracruz, Trappe 3568 (OSC).

*Sporocarps* globose to subglobose, 460-750 x 590-780 µm, brownish black to black, minutely verrucose from exposed tips of spores formed radially in a single, tightly packed layer

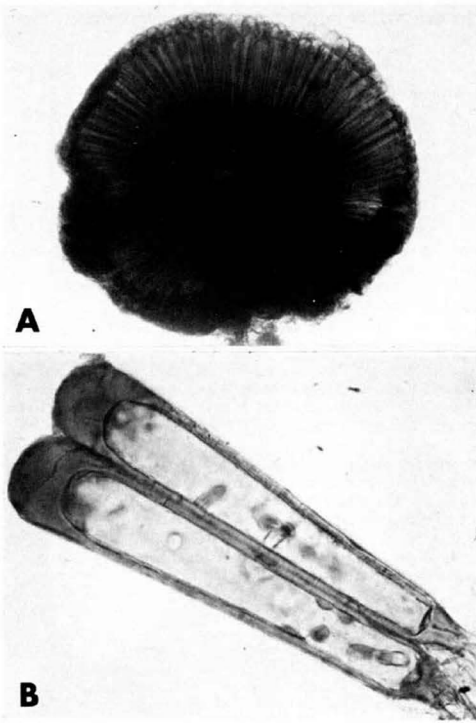


Fig. 1. *Sclerocystis clavispora:* (A) Sporocarps in cross-section, with long chlamydospores formed radially from central plexus, x100. (B) Chlamydospores, x500.

around a central plexus of hyphae; base indented; peridium lacking. *Chlamydospores* brown 140-185 x (20-) 25-40 (-50) µm, clavate to subcylindric, tapering to a hyphal attachment 7-10 µm diam. Spore walls 1.5-5 µm thick on the sides, at the spore apex thickened to 17-25 µm, at the base thickened to 5-8 µm and occluding the attachment at maturity. Reaction to Melzer's reagent not distinctive. *Central plexus* 150-450 µm diam, of tightly interwoven, pale brown, thin-walled hyphae 3-10 µm diam.

DISTRIBUTION AND HABITAT: Tropical Mexico, in pastures and fields.

MYCORRHIZAL ASSOCIATIONS: Associated in the field with roots of grasses and *Saccharum officinarum* L.

ETYMOLOGY: Latin, *clavispora* (clavate spored).

COLLECTIONS EXAMINED: TYPE: MEXICO - Veracruz: 40 km south of Catemaco near Hueyapan among roots of grasses and forbs, 13 July 1972, Trappe 3568 (OSC, isotype ENCB). PARATYPE: *Oaxaca*: Salinacruz, South of Jesús Carranza in grass field, 12 July 1972 (OSC).

*Sclerocystis rubiformis* Gerd. & Trappe is the only other species of the genus known to lack a peridium. The narrowly clavate spores with uniquely thickened apical walls of *S. clavispora* separate it readily from *S. rubiformis*. These spore characters can be used as an insertion for *S. clavispore* in couplet 1 of the key to species of *Sclerocystis* in Gerdemann and Trappe (1974, p. 60).

A species similar to *S. clavispora* has been reported from India by Thapar and Khan (1973), figs. 19-21, 30, 33) and Bakshi (1974, Pl. XII, figs. 17-19). These authors do not describe the pattern of spore wall thickening, however, and I have not seen their material. Its identity thus remains uncertain.

*GLOMUS CONSTRICTUS* Trappe sp. nov. Fig. 2A.

Chlamydosporae subglobosae vel globosae, 150-330 µm diam, fuscae vel nigrae; parietibus fuscis, 7-12 (-15) µm crassis; basibus rectis vel infundibuliformibus. Hypha affixa recta vel recurvata, ad basim sporae 20-30 µm diam, prope sporam typice constricta ad 10-17 (-22) µm, sub constrictio typice tumida ad 15-30 µm et hyphis tenuibus protrudentibus, sub tumore dichotome furcata. Peridium destitutum. Typus: Mexico, Veracruz, Trappe 3574 (OSC).

*Chlamydospores* naked, formed singly or in loose clusters in soil, subglobose to globose, 150-330 µm diam, dark brown to black, shiny-smooth. Spore walls 7-12(-15) µm thick, dark brown, one-layered or occasionally seeming two-layered; base straight or occasionally with a short funnel-shaped projection; attachment occluded by wall thickenings; contents of oil globules of widely varying sizes. Reaction to Melzer's reagent not distinctive. Attached hypha straight to recurved and with the following features appearing in sequence away from the spore: point of attachment with dark brown walls 3-6 µm thick; just beyond the point of attachment the hypha constricted to 10-17(-22) µm diam; just beyond the constriction, the hypha inflated to 15-30 µm diam with yellow to yellow-brown walls 2-3 µm thick, from which often grow several hyaline to yellow, fragile, thin-walled hyphae 5-7 µm diam; just beyond the inflated segment often with a thick-walled septum; and beyond the inflated segment the hypha dichotomously forked.

DISTRIBUTION AND HABITAT: Central California in irrigated soils to Guadeloupe (Leeward Islands) and tropical rain forests of Mexico.

MYCORRHIZAL ASSOCIATIONS: Associated in the field with roots of *Cocos*, *Citrus*, and *Persea* spp., *Zea mays* L., and grasses.

ETYMOLOGY: Latin, "constricted," referring to the typical constriction of the attached hypha near the spore base.

COLLECTIONS EXAMINED. TYPE: MEXICO - Veracruz: San Andrés Tuxtla, Catemaco, in soil under *Cocos nucifera* L. on grounds of U.N.A.M. Biol. Sta. Headquarters, 9 July 1972, Trappe 3574 (OSC; isotype, ENCB). PARATYPES: UNITED STATES - California: Fresno Co., 13 Jan. 1976, leg. J. Menge, Trappe 4999 (OSC); Santa Barbara Co., Carpinteria, May 1974, leg. G. A. Zentmyer, Trappe 3920 (OSC); San Diego Co., Fallbrook, 8 April and May 1974, leg. G. A. Zentmyer, Trappe 3892 and 3915 (OSC). MEXICO - Hidalgo: Tulancingo, 4 Aug. 1972, Trappe 3829 (OSC, ENCB); Veracruz: Boca del Rio, 10 Sept. 1972, Trappe 3607 (OSC); Tabasco: Cardenas, 12 July 1972, Trappe 3589 (OSC); Chiapas: Ixtacomitán (camino Pichucalco-Chiapa de Corzo), 13 July 1972, Trappe 3791 (OSC). GUADELOUPE - Guadeloupe Nat. Forest, Camp Jacob, 7 Jan. 1974, leg. S. Carpenter and D. H. Pfister, Pfister 1060A (FH, OSC).

*Glomus constrictus* spores resemble those of *G. macrocarpus* var. *geosporus* (Nicol. & Gerd.) Gerd. & Trappe, but the distinctively, often recurved, constricted and then inflated attached hyphae of *G. constrictus* contrast with the straight,

simple attached hyphae of the other. The two sometimes occur together, so that in a field collection the base and attached hypha of each spore must be examined to separate them. However, *G. constrictus* typically has a cluster of soil particles held tightly to the spore base by the fine hyphae that usually grow out from the inflated part of its attached hypha. This provides a quick and reasonably reliable way to separate it from *G. macrocarpus* var. *geosporus*, which usually is clean at the spore base. Some spores of *G. constrictus* have a funnel-shaped base similar to that of *G. mosseae* (Nicol. & Gerd.) Gerd. & Trappe, but the latter has yellow to brown spores divided from the attached hyphae by a septum, and its spores are often enclosed in a peridium.

In the key to species of the genus *Glomus* (Gerdemann and Trappe 1974, p. 38-40), *G. constrictus* might key out in two different places. In dichotomy 3 it can be separated from *G. mosseae* by its dark brown to black color and constricted, then inflated attached hypha. In dichotomy 15, it can be separated from *G. macrocarpus* var. *geosporus* by the elaborate structure of its attached hypha.

The wall structure, lack of inner membranes or soil-borne vesicles, and content of variably sized oil globules of spores of *G. constrictus* are all typical of the genus *Glomus*. Its constricted and then inflated attached hypha, however, mimic the bulbous, suspensor-like cells at the base of spores of *Gigaspora* spp. (Gerdemann and Trappe 1974). In *Gigaspora heterogama* (Nicol. & Gerd.) Gerd. & Trappe, this suspensor-like cell is recurved as often is the attached hypha of *Glomus constrictus*. The dichotomous fork of the attached hypha a short distance below the base of *G. constrictus* spores resembles the conjugation of undifferentiated hyphae that produces a stalked zygospore in the genus *Dispira* (Dimargaritaceae, Mucorales) (Benjamin 1959, 1961). These features of *G. constrictus* may be merely coincidental, but its life cycle needs to be worked out to determine if it represents any phylogenetic ties between *Glomus*, *Gigaspora*, the zygosporic genus *Endogone*, or the Mucorales.

*ACAULOSPORA SCROBICULATA* Trappe sp. nov. Figs. 2B-2C

Sporae singulae in solo efformatae, sessiles, gestae a latere hyphae latae in vesiculo globoso prope terminatae. Sporae globosae vel subglobosae, 100-240 x 100-220 µm, olivaceae vel brunneolae, depressionibus 1-1.5 x 1-3 µm scrobiculatae.

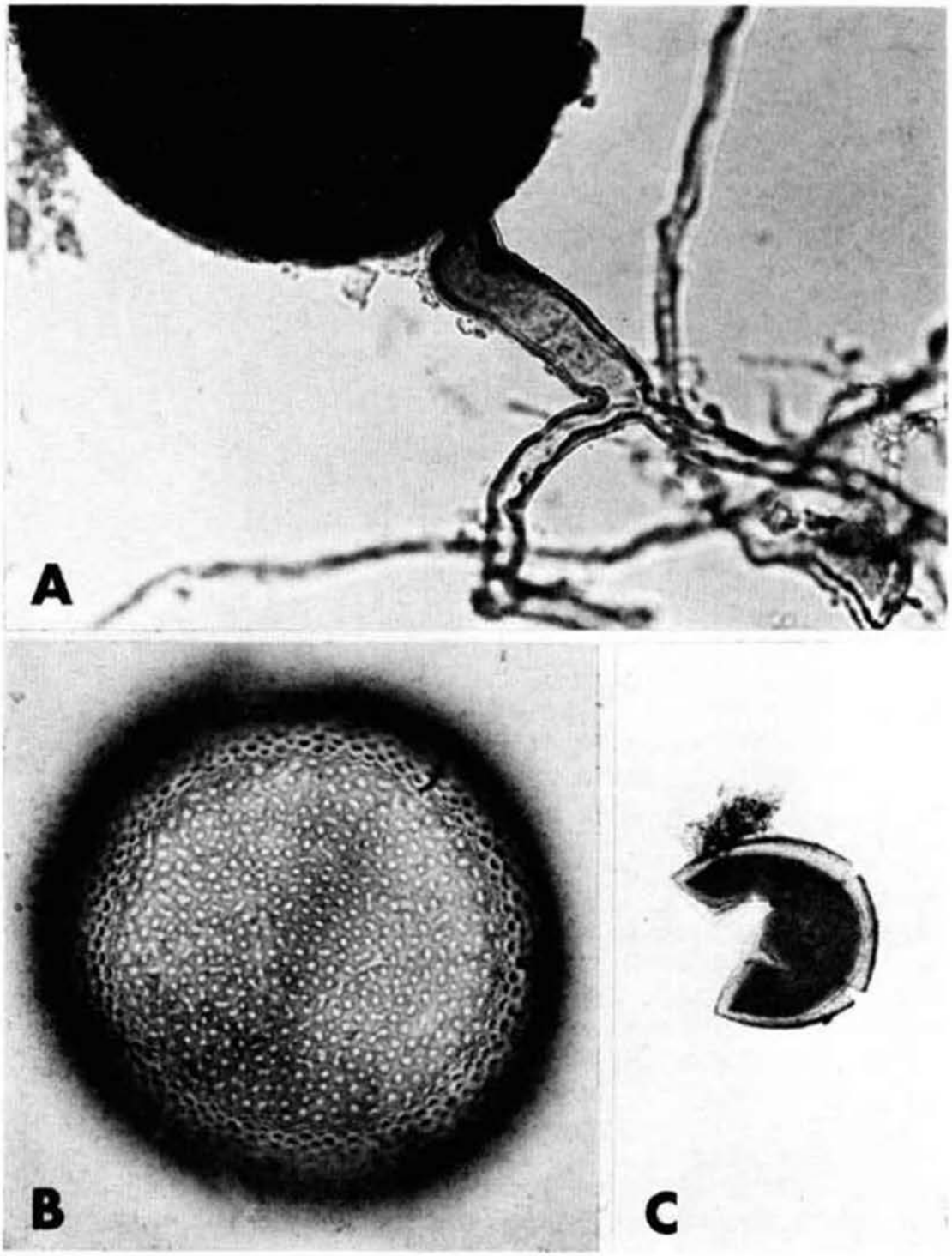


Fig. 2. (A) *Glomus constrictus*, showing constriction of hypha at attachment to spore, x350. (B,C) *Acaulospora scrobiculata*: (B) Pitted spore surface, x400; (C) crushed spore in Melzer's reagent, with innermost wall layer darkened, x 100.

Sporae tunica stratis quatuor: exteriore scrobiculato, dilute primulino, 3-6 µm crasso; secundo adhaerenti, hyalino, 0.2-0.5 µm crasso; tertio adhaerenti, hyalino, 0.5-1 µm crasso; interiore disjuncto, hyalino, interdum minute asperulo, 0.2-1.0 µm crasso, iodo rubescenti. Typus: Mexico, Chiapas, Trappe 3795 (OSC).

*Sporocarps* unknown. *Azygospores* forming singly in soil, sessile, borne laterally on a wide, thin-walled, hyaline hypha that terminates nearby in a thin-walled vesicle. *Vesicle* globose, 100-160 µm in diam, becoming empty and collapsing by spore maturity. *Spores* globose to broadly ellipsoid, 100-240 x 100-220 µm subhyaline in youth, becoming light olive to light brown at maturity. Spore surface evenly pitted with depressions 1-1.5 x 1-3 µm, separated by ridges 2-4 µm thick, the mouths of the depressions circular to elliptical or occasionally linear to Y-shaped. Spore wall continuous except at the circular, rimmed vesicle attachment ±15 µm diam and consisting of four layers: (1) the rigid, pitted, subhyaline to light greenish yellow outer layer 3-6 µm thick; (2) an adhering but separable, smooth, hyaline layer 0.2-0.5 µm thick; (3) an adhering but separable, smooth, hyaline layer 0.5-1.0 µm thick; and (4) a separated, sometimes minutely roughened, hyaline inner layer 0.2-1.0 µm thick. Spore contents of small, relatively uniform guttules. Reactions to Melzer's reagent: outer three spore wall layers yellow, innermost layer quickly becoming deep red on contact.

DISTRIBUTION AND HABITAT: Rain forests, road banks, and sugarcane fields of the Mexican tropics and central highlands, maize fields and subalpine meadows of central and western USA, and lowlands of central Japan. Koske (1974) has described a "yellow punctate" spore from Australian sand dunes that fits the description of *A. scrobiculata*.

MYCORRHIZAL ASSOCIATIONS: Associated in Mexico with roots of *Saccharum officinarum* L. and wild grasses, in the U.S. with *Zea mays* L. and *Festuca viridula* Vasey, and in Japan with wild grasses.

ETYMOLOGY: Latin, "minutely pitted," referring to the spore surface.

COLLECTIONS EXAMINED: TYPE: MEXICO - Chiapas: Ixtacomitán (Camino Pichucalco-Chiapa de Corzo), 13 July 1972, Trappe 3795 (OSC; isotype, ENCB). PARATYPES: UNITED STATES - Washington: Columbia Co., Oregon Butte, 20 Aug. 1975, leg. Paul Tresham, Trappe 4538 (OSC). Oregon: Union Co., Indian Creek Meadow, 14 Aug. 1975, leg. Gerald Strickler, Trappe 4537 (OSC); Wallowa Co., Wallowa Mountains, Standley Pasture,

15 July 1975, leg. Gerald Strickler, Trappe 4494 (OSC). Illinois: Mason Co., Kilbourne, 4 Oct. 1976, leg. Wm. Becker, Trappe 4998 (OSC). MEXICO - Mexico: 5 km E. of Toluca, 23 June 1972, Trappe 3861 (OSC). Veracruz: 5 km NE of Orizaba, 7 July 1972, Trappe 3604 (OSC). JAPAN - Shiga: Ótsu, Tomi-kawa, 3 July 1975, Trappe 4265 (OSC).

The red reaction of the innermost spore wall layer in Melzer's reagent is unique to *A. scrobiculata* among the Endogonaceae described to date. This reaction combined with the light colored, pitted spore wall readily distinguish *A. scrobiculata* from other *Acaulospora* spp. as described by Gerdemann and Trappe (1974) and Ames and Linderman (1976).

## ACKNOWLEDGMENTS

Dr. Gastón Guzmán, Instituto Politécnico Nacional, E.N.C.B., Mexico, Dr. Teóphilo Herrera, Universidad Nacional Autónoma de México, and Dr. Tsuguo Hongo, Shiga University Faculty of Education, Japan, generously hosted the author in forays in their respective countries. The photographs of *G. constrictus* were provided by Dr. John Menge, University of California, Riverside. The research was supported in part by grants from the American Philosophical Society and the Japan Society for the Promotion of Science.

## LITERATURE CITED

Ames, R. N., and R. G. Linderman. 1976. *Acaulospora trappei* sp. nov. Mycotaxon 3:565-569.

Bakshi, B. K. 1974. Mycorrhiza — its role in forestry. Forest Res. Inst. and Colleges, Dehra Dun. 89 p.

Benjamin, R. K. 1959. The merosporangeriferous Mucorales. Aliso 4:321-433.

_____. 1961. Addenda to "The merosporangiferous Mucorales." Aliso 5:11-19.

Gerdemann, J. W., and T. H. Nicolson. 1963. Spores of mycorrhizal *Endogone* species extracted from soil by wet sieving and decanting. Trans. Brit. Mycol. Soc. 46:235-244.

_____, and J. M. Trappe. 1974. The Endogonaceae in the Pacific Northwest. Mycologia Mem. 5:1-76.

Koske, R. E. 1974. *Endogone* spores in Australian sand dunes. Can. J. Bot. 53:668-672.

Thapar, H. S., and S. N. Khan. 1973. Studies on endomycorrhiza in some forest species. Proc. Indian Natl. Sci. Acad. B 39:687-694.

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# *WANGIELLA DERMATITIDIS*, A CORRECTION

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Recently, *Wangiella* McGinnis was established to accommodate the dematiaceous hyphomycete originally described as *Hormiscium dermatitidis* Kano (3). Kano's 1937 description of the fungus did not include a Latin diagnosis; hence, the fungus was redescribed as a new species. It has been brought to my attention that Kano described this hyphomycete as a new species twice, once in 1934 (1) and again in 1937 (2). The binomial was validly published and does not contravene Article 36 as previously believed. Therefore, the revised authorship (Kano) McGinnis is proposed. Since Kano's isolate (CBS 207.35) has been designated as the type culture for both *W. dermatitidis* McGinnis and *W. dermatitidis* (Kano) McGinnis, these binomials are obligate synonyms.

*Wangiella dermatitidis* (Kano) McGinnis (Fig. 1).

≡ *Hormiscium dermatitidis* Kano, Aichi Igakkai Zasshi 41:1657-1673, 1934.

≡ *Fonsecaea dermatitidis* (Kano) Carrión, Arch. Dermatol. Syph. (Chicago) 61:996-1008, 1950.

≡ *Hormodendrum dermatitidis* (Kano) Conant, Manual of Clinical Mycology, p. 276, 1954 (as 1953).

≡ *Phialophora dermatitidis* (Kano) Emmons, Medical Mycology, p. 291, 1963.

≡ *Wangiella dermatitidis* McGinnis, Mycotaxon 5:355, 1977 (incorrect authorship).

≡ *Exophiala dermatitidis* (Kano) de Hoog, Mycol. Stud. Baarn, No. 15, p. 118, 1977.

*Aureobasidium mansonii* (Castellani) Cooke sensu Cooke, Mycopathol. Mycol. Appl. 17:34, 1962, pro parte, non *Microsporum mansonii* (as *Microsporon mansoni*) Castellani, Brit. Med. J. 2:1271, 1905, nom. dub.

*Phialophora gougerotii* (Matruchot) Borelli sensu Borelli, Mem. del VI. Con. Venez. Cient. Med. 5: 2945-2972, 1955, pro parte, non *Sporotrichum gougerotii* (as *gougeroti*) Matruchot, Compt. Rend. Acad. Sci. (Paris) 150:543-545, 1910.

*Rhinocladiella mansonii* (Castellani) Schol-Schwarz sensu Schol-Schwarz, Antonie van Leeuwenhoek 34: 122, 1968, pro parte, non *Microsporum mansonii* (as *Microsporon mansoni*) Castellani, Brit. Med. J. 2: 1271, 1905, nom. nud.

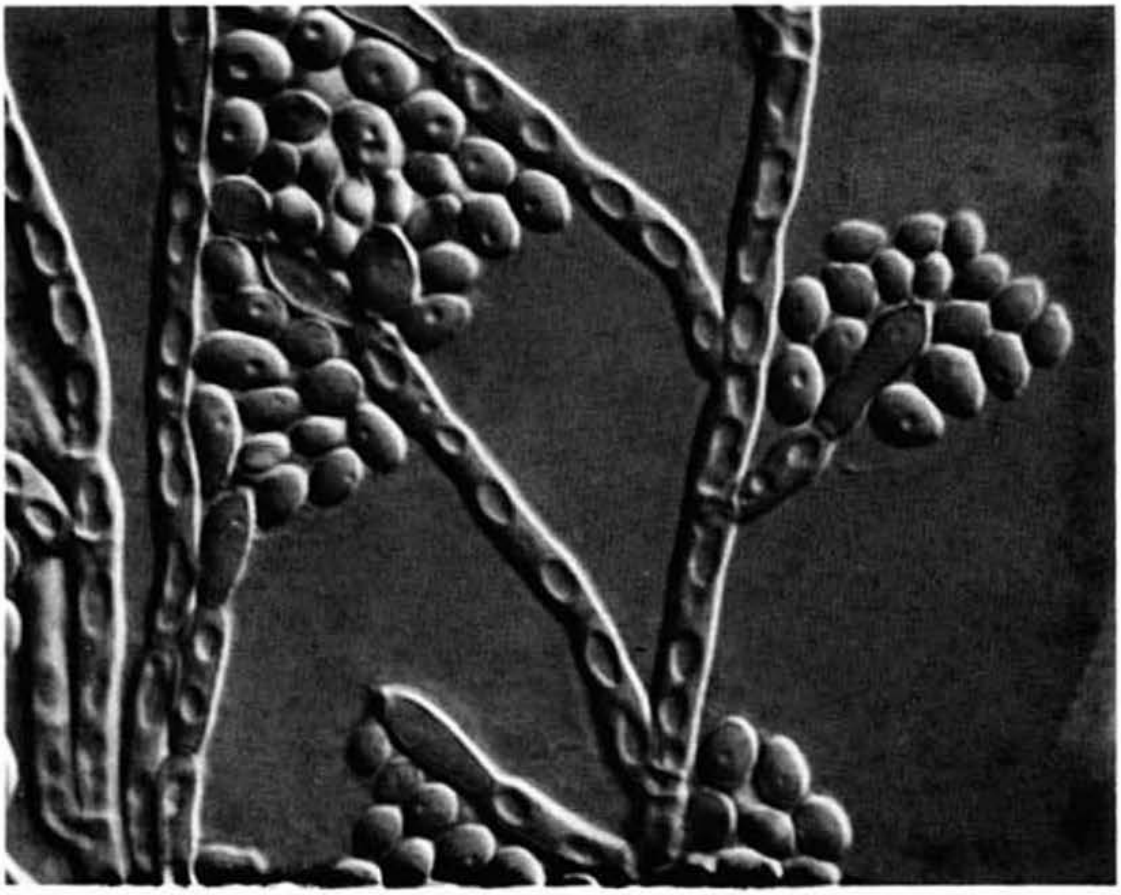
ACKNOWLEDGEMENTS

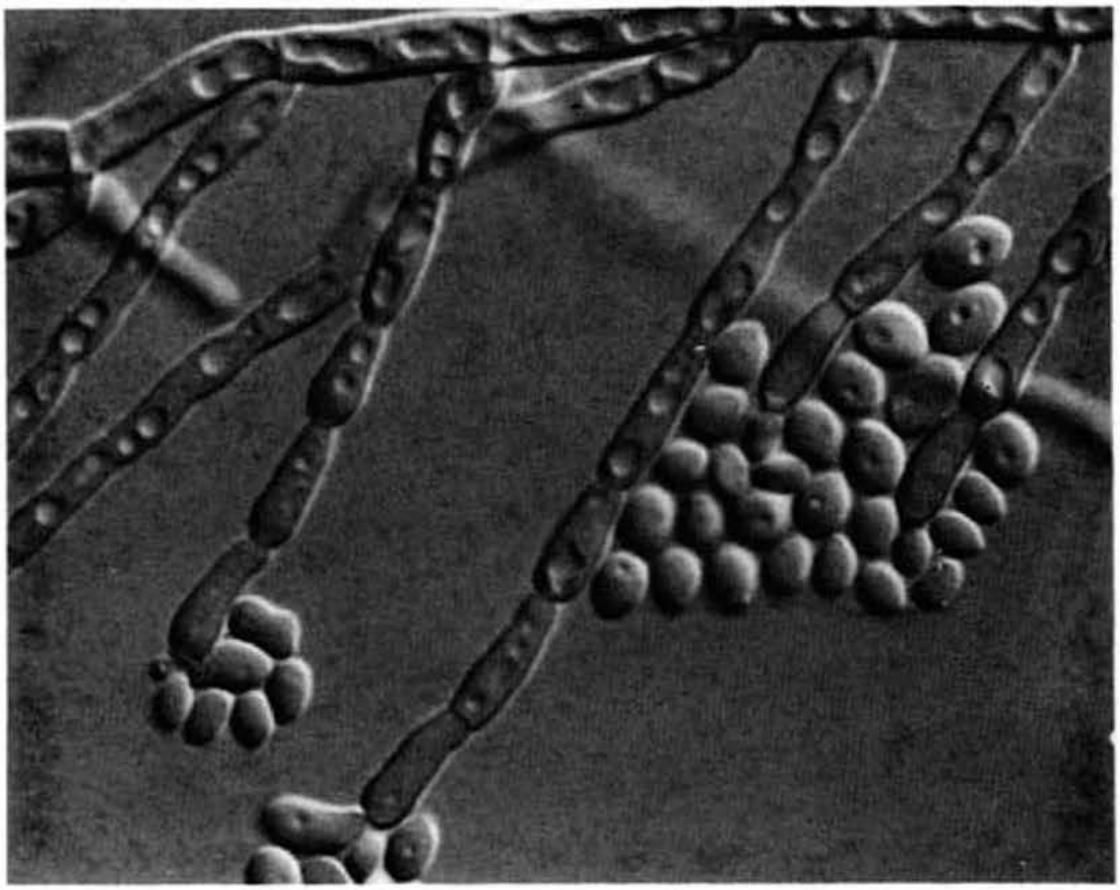
The author wishes to thank Dr. Donald Rogers for reviewing the manuscript and Mr. Barry Katz for photographic assistance.

LITERATURE CITED

1. Kano, K. 1934. A new pathogenic *Hormiscium* Kunze causing chromoblastomycosis. Aichi Igakkai Zasshi 41: 1657-1673 (in Jap.).
2. _____. 1937. Über die Chromoblastomykose durch einen noch nicht als Pathogen beschreibenen Pilz: *Hormiscium dermatitidis* n. sp. Arch. Dermatol. Syph. (Berlin) 176: 282-294.
3. McGinnis, M.R. 1977. *Wangiella*, a new genus to accommodate *Hormiscium dermatitidis*. Mycotaxon 5:353-363.

Figure 1. *Wangiella dermatitidis* (CBS 207.35). Phialides and phialoconidia. Nomarski differential interference contrast microscopy. 1600 x.





MYCOTAXON

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# NOTICE

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MYCOTAXON

Vol. VI, No. 2, pp. 371-374 October-December 1977

# A NEW TREMELLA WITH DECIDUOUS STERIGMATA

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*Tremella mayorgae* Lowy, sp. nov. Figs. A-B

Fructificatio in humido elastico gelatinosa, rufo-brunnea, lobata magna (± 1 cm alt.), surrotunda, lacunosa; magnitudine in sicco valde contractio, atrofusca; hymenio cum basidia conferta; hyphae 3-4 µm diam, parce nodosae; dikaryoparaphyseae non ramosae, longuisculae subclavatae, 22-27 X 3-4 µm; probasidia subglobosa; metabasidia sub-ovoidea, cruciatim septata, 23-26 (-30) X 8.5-10.5 (-12)µm; protosterigmata cylindraceae, transeuns fusiforme, 22-30.5 (-36) X 5.0-7.5 µm, decidua quando matura; spiculae aciculae, 6.0-7.5 µm long; basidiosporae subglobosae, (7-)8.0-9.5 µm, per repetitionem vel promycelium germinantes.

Holotype: Mexico. Laguna al Campamento Uxpanaapa, Dpto. Veracruz. On unidentified woody substrate, 15-VII-1976. G. Guzmán No. 15833, Herbario de La Escuela Nacional de Ciencias Biológicas (ENCB).

Fructification rubbery gelatinous when wet, resin brown with large, rounded, hollow lobes ± 1 cm in height and ± 275 µm thick; drying dark brown to nearly black, greatly reduced in volume; hymenium crowded with basidia; hyphae 3-4 µm diam, sparsely clamped; dikaryoparaphyses unbranched, slenderly subclavate, 22-27 X 3-4 µm; probasidia subspherical, becoming elongate; metabasidia 4-celled, subovoid, 23-26 (-30) X 8.5-10.5(-12) µm; protosterigmata cylindrical, becoming subcylindrical and eventually fusiform, 22-30.5(-36) X 5.0-7.5 µm in greatest diameter, deciduous when mature, with acicular spicules bearing subspherical basidiospores, (7-) 8.0-9.5 µm, germinating by germ tube or by repetition.

This species is named in honor of the late, eminent

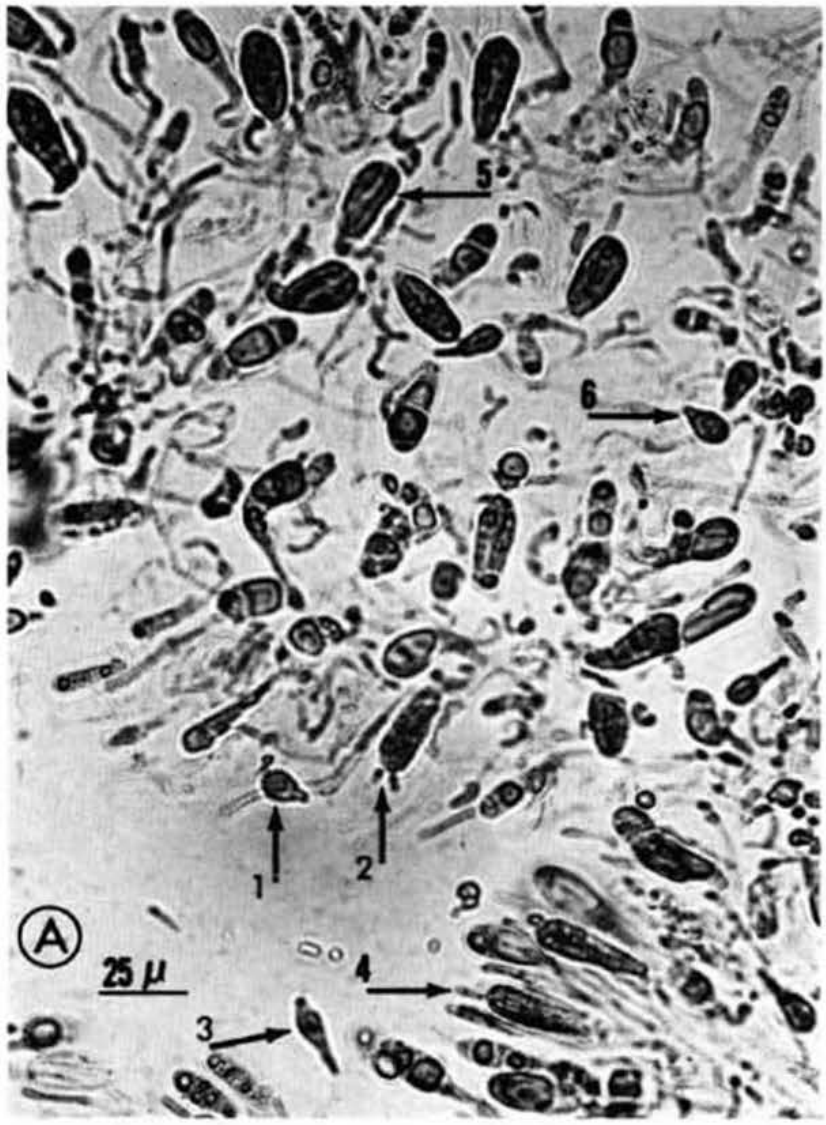


Fig. A. Crush mount of *Tremella mayorgae* Lowy. 1 & 6, basidiospores germinating by germ tube; 2 & 4, basidia with young, cylindrical protosterigmata; 3, detached fusiform sterigma. The spicule has not yet been produced at the apex (above); 5, a longitudinally septate metabasidium.

medical mycologist, Dr. Rubén Mayorga Peralta of the Universidad de San Carlos de Guatemala, where he pioneered in Guatemalan mycological studies.

The most notable feature of the new species is the

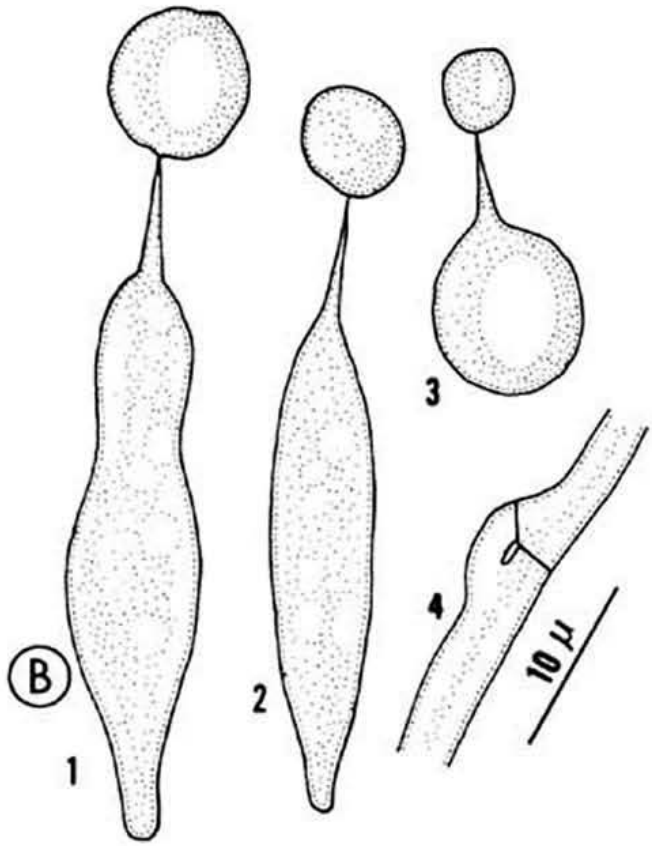


Fig. B. 1, mature sterigma with basidiospores borne upon its spicule; 2, maturing sterigma with young basidiospore; 3, basidiospore germinating by repetition; 4, hypha with clamp connection.

formation of sterigmata that eventually become detached from the basidium. Roughly three stages may be identified in the maturation of sterigmata. The first is characterized by the production of slender, cylindrical evaginations from the basidial apex (Fig. A, 2 & 4). These structures elongate, become broadly cylindrical and terminate in an acicular spicule (Fig. B, 2). At or near this stage, basidiospore formation is initiated and during the process the sterigma undergoes its final morphological change, becoming fusiform (Fig. B, 1). Fig. A, 3 shows a detached fusiform sterigma upon which the spicule has not yet formed. It is approximately intermediate between stages 1 & 2 shown in Fig. B. Sterigmata such as those in Fig. B, 1 & 2, were

found in crush mounts, but all those observed at these stages of development were detached from basidia. The precise stage of development that is reached by the sterigma prior to its detachment from the basidium, could not be determined. In all likelihood, detachment occurs after the basidiospore has been formed and while there is still continuity between the basidial cell and its emergent sterigma. The change in sterigmal shape is probably associated with the formation of the basidiospore as sterigmal cytoplasm flows through the spicule.

Only one other species of *Tremella*, *T. brasiliensis* (A. Möller) Lloyd, is known to produce sterigmata that become deciduous. In this species, however, the sterigmata remain unchanged in morphology (Lowy, 1971).

## REFERENCE CITED

Lowy, B. 1971. Tremellales. Monograph No. 6. *Flora Neotropica*. Hafner Publ. Co., Inc., New York. 153 p.

MYCOTAXON

Vol. VI, No. 2, pp. 375-380 October-December 1977

# NEW TAXA IN THE CORTICIACEAE (APHYLLOPHORALES, BASIDIOMYCETES).

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SUMMARY

Physodontia, Physodontia lundelli and Sistotrema autumnalis are described as new based on collections from Scandinavia. The combination Sistotrema eximum (Jacks.) Ryv. & Solheim is proposed.

PHYSODONTIA Ryv. & Solheim gen. nov.

Fructificatio resupinata, grandinioidea vel aculeata, poroso-reticulata inter aculeos, alba vel pallide cremea, systema hypharum monomiticum, hyphae tenuiter tunicatae, fibulatae; gloeocystidia flava, abundantia cum in hymenio tum in subhymenio et tramati, cystidia in hymenio, anguste sublatae, laevia, hyalina, tenuitunicata proicientia, basidia pusilla, clavata, 4 sterigmatibus, sporae subglobosae, laeves, pusillae, non-amyloideae.

Type species: Physodontia lundelli Ryv. & Solheim.

Fruitbody resupinate, grandinoid, odontioid to hydnoid, porose-reticulate between the aculei, white to pale cream, hyphal system monomitic, hyphae with clamps, thinwalled, gloeocystidia ellipsoid to oblong, very numerous in the hymenium, subhymenium and trama, cystidia in the hymenium subulate, smooth, hyaline, thinwalled and projecting, basidia small, clavate with 4 sterigmata, spores small, subglobose, smooth and non-amyloid. On dead wood.

The small, smooth spores, the loose consistency, the ampullate swellings on the basal hyphae and the small basidia all point towards Trechispora as the closest relative. However, gloeocystidia are not known from this genus, and the cystidia described in Trechispora are of a different type than those of Physodontia. Thus, we

felt that we would introduce a far too deviating element if the new species had been described in Trechispora.

Gloeocystidia are known from many genera in the Corticiaceae, above all from Gloeocystidiellum, but this genus is characterized by amyloid spores and much larger basidia and spores besides which the hymenium is much denser. In conclusion, we felt that the new species had so many distinct characters in combination that a new genus was justified.

PHYSODONTIA LUNDELLI Ryv. & Solheim nov. sp.

Fructificatio resupinata, grandinioidea vel aculeata, poroso-reticulata inter aculeos, alba vel pallide cremea, systema hypharum monmiticum; hyphae tenuitunicatae, fibulatae; gloeocystidia flava abundantia cum in hymenio, tum in subhymenio et tramati, 12-20 x 6-12 µm, cystidia in hymenio, 18-40 x 3-5 µm, anguste sublata, laevia, flavida, hyalina, basidia 8-15 x 4-5,5 pusilla,clavata, 4 sterigmatibus; sporae subglobosae, laeves,pusillae, non-amyloideae, 3-3,5 x 2-2,5 µm.

Type Lundell 1667, (Herb. U, O, Eriksson).
Type locality: Sweden: Småland, Femsjø parish, Dullabergets northern slope, 4. Oct. 1939, on rotten coniferous wood.

Fruitbody resupinate, grandinioid to hydnoid, aculei up to 300 µm long, finely fimbriate in the apices, white to pale cream, hyphal system monomitic, generative hyphae with clamps, 2-4 µm wide, thinwalled, gloeocystidia very abundant, yellowish and with a grainly content, oblong to rounded, 12-20 x 6-12 µm, present in the hymenium, subhymenium and the trama of central part of the teeth, cystidia present in the hymenium, thinwalled, subulate, hyaline, acute, projecting above the hymeniym, 18-40 x 3-5 µm, basidia small, clavate 8-15 x 4-5,5 µm with 4 sterigmata, spores subglobose, thinwalled, hyaline and smooth non-amyloid, 3-3,5 x 2-2,5 µm,

Other specimens seen:
Sweden: Västergötland, Mölndal, Änggårdsbergen, 3. Nov. 1971, S. Jacobsen 9821, on coniferous wood (Herb. E.); Norway: Hedmark, Engerdal, Røskdalsknappen, 900 m a.s.l., 19. August 1975, H. Solheim 354 (Herb. O and Erikss.); Finland: Ostrobottnia, Rovaniemi, Pisvaara nat. park between Isopäri and Teeripäri, 1.Sept. 1960, V. Kujala and J. Eriksson 9821, on rotten Pinus sylvestris (Herb. Eriksson).

The species is named in honour of the late curator S. Lundell of the Uppsala herbarium who made the first collection of the species. His note, enclosed in the type specimen, indicates that he was aware of its unique combination of characters and that it probably was

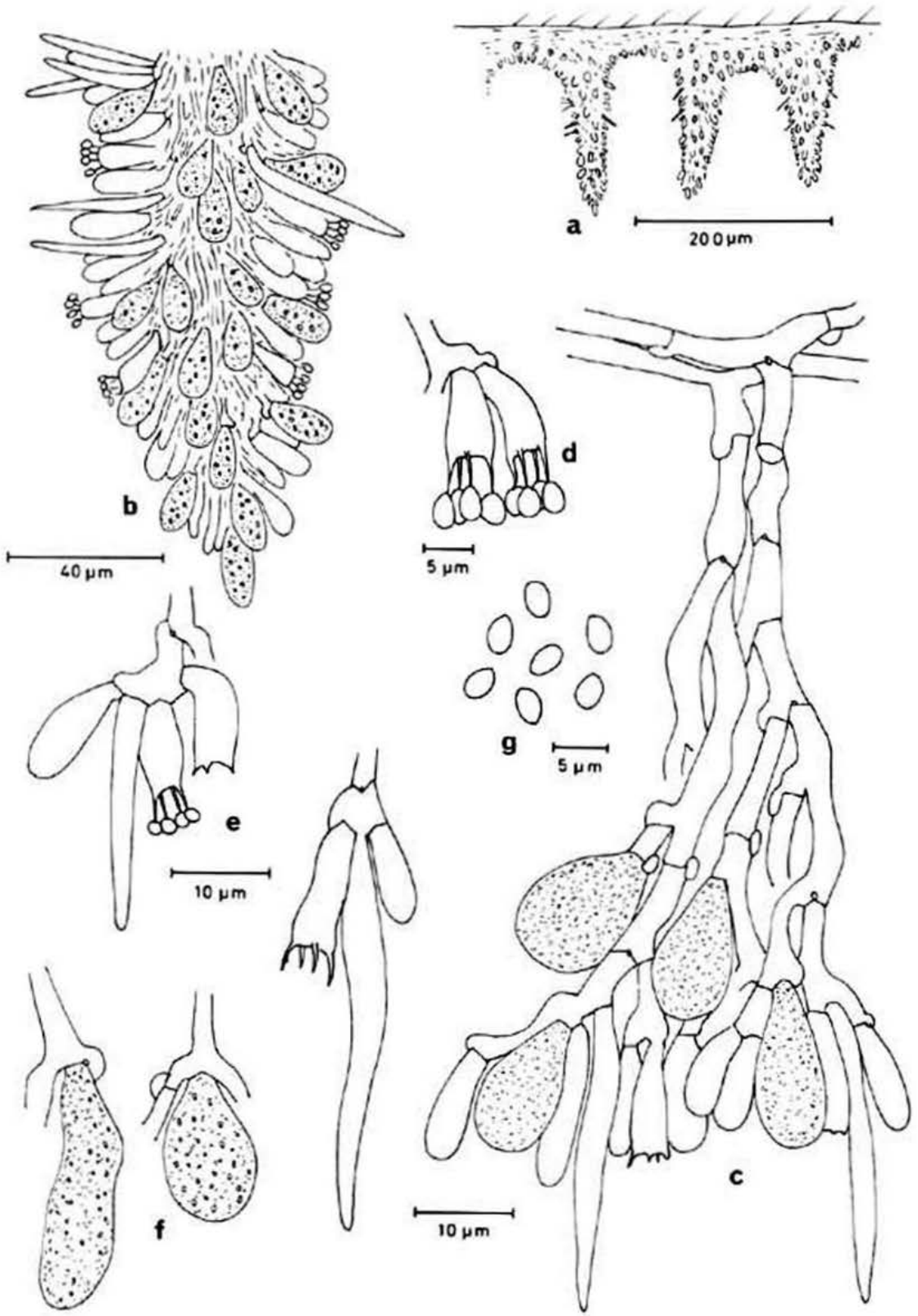


Fig.1. Physodontia lundelli. a) section through the fruit-body b) section through an aculeus c) section through the hymenium d) basidia e) basidia and cystidia f) gloeocystidia g) spores. From the type. Drawing by L.Ryvarden.

undescribed. We guess that the species will be found in USSR and perhaps also in North America. Its known distribution indicates a boreal species.

SISTOTREMA AUTUMNALIS Ryvarden & Solheim nov.sp.

Fructificatio resupinata, tenuis, arachnoidea, porosoreticulata, deinde subpellicularis, albida, usque ad 100 µm crassa; hyphae fibulatae; basidia longe urniformia, 30-50 x 5-7 µm, 2 sterigmatibus, usque ad 7 longis, sporae oblongae ellipsoideae ad fusiformes, 10-14(16) x 5,5-8 µm. Typus: Bjørgum 1298 (Herb. O, DAOM and Erikssson). Type locality: Norway, Nordland county, Tjeldsund, Kongsvikdalen, 28. September 1967, on Alnus incana. Fruitbody white, resupinate, first thin, arachnoid, porosereticulate, then subpellicular, up to 100 µm thick, generative hyphae thinwalled, clamped with oily drops, those of the subiculum up to 6 µm wide and some clamps with ampullate- shaped swellings, basidia elongate, urniform to suburniform,30-50 x 5-7 µm with two stout and curved sterigmata up to 7 µm long, spores thinwalled, hyaline and non-amyloid, ellipsoid to fusiform, 10-14(16) x 5,5-8 µm, on rotten deciduous wood.
Specimens seen, all from Norway; Nordland county, Tjeldsund, Kongsvikdalen, 28. September 1976, on Betula, Alnus incana and Salix,leg. K. Bjørgum 1256,1266,1296 and 1298. Lødingen, Kanstadfjorden, 16. September 1976, on Betula, K. Bjørgum 1110, ibid. 5. October 1976 on Alnus incana, K. Bjørgum 1574. Hedmark county, Engerdal, Røskdalsknappen, 9. October 1976,on Betula and Sorbus, Solheim 2212a,2173a and 2174. Engerdal, Gutulia national park, 10. October 1976, on Alnus incana, Betula and Sorbus, Solheim 2229,2233 and 2265.
All in herb. O.

It is extraordinary that a species with so many striking characters should be undescribed. However, we have searched the literature in vain and J. Eriksson of the University of Göteborg who kindly examined the collections is convinced that it is new. Further, it is remarkable that 12 collections should turn up in a single season even if some of them are taken rather close to each other. Solheim's collections are taken in the most strongly continental part of Norway with dry and hot summers and very cold winters (freqently down to -40°C). Those of Bjørgum are collected some 1500 km further to the north in a typical oceanic coastal area with humid summers and mild winters. Thus, the new species must have a very wide climatical amplitude.

As reflected in the specific name, all collections have been made rather late in the season in a mild period after the first frost. This may be significant and could indicate that the species is psychrofilous. It may also explain why it has been overlooked for so many years as corticiologists in general are not too keen to go

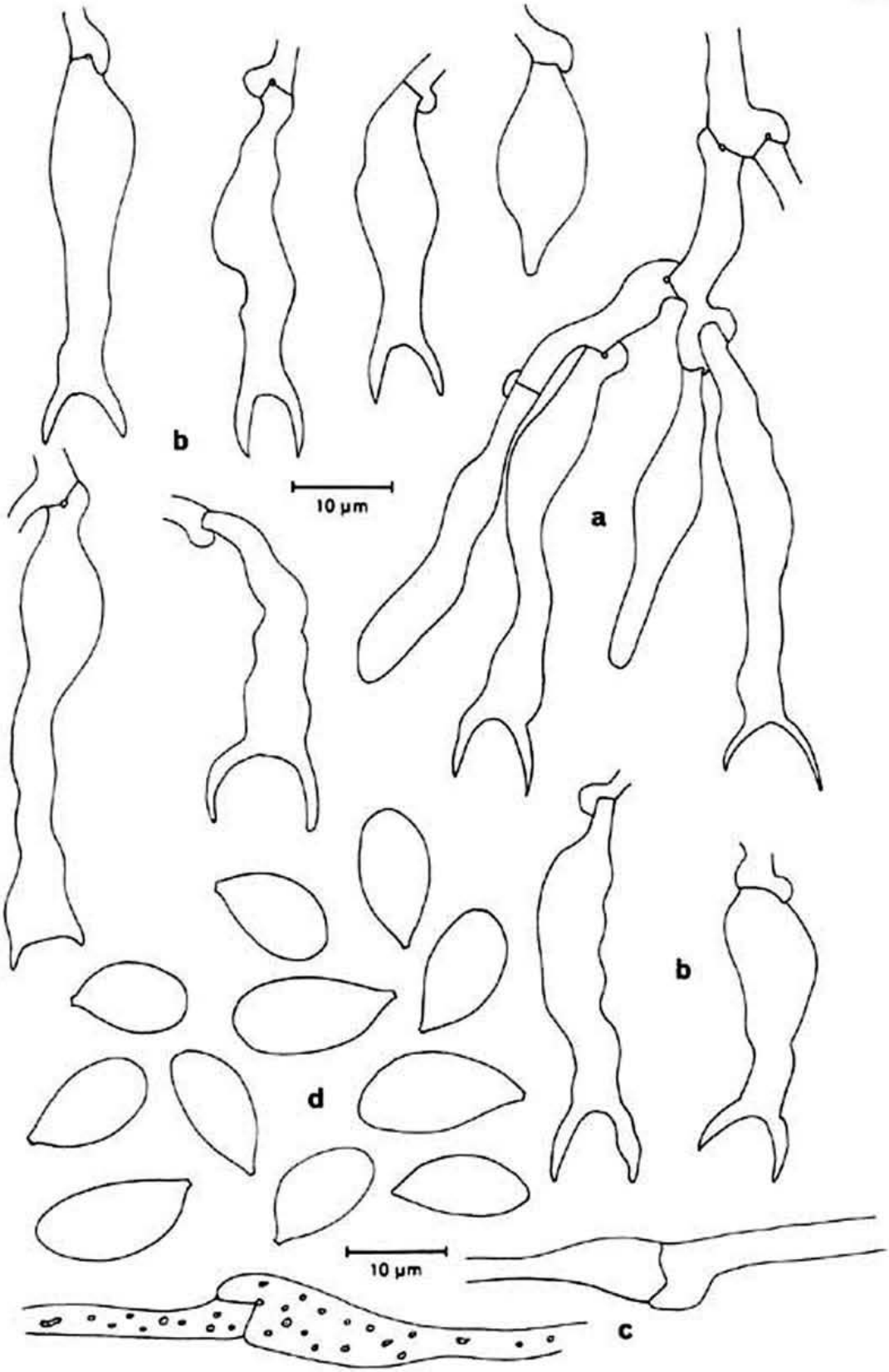


Fig.2. Sistotrema autumnalis. a) part of the hymenium b) basidia in different stages of development c) basal hyphae with swellings d) spores. From the type. Drawing by L.Ryvarden.

collecting when the temperature comes close the freezing point. The reason why both Bjørgum and Solheim did it, is that they had been instructed to collect until the snow covered the ground.

It is with a certain doubt that the new species is placed in Sistotrema and not in Urnobasidium, which could have been an alternative. Urnobasidium is typified by U. sernanderi, which has gloeocystidia and urniform basidia with 2-4 sterigmata.

Except for these characters, the genera come very close to each other and the need of Urnobasidium as a genus of its own may be discussed. As our new species differs considerably from the type of Urnobasidium, we have chosen to refer it to Sistotrema. A third character that points towards Sistotrema are the ampullate swellings found in connections with clamps on many of the hyphae in the subiculum. This is also a common feature in Sistotrema. The same is true for the many oily drops and irregular bodies in the hyphal protoplasm.

K. Hjortstam, K.H. Larsson and J. Eriksson have all seen our specimens and we came all to the conclusion that Sistotrema was the best genus. A more detailed discussion on Sistotrema and its delimitation will be given in a later volume of Corticiaceae of North Europe.

Corticium eximum Jacks. is undoubtly closely related. By courtesy of Fr. J. Eriksson who had the type material on loan, we had the opportunity to study the type in Göteborg. The main character separating the new species is the shape of the spores which are broadly ellipsoid and 8-10,5 long in C. eximum, subfusiform and 10-14 µm long in S. autumnalis. The number of sterigmata in C. eximum varies form 2 to 4 even if 2 is the dominating number. The basidia of S. autumnalis have persistently only two sterigmata. The form of the basidia is the same in both species, and the following new combination is proposed: Sistotrema eximum (Jacks.) Ryv. & Solheim comb. nov. Basionym: Corticium eximum Jacks. Can. J. Res. 26, Sec. C:152,1948

## ACKNOWLEDGEMENTS

We are most grateful to John Eriksson for his generousity in placing collections of Physodontia at our disposal and who also proposed the new name to us. Further, he, Kurt Hjotstam and Karl-Henrik Larsson have all been helpful with suggestions in connection with Sistotrema autumnalis for which we extend our most sincere thanks.

MYCOTAXON

Vol. VI, No. 2, pp. 381-390 October-December 1977

# ENTOMOPHTHORA TURBINATA SP. N., A FUNGAL PARASITE OF THE PEACH TRUNK APHID, PTEROCHLOROIDES PERSICAE (LACHNIDAE)

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## SUMMARY

*Entomophthora turbinata* sp. nov., attacking the peach trunk aphid, *Pterochloroides persicae*, was identified. Infected aphids were found only in late spring on the coastal plain of Israel. Turbinate conidia containing 5-7 nuclei and internal black resting spores, similar to those of *E. fresenii*, were not found to occur simultaneously within the same individual. Neither secondary conidia, rhizoids, nor cystidia were observed. Diseased aphids tended to hang by their rostra and those with resting spores assumed the form of a drop of fluid. This disease had been noted in Israel before 1951, and the causal agent is apparently the same as the unidentified organism reported in the past as killing giant willow aphids in California and British Columbia and ambrosia aphids in Illinois.

## INTRODUCTION

In early May 1975, high mortality was noticed in dense infestations of peach trunk aphids, *Pterochloroides (=Lachnus) persicae* (Cholodkovsky) (Lachnidae) on four Japanese plum and almond trees at Rishon-le-Zion and Rehovot, in the coastal plain of Israel. One plum and one almond tree of those sampled at Rehovot were not irrigated.

No chemicals had been applied to these trees for several years. The bodies of apterous and alate aphids were found hanging downwards from branches and twigs by their long probosces in a manner resembling clothes hung on a line. Others were stuck to leaves upon which they had dropped by the great amount of honeydew produced by the aphids above which had covered the leaves. Microscopic examination revealed an entomophthorous mycosis in the dead aphids. Two spore states were present, conidial sporulation from some, resting spore formation within others. By early June it was difficult to find new infections. On these isolated trees, infections by the same fungus reoccurred, starting in mid-April of 1976 and in mid-May of 1977. Maggots of the predatory gall midge, *Aphidoletes aphidimyza*, which are known to destroy entire colonies of these aphids (Bodenheimer and Swirski, 1957), were present on the trees at Rishon-le-Zion, but did not appear in Rehovot; therefore, we attribute the very high mortality at Rehovot during the first year to the disease.

A major epizootic of this large aphid, which attacks stone-fruit trees in southeastern Europe, central Asia, India, and the Middle East (Avidov and Harpaz, 1969), had been encountered by Plaut (1951) in the coastal plain of Israel in April and May of 1947 and 1948. He stressed that the stricken insects were liquefied and hung by their rostra in the form of a drop of fluid; upon pricking the bodies with a needle, they burst open, spewing out a dark liquid containing numerous large black spore-like bodies. Plaut sent examples for identification to Dr. E. A. Steinhaus in California who informed him of a similar disease in several aphid species from the United States, with spores of a unique kind, but that it would seem that the symptom of liquefaction of the dead aphid was not characteristic of a fungal infection. Steinhaus (1951), under the heading "Unidentified fungus infection of aphids," mentioned having received this material, which he stated appeared to be infected with the same type of fungus as other stricken aphids he described from California and Illinois; these he thought to be possibly of the Fungi Imperfecti or phycomycetes. Essig (1926) reported a disease of the giant willow aphid, *Pterochlorus viminalis* (B. de Fonsc.) collected in August of 1911 near Santa Paula, California which "causes the bodies to melt away and kills great numbers in Southern California." In British Columbia during 1941, the same aphid species was stricken

by a disease which "literally liquefied the bodies into black drops which fell to the ground" (Spencer, 1945). According to Steinhaus, Dr. J. N. Couch also examined Essig's microscopic slide preparations and believed the disease to be caused by a fungus possibly belonging to the Hyphomycetes. During September of 1946, ambrosia aphids, *Macrosiphum ambrosiae* (Thos.), from Mahomet, Illinois, were affected by the same disease. According to Steinhaus (1951), microscopic slide preparations of the diseased insects from California and Illinois revealed "peculiar conidia-like or spore-like bodies....dark-colored, oval-shaped....with approx. dimensions of 20 x 35 microns. Two distinct walls appear to surround the main body of the spore....; an attachment structure frequently may be seen at one end. .....The mycelium....is present primarily in fragments." Steinhaus stressed that both he and Couch had been unable to find anything in the literature which resembled the material examined. Published photographs of the spore-like bodies from the American aphids (Steinhaus, 1951: Figs. 8, 9) were exactly comparable to the drawings we saw of spores made by Plaut, and to the inclusions we found in peach trunk aphids. These structures are not at all like conidia but strongly resemble the zygospores of *Entomophthora fresenii* (Nowakowski) Gustafsson, the only known entomophthorous fungus which possesses resting spores with both a jet-black epispore together with a subovoid broadly elliptical shape (Soper and MacLeod, 1963; MacLeod and Müller-Kögler, 1970). The "*Entomophthora* sp." found in Quebec by Smirnoff and MacLeod (1973) on *Cinara curvipes* Patch on balsam fir branches formed only resting spores within the aphids, which then liquefied; these spores bear a striking resemblance to those mentioned above, and it is possible that they belong to the same species under consideration here, if not *E. fresenii*.

## DESCRIPTION OF DISEASE AND PATHOGEN

In aphids from which conidia were discharged, there was no noticeable change in color and shape. Sporulation was characterized by a glistening, brownish pebbly surface on the lower side of the abdomen where a dense palisade of subhyaline to reddish conidiophores emerged from the cuticle; under the microscope this hymenial surface appeared like irregular cobblestones. Sporulation was almost always restricted to the lower and lateral sides of

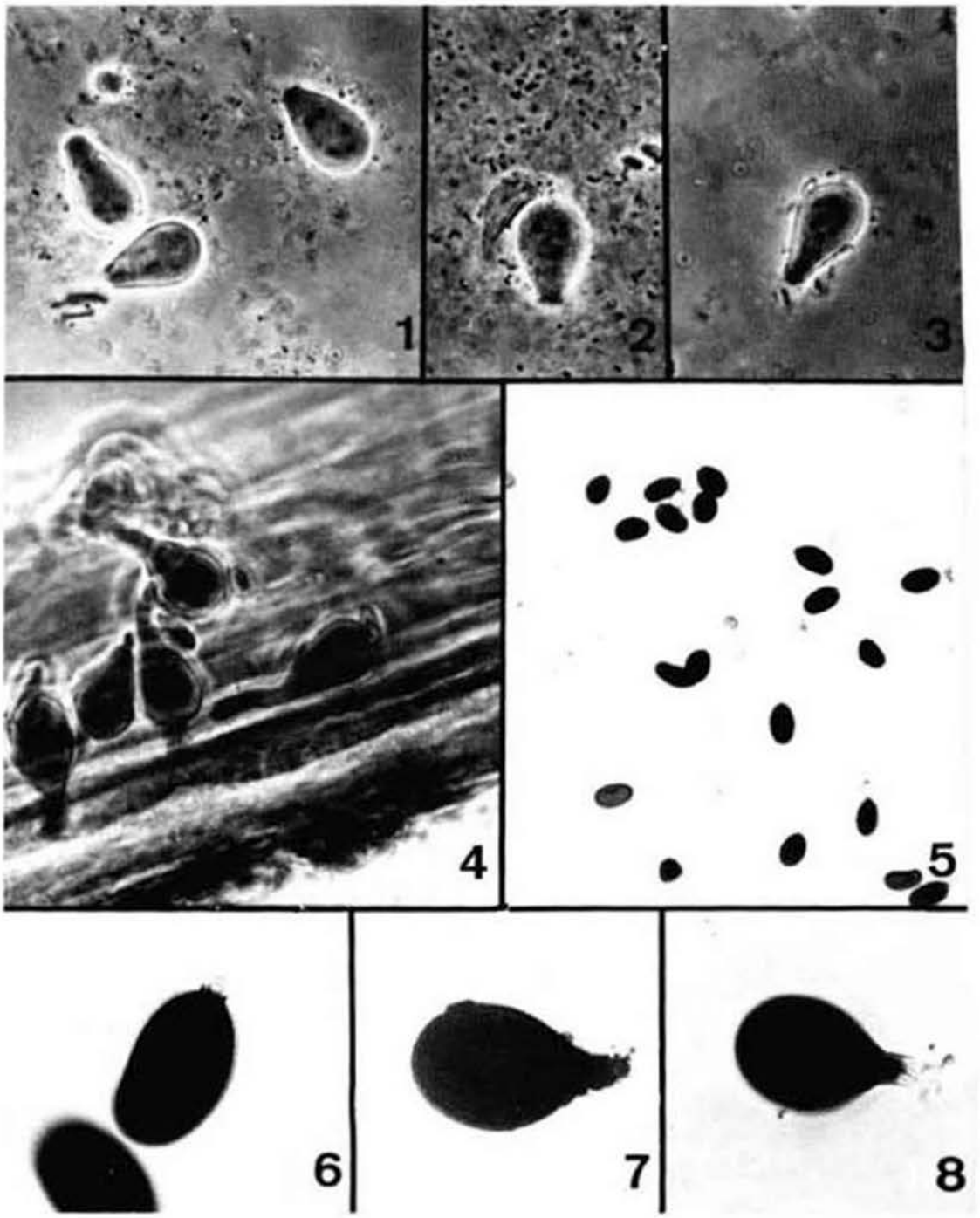
the abdomen and, occasionally, of the thorax; sporulation rarely occurred on the upper side of the abdomen. Conidiophores were simple, short, broad, and often broader just below the point of conidial attachment. Observations on sporulation were hindered by the white pruinosity of the healthy aphids, by the grey-black appearance of the abdomen of infected insects, by the rich growth of saprobic fungi such as *Cladosporium* spp. on most specimens (particularly those covered with honeydew), by the extrusion of dark-brown to reddish fluid from infected aphids in squash preparations, and by the very shortness of the conidiophores themselves.

In moist chambers, conidia were not thrown farther than 3 mm from the aphids. In microscopic preparations, the color of most of the conidia was light-brownish to reddish-brown. This color was restricted to the cytoplasm and did not leach upon transferring spores to fresh lactophenol mounting medium; the spore walls were hyaline. Some mature spores were completely hyaline.

Younger conidia were obovate, and upon maturity became long-turbinate (obconical), (*Turbinata*-type according to Lakon, 1919) (Figs. 1, 2, 3); mature conidia generally taper evenly to a blunt but narrow base which is sometimes slightly papillate; (17.6)19.3-22.5(25.7) x (11.2)12.2-16.0μ (mean: 19.8 ± 2.0 x 13.1 ± 1.3μ), with length:width range of 1.20-1.86 (mean: 1.52 ± .13) (75 measurements in lactophenol). The outer wall of the conidium sometimes was seen to separate from the inner wall along the sides. Conidia stained with Delafield's haematoxylin contained five to seven or more nuclei (Figs. 1, 2, 3). Conidia often germinated *in situ* on aphids, and invariably produced through the basal papilla a wide, rarely branching germ tube (Fig. 4). No type of secondary conidia was ever encountered. Conidia were often seen clinging to legs of non-stricken dead aphids, mostly by the narrow basal end, as if that part alone was adhesive.

Rhizoids and cystidia were never seen. Hyphal bodies were usually reddish, wide, long and irregular, but became shorter after the septation and evacuation of cytoplasm from some sections.

The shiny black resting spores were exuded in a dark liquid from the easily ruptured aphids. A single aphid was




FIGURES 1-8. *Entomophthora turbinata*: 1-3. Conidia stained with Delafield's haematoxylin, showing nuclei. 4. Germination of conidia through the papilla, on antenna of peach trunk aphid. 5-8. Black resting spores. 5-6. The most common types. 7-8. Other types, showing exaggerated prolongation at one side. (All in lactophenol, approx. x 700; Figure 5, approx. x 140).

found filled with immature, hyaline, thick-walled broad-elliptical spores; they had a small process at the extremity of the slightly wider end; (28.4-31.6 x 17.4-22.2μ). All other specimens had spores of approximately the same shape as the above. Mature resting spores were jet-black, smooth, with a more prominent subhyaline protuberance at one end 31.6-41 (44.2) x (15.8) 17.4-23.7 (25.3) μ (50 measurements, including the protuberance). The shape and dimensions of resting spores from one individual aphid were usually fairly uniform, but sometimes varied considerably (Figs. 5, 6, 7, 8). Occasionally there was a concavity in spores, coupled with a tendency toward a slight bending. When pressure was exerted on the cover slip of a slide, the thin black epispore ruptured, revealing a thick-walled hyaline spore underneath.

## IDENTIFICATION OF THE PATHOGEN

More than fourteen *Entomophthora* species are described from aphids (Hall, 1973; Thoizon, 1970), but none possess conidia as small as those found on the peach trunk aphid. Only two entomopathogenic species have conidia resembling those of the peach trunk aphid: (1) *E. montana* (Thaxt.) Gustafsson, which has uninucleate conidia 15-25 x 11-18μ according to Thaxter (1888), and 17-26 x 10-19μ as reported by Gustafsson (1965). It produces digitate conidiophores, however, and forms rhizoids and cystidia, and has only been found on Diptera. (2) *Strongwellsea castrans* Batko and Weiser (1965), has uninucleate, broadly papillate conidia (Humber, 1976) that are produced within a concavity in the abdomen of muscoid flies. The hyaline, sphaerical resting spores of *E. virulenta* (Thoizon, 1967), and the orange, spiny, sphaerical resting spores of *S. castrans* (Wilding, 1967; Humber, 1976) were never found in any of our specimens.

The common occurrence of smooth, elongate black resting spores in the Israeli material raises the question whether or not they belong to the same species as the conidia-producing fungus, or whether they belong to *E. fresenii*, which is common in Israel and elsewhere. If the former is true, then the fungus must be a new undescribed species, if the latter, it could possibly be a deviant of *E. montana*. It is not likely that the resting spores are those of *E. fresenii*, because the conidia of

that fungus was never encountered emerging from the peach trunk aphid, nor from various aphids in their near vicinity, even though in Israel this species produces conidia more often than resting spores. In contrast, the separate conidial and resting spore forms of the fungus have been found on peach trunk aphids on the same trees in a number of locations. Also, members of the Lachnidae have very seldom been found infected by *Entomophthora*, anywhere in the world: *Tuberolachnus salignus* (Gmel.) by *E. aphidis* Hoffm. (Leatherdale, 1970); *Cinara pinea* Mordv. and *C. todocola* In. by *E. aphidis* (Thoizon, 1970); *Cinara curvipes* Patch by *Entomophthora* sp. (Smirnoff and MacLeod, 1973); *Schizolachnus piniradiatae* (Davidson) by *E. aphidis* (Thoizon, 1970) and *E. fresenii* (Thoizon, 1970). The report by Tsinovskii and Egina (1972) of various *Entomophthora* species attacking peach-potato aphid, "*Lachnus persicae*" in Latvia obviously was referring to *Myzus persicae*. It is unlikely that a single aphid species of this group would suffer from disease caused by the same pair of different species at a number of widely dispersed localities. Studies in culture would conclusively prove the connection between the two spore states, but the fungus has not yet been obtained in pure culture. The more than occasional appearance in peach trunk aphids of mature resting spores with a long narrow prolongation at one end (Figs. 7, 8), which does not seem to have been figured or described in various papers dealing with *E. fresenii*, might be further evidence that the former is another species. On these grounds, we therefore consider the small conidia and black resting spore to be from the same species. A search should be made for the conidial stage in other Lachnidae.

An *Entomophthora* with conidia greatly resembling those on peach trunk aphid was found near Rehovot in May 1977 on *Aphis craccivora* in alfalfa (Kenneth and Ben Ze'ev, unpublished). Numerous very broad cystidia were formed, but no resting spores were observed. Secondary conidia were produced, something that did not occur in the peach trunk aphid fungus. It has been impossible to determine a relationship between this fungus and the one considered in this paper.

The peach trunk aphid fungus does not fall into any of the zoophilic genera of Entomophthoraceae as delineated by Batko and Weiser (1965), as the "monosporic sporangiola"

would place it only in *Zoophthora* Batko or *Strongwellsea*, both of which have only one nucleus in the conidium.

ENTOMOPHTHORA TURBINATA SP. NOV.

Conidia symmetria, recta, turbinata vel obovoidea, apice late rotundo, sursum ad angustam basem leniter attenuata, perparvis papillis; hyalina aut brunneo vel rubricoso cytoplasmate; 5-7 nucleata; externo pariete partim disjungente, 17.7-25.7 x 11.2-16μ; per papillas germinantia. Secundaria conidia ignota. Conidiophoris brevibus, simplicibus, paliformibus, praecipue de infero ventre aliguando de thorace; aphidis probosce ad substratum affixis. Rhizoideis et cystidiis absentibus. Perduribus sporis intra hospitem tumidum, nitentem in liquore innatis; ex late ellipticis ad subovoidea, 31.6-44.2 x 15.8-25.3μ, atropiceo, laeve episporio et ad unum extremum subhyalino processu, aliguando corpore elongato anguste extenso.
Hospes: Rhynchota: *Pterochloroides (=Lachnus) persicae* Cholodkovsky (Lachnidae): *Prunus amygdalus* Batch, *P. salicina* Lindl., Rishon-le-Zion, Rehovot, Israel, May, 1975.

Conidia symmetrical, straight, turbinate to obovoid, with a broadly rounded apex, tapering uniformly toward a narrow base with a very small papilla; hyaline or with brown to reddish-brown cytoplasm; 5-7 nucleate; outer wall partially separating; 17.7-25.7 x 11.2-16μ; germinating through the papilla. Secondary conidia unknown. Conidiophores short, simple, in palisade, mainly from underside of abdomen, occasionally of thorax; aphids attached to substratum by proboscis. Rhizoids and cystidia absent. Resting spores produced in liquid within bloated, shiny host, which turns to tear-drop shape; broadly elliptical to subovoid, 31.6-44.2 x 15.8-25.3μ, with jet-black smooth epispore and with subhyaline protuberance at one end, occasionally with narrow elongate prolongation of body.
Host: Rhynchota: *Pterochloroides (=Lachnus) persicae* Cholodkovsky (Lachnidae): *Prunus amygdalus* Batch, *P. salicina* Lindl., Rishon-le-Zion, Rehovot, Israel, May, 1975.

The holotype (Microscopic preparation) will be deposited at the National Fungus Collection, (BPI) Beltsville, Maryland; paratype material is deposited at

the Department of Plant Pathology, Faculty of Agriculture, Hebrew University, Rehovot, Israel.

## ACKNOWLEDGEMENT

This research was supported by a grant from the United States-Israel Binational Science Foundation (BSF), Jerusalem, Israel. We thank Dr. R. S. Soper, Agricultural Research Service, USDA and Dr. R. A. Humber, Department of Entomology, University of Maine, Orono, Maine, for fruitful discussions on the subject and Professor David Tatem, University of Maine, Orono, Maine, for the Latin diagnosis.

## LITERATURE CITED

Avidov, Z. and I. Harpaz. 1969. "Plant Pests of Israel." Israel Universities Press, Jerusalem. 549 pp.

Batko, A. and J. Weiser. 1965. On the taxonomic position of the fungus discovered by Strong, Wells, and Apple: *Strongwellsea castrans* gen. et sp. nov. (Phycomycetes: Entomophthoraceae). J. Invert. Pathol. 7: 455-463.

Bodenheimer, F. S. and E. Swirski. 1957. "The Aphidoidea of the Middle East." The Weizmann Science Press of Israel, Jerusalem. 378 pp.

Essig, E. O. 1926. Insects of Western North America. MacMillan, New York. 1035 pp.

Gustafsson, M. 1965. On species of the genus *Entomophthora* Fres. in Sweden. I. Classification and distribution. Lantbrukshögskölans Ann. 31: 103-212.

Hall, I. M. 1973. Pathogens of aphids. *In*: "Perspectives in Aphid Biology" (ed. A. D. Lowe). Entom. Soc. of N. Zealand, Auckland: 30-40.

Humber, R. A. 1976. The systematics of the genus *Strongwellsea* (Zygomycetes: Entomophthoraceae). Mycologia 68(5): 1042-1060.

Lakon, G. 1919. Die Insektenfeinde aus der Familie der Entomophthoreen. Z. Angew. Entomol. 5(2): 161-215.

Leatherdale, D. 1970. The arthropod hosts of entomogenous fungi in Britain. Entomophaga 15(4): 419-435.

MacLeod, D. M. and E. Müller-Kögler. 1970. Insect pathogens: species originally described from their resting spores mostly as *Tarichium* species (Entomophthorales:Entomophthoraceae). Mycologia 62: 33-66.

Plaut, N. 1951. "*Lachnus persicae* Cholodk. (Aphididae)." Ph.D. Thesis, Hebrew University, Jerusalem.

Soper, R. S. and D. M. MacLeod. 1963. Spore morphology of *Entomophthora fresenii* Nowakowski. J. Insect Pathol. 5: 478-482.

Smirnoff, W. A. and D. M. MacLeod. 1973. Une epizootie d'*Entomophthora* sp. dans une population du puceron du Sapin (*Cinara curvipes*) (Hemiptera:Aphididae). Can. Ent. 105: 1369-1372.

Spencer, G. J. 1945. On the incidence, density and decline of certain insects in British Columbia. Proc. Entom. Soc. Brit. Columbia 48(8): 19-23.

Steinhaus, E. A. 1951. Diagnosis of diseased insects, 1944-1950. Hilgardia 20(22): 629-678.

Thaxter, R. 1888. The Entomophthoreae of the United States. Memoirs Boston Soc. Nat. Hist. 4: 133-201.

Thoizon, G. 1970. Specificité du parasitisme des Aphides par les Entomophthorales. Ann. Soc. Entomol. France, n.s. 6: 517-562.

Tsinovskii, A. P. and K. A. Egina. 1972. *Entomophthora* fungi used in the control of aphids. Pathologiya Nasekomykh i Klishchei, Riga: 73-94 (translated from Russian).

Wilding, N. 1967. Wheat-bulb fly. Rep. Rothamsted Exp. Sta. for 1967: 218.

MYCOTAXON

Vol. VI, No. 2, pp. 391-417 October-December 1977

# A CONTRIBUTION TO THE GENUS *TRICHOSPORON*

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SUMMARY

Strains of all available species of *Trichosporon*, including the type strains, were examined morphologically and physiologically. *Trichosporon aquatile* and *T. jerovecii* are considered synonyms of *T. beigelii*. *Trichosporon aculeatum*, *T. arenicola*, *T. fennicum*, *T. inkin*, *T. melibiosaceum*, *T. oryzae*, and *T. penicillatum* are excluded from the genus. *Candida hellenica* comb. nov. is proposed to accommodate *Trichosporon hellenicum*. A synoptic key is provided for the identification of the six recognized species of *Trichosporon* (*T. beigelii*, *T. capitatum*, *T. fermentans*, *T. pullulans*, *T. eriense*, and *T. brassicae*).

The genus *Trichosporon* has been implicated in human disease for about 100 years (Behrend, 1890; Rabenhorst, 1867). It is about this time also that the taxonomic history of this group begins. *Trichosporon beigelii* (Kuch. & Raben.) Vuillemin (1902) [=*T. cutaneum* (De Beurm. *et al.*) Ota (1926)] is the most numerous species of the genus and is cosmopolitan in distribution. It is encountered as a saprophyte in a great diversity of habitats, from fresh and marine water to plant detritus to the body surfaces and sputum of man (Carmo-Sousa, 1970; Rippon, 1974). The other species are less numerous and thus less frequently encountered. It may be for this reason that they have been reported from a less diverse range of habitats, though several have been reported from materials of both plant and animal origin.

Since the monograph of Carmo-Sousa, 8 species of *Trichosporon* have been described, and it thus appeared that another treatment of the genus would be of value. Jong & King (1977) placed one of these recently described species, *Trichosporon oryzae* Ito *et al.* (1974), in synonymy with *Candida edax* van der Walt & Nel (1968).

The characteristics an imperfect fungus must have to be assigned to *Trichosporon* (Carmo-Sousa, 1970) are the presence of a unicellular phase consisting of budding cells and septate (true) mycelium from which arthroconidia (=arthrospores) are formed. In studying strains and descriptions of species assigned to this genus, it became apparent that the generic criterion most difficult to ascertain is whether the fungus in question forms arthroconidia. In many fungi in which the hyphae are septate at more or less regular intervals, a number of the hyphal segments may break apart at some stage of development. However, the definition of arthroconidia given in the Dictionary of the Fungi (Ainsworth, 1971) not-withstanding, the separation of hyphal segments one from another is not sufficient alone to consider those segments arthroconidia, at least in this genus.

King & Jong (1976b) gave the following criteria for identifying arthroconidia in *Trichosporon* based on light microscopic observations: arthroconidia (1) are produced by septation of recently determinate hyphae (relatively young hyphae that have ceased to elongate), (2) are produced in chains with no empty cells between the conidia, (3) break apart prior to further development, i.e. production of germ tubes or blastospores, and (4) separation of arthroconidia in a chain takes place in a very short time span, i.e., maturation is reached nearly simultaneously. These criteria are essentially the same as those enumerated by Cole (1975) based on light and electron microscopic data, with the exception that Cole states that arthroconidia in this genus may proliferate prior to separating from the chain of conidia. Representative aspects of arthroconidia in this genus are depicted in Figs. 1-3.

Although the distribution of members of this genus is cosmopolitan, the geographical areas in which they are known to cause disease is more limited. White piedra, caused by *T. beigelii*, is a rather benign disease of the hair in man and is by far the most common disease due to this genus (Gentles & Touche, 1969). According to Emmons *et al.* (1977) it occurs in temperate and tropical regions of Europe, Asia and South America, and rarely in the Southern United States. Rippon (1974) states that the condition occurs sporadically in the United States and Europe, and more commonly in South America and the Orient.

More serious diseases caused by members of this genus are rare. Species of *Trichosporon* have been implicated in bovine mastitis (Jungerman & Schwartzman, 1972), and *T. capitatum* has been implicated in pulmonary disease of man (Rippon, 1974). *Trichosporon beigelii* (as *T. cutaneum*) has also been found to cause pulmonary and systemic infections (Rippon, 1974), in deep gummatous lesions and from one case of fatal disseminated mycosis (Emmons *et al.*, 1977).

Carmo-Sousa (1970) provided the most recent comprehensive taxonomic treatment of the genus *Trichosporon* Behrend. She accepted as valid only 7 of the species that had been described as having only the imperfect *Trichosporon* state, and one (*T. variabile* (Lindner) Delitch.) that also had a perfect state. The species with only an imperfect state accepted by Carmo-Sousa (1970) were *Trichosporon aculeatum* Phaff *et al.* (1956), *T. capitatum* Diddens & Lodder (1942), *T. inkin* (Oho) Carmo-Sousa & Van Uden (1967), *T. penicillatum* Carmo-Sousa (1965), and *T. pullulans* (Lindner) Diddens & Lodder (1942). During the course of the work leading to the present treatment of the genus, two of these species have been excluded. *Trichosporon inkin* is now the type species of *Sarcinosporon inkin* (Oho) King & Jong (1975) and *Aciculoconidium aculeatum* King & Jong (1976a) has been erected to accommodate *T. aculeatum*. Von Arx *et al.* (1977) transferred *T. capitatum*, *T. fermentans*, and *T. penicillatum* to *Geotrichum*; we accept the transfer of only *T. penicillatum* for reasons discussed below. Carmo-Sousa (1970) reported that cultures of five species were not available: *Trichosporon luchetti* Redaelli & Ciferri (1941), *T. intermedium* Florenzano (1950), *T. merulioides* Kobayashi (1953), *T. neofermentans* Kobayashi (1953), and *T. yamanashiensis* Yokotsuka & Goto (1955).

## METHODS AND MATERIALS

Strains examined. The fungal strains accessioned to the American Type Culture Collection (ATCC) Mycological collection as species of *Trichosporon* (Tables I and II) were examined morphologically and physiologically as described below. The fungus strains accessioned as species of genera other than *Trichosporon* (Table III), although they were originally described as species of that genus, were examined only for arthroconidia production as described under morphology.

Morphology. Media used were Difco corn meal agar (CM); 2% dextrose, 0.5% Difco yeast extract, 1.0% Difco peptone, with 1.5% agar for solid media (GYEP); Difco yeast malt agar (YM); Difco malt agar (MA); infusion from 500 g potatoes, 20 g dextrose, 15 g agar, distilled water to make 1 liter (PDA); and 2% Difco malt extract, 0.5% Difco yeast extract, 40% sucrose, 2% Difco agar (M40Y). All media were sterilized by autoclaving at 15 psi for 15 min. All cultures were incubated at room temperature (22±2C) unless otherwise indicated.

Using CM and GYEP agars, slide and Dalmau cultures were prepared according to the methods of Lodder (1970). The slide cultures were examined at 4 and 7 days, and the Dalmau cultures at 4 and 7 days, and at intervals up to 30 days. Stationary cultures in 30 ml of GYEP broth in 100 ml cotton plugged flasks were examined 2 and 4 days after inoculation for detection of unicellular growth.

Strains that failed to produce a unicellular budding growth using the above methods were grown at 37 C on YM agar slanted in test tubes and at 24 C on GYEP and M40Y agars in Petri dishes in candle jars, and examined after 7 days incubation for the presence of unicellular budding growth.

The strains accessioned as other than *Trichosporon* species were streaked onto CM, GYEP, PDA, MA and M40Y agars in Petri dishes and examined for the presence of arthroconidia 7 days after inoculation. The strains accessioned as species of *Trichosporon* but that failed to produce arthroconidia on CM and GYEP agars in slide and Dalmau cultures were inoculated and examined in the same manner as the non-*Trichosporon* strains on PDA, MA and M40Y agars.

TABLE I. ATCC STRAINS OF SPECIES CONSIDERED BY CARMO-SOUSA (1970), AND ACCESSIONED AS *TRICHOSPORON*[a]

| Name | ATCC No. | Name | ATCC No. |
|---|---|---|---|
| *T. beigelii*[b] | 757 | *T. fermentans* | 10675[d] |
| | 4155 | | 28577 |
| | 10267 | | 28578 |
| | 11115 | *T. penicillatum* | 18019[d] |
| | 14905 | *T. pullulans* | 9331 |
| | 13445 | | 10677[d] |
| | 14254 | | |
| | 14255 | *T. hellenicum*[c] | 15542[d] |
| | 22164 | | 28579 |
| | 22375 | *Trichosporon* sp. | 4151 |
| | 26466 | | 10266 |
| | 28592[d] | | 20187 |
| *T. capitatum* | 10663[d] | | 28330 |
| | 28575 | | |
| | 28576 | | |
| | 28591 | | |

a *Sarcinosporon inkin* (=*T. inkin*) and *Aciculoconidium aculeatum* (=*T. aculeatum*) are not included.

b Considered *T. cutaneum* by Carmo-Sousa (1970).

c Excluded from *Trichosporon* by Carmo-Sousa (1970).

d Type strain of the species.

TABLE II. ATCC STRAINS OF *TRICHOSPORON* SPECIES NOT CONSIDERED BY CARMO-SOUSA (1970).

| Name | ATCC No. | Source of Description |
|---|---|---|
| *T. aquatile* | 22310[a] | Hedrick & Dupont (1968) |
| | 28574 | |
| *T. brassicae* | 24124[a] | Nakase (1971) |
| *T. eriense* | 22311[a] | Hedrick & Dupont (1968) |
| *T. fennicum* | 18895[a] | Sonck & Yarrow (1969) |
| *T. jerovecii* | 34499[a] | Fragner (1969) |
| *T. melibiosaceum* | 28580 | Scott & van der Walt (1970) |
| | 28681 | |
| *T. oryzae*[b] | 28323[a] | Ito *et al.* (1974) |
| | 32189 | |

a Type strain of the species.

b Considered a synonym of *Candida edax* by Jong and King (1977).

TABLE III. ATCC TYPE STRAINS ORIGINALLY DESCRIBED AS *TRICHOSPORON* SPECIES BUT ACCESSIONED TO THE ATCC UNDER OTHER NAMES

| ATCC No. | Original Name | Name as Accessioned | Source of Description as *Trichosporon* |
|---|---|---|---|
| 10676 | *T. margaritiferum* | *Oosporidium margaritiferum* | Buchwald (1939) |
| 18817 | *T. diddensii* | *Candida diddensii* | Phaff *et al.* (1952) |
| 22975 | *T. maritimum* | *Candida maritima* | Siepmann & Hohnk (1962) |
| 28774 | *T. lodderi* | *Candida tropicalis* | Phaff *et al.* (1952) |
| 28870 | *T. dendriticum* | *Candida krusei* | Cifferi & Redaelli (1935) |
| 28871 | *T. piscium* | *Candida zeylanoides* | Siepmann & Hohnk (1962) |
| 28872 | *T. atlanticum* | *Candida diddensii* | Siepmann & Hohnk (1962) |
| 28873 | *T. appendiculare* | *Candida guilliermondii* | Batista *et al.* (1959) |
| 28874 | *T. veronae* | *Candida veronae* | Floranzano (1953) |

Physiology. For inoculations in all physiological tests, the growth after 2 days on YM agar slanted in a test tube was aseptically scraped off and suspended in 6.5 ml of sterile distilled water, and the suspended cells drawn into a sterile disposable syringe equipped with a 20 gauge needle. Each tube of test medium was inoculated with one drop of the suspension. All tests were performed in duplicate, and all cultures were incubated non-shaken at room temperature (22±2 C).

Carbon assimilation tests were similar to those performed by Wickerman (1951). All sources (Table IV) were filter sterilized, except starch and inulin which were autoclaved at 15 psi for 15 min. The carbon sources were used at a level of 0.5% in 5 ml of Difco yeast nitrogen base, except raffinose at 1.0%. The pH of all media was unadjusted. Cultures were evaluated for presence or absence of growth over a 30-day period of incubation.

The assimilations of the following nitrogen sources at the concentrations indicated were tested: $KNO_3$, 0.078%; $NaNO_2$, 0.026%; ethylamine HCL, 0.064%; and as a positive control, $NH_4NO_3$, 0.10%. For each nitrogen source, duplicate tubes of 5 ml Difco yeast carbon base with the nitrogen source were inoculated and after 10 days, these cultures were suspended using a test tube mixer, and 1-3 drops of the suspension from a Pasteur pippette was used to inoculate a second set of tubes. The second set of tubes contained a basal medium (glucose, 5 g; $KH_2PO_4$, 1 g; $MgSO_4.7H_2O$, 0.5 g; $FeCl_3$, 0.6 mg; $ZnSO_4.7H_2O$, 0.9 mg; $MnSO_4.1H_2O$, 0.3 mg; biotin, 5 µg; thiamine, 100 µg; distilled water, 1 liter) and the nitrogen source. The $NH_4NO_3$ was not used in the first set of tubes, and was inoculated from the first set of $KNO_3$ cultures, along with the second set of $KNO_3$ tubes. The second set of tubes were examined for the presence of growth after 10 days.

As a test for vitamin-free growth, duplicate tubes of Difco vitamin-free yeast base were inoculated and after 10 days, a second set of tubes containing $NH_4NO_3$ and the basal medium without vitamins was inoculated from the first set, and examined for growth after 10 days.

Duplicates of GYEP agar slanted in test tubes were inoculated and examined for growth after 4 days incubation at 30, 37, 45 and 50 C. Duplicate tubes of arbutin medium

(arbutin, 1.25%; yeast extract, 1.25%; ferric ammonium sulfate, 0.125%; agar, 1.0%) were inoculated and examined after 10 days for darkening. Duplicate tubes of urea medium (Difco urea agar base, pH adjusted to 6.8; 1.5% agar) were inoculated and examined after 10 days for reddening.

The ability to ferment glucose was tested using the OF method (Hugh & Liefson, 1953). Difco OF basal medium + 3.0% glucose was inoculated as stabs and melted vaspar (50% vaseline + 50% paraffin) was poured over the top of the inoculated stabs. Following solidification, the vaspar provided a gas-tight seal. Duplicate stabs were inoculated and incubated at room temperature until gas was apparent beneath the vaspar plug or for 10 days. Presence of gas was considered positive for fermentation.

RESULTS

Morphology. Strains of most of the species listed in Tables I and II produced arthroconidia on either CM or GYEP agars. The exceptions were the strains referable to *T. hellenicum* (ATCC 15542 and 28579), *T. melibiosaceum* (ATCC 28580 and 28681), *T. fennicum* (ATCC 18895), and *T. oryzae* (ATCC 28323 and 32189). None of the strains listed in Table III produced arthroconidia on any media used.

Strains referable to other species that failed to produce arthroconidia on either CM or GYEP agars were the strains of *T. beigelii* ATCC 28592 (the type strain), ATCC 22375, and ATCC 22164; *T. pullulans* strain ATCC 10677; *T. eriense* strain ATCC 22311; *T. brassicae* strain ATCC 24124; and *Trichosporon* sp. strain ATCC 14905. However, these strains have been shown to produce arthroconidia using methods and media other than those reported here (King & Jong, 1976b). The remaining strains listed in Table I produced at least some arthroconidia on CM.

The unicellular budding phase was generally produced most readily in GYEP broth. Those strains that failed to produce a unicellular budding phase either in GYEP broth or on CM or GYEP agars were *T. beigelii* strains ATCC 757, 11115, 13445, 14254, 14255 and 26466; *T. capitatum* strain ATCC 28575; and *Geotrichum penicillatum* (= *T. penicillatum*) ATCC 18019. None of these strains produced the unicellular phase at 37 C on GYEP agar. In candle jars, *T. beigelii* strain 11115 produced blastoconidia on GYEP agar and

TABLE IV. UTILIZATION OF CARBON SOURCES BY STRAINS ACCEPTED IN *TRICHOSPORON*

| C-Source / ATCC No. | Glucose | Galactose | L-Sorbose | Sucrose | Maltose | Cellobiose | Trehalose | Lactose | Melibiose | Raffinose | Melezitose | Inulin | Soluble Starch | D-Xylose | L-Arabinose | D-Arabinose | D-Ribose | L-Rhamnose |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *T. aquatile* | | | | | | | | | | | | | | | | | | |
| 22310 | + | + | - | + | + | + | + | + | - | - | + | - | + | + | + | + | + | - |
| 28574 | + | + | - | + | + | + | + | + | - | - | + | - | + | + | + | + | + | - |
| *T. beigelii* | | | | | | | | | | | | | | | | | | |
| 4155 | + | + | + | + | + | + | + | + | + | + | + | - | + | + | + | + | + | + |
| 10267 | + | + | - | + | + | + | + | + | - | - | + | - | + | + | + | + | + | + |
| 11115 | + | + | + | + | + | + | + | + | - | - | + | - | + | + | + | + | + | + |
| 14905 | + | + | + | + | + | + | + | + | + | + | + | - | + | + | + | + | + | + |
| 22164[a] | + | + | + | + | + | + | + | + | + | + | + | - | + | + | + | + | + | + |
| 22375 | + | - | - | - | + | + | + | + | - | - | - | - | + | + | + | - | + | - |
| 28592 | + | + | + | + | + | + | + | + | + | + | + | - | + | + | + | - | + | + |
| *T. brassicae* | | | | | | | | | | | | | | | | | | |
| 24124 | + | + | + | + | + | - | + | - | - | - | - | - | + | + | + | - | + | - |
| *T. capitatum* | | | | | | | | | | | | | | | | | | |
| 10663 | + | - | - | - | - | - | - | - | - | - | - | + | + | - | - | - | - | - |
| 28575 | + | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 28576 | + | + | - | - | - | - | - | - | - | - | - | - | + | - | - | - | - | - |
| 28591 | + | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *T. eriense* | | | | | | | | | | | | | | | | | | |
| 22311 | + | - | + | - | - | + | - | - | - | - | - | - | + | + | - | - | - | - |
| *T. fermentans* | | | | | | | | | | | | | | | | | | |
| 10675 | + | + | + | - | - | + | - | - | - | - | - | - | + | + | - | - | - | - |
| 28577 | + | + | + | - | - | + | - | - | - | - | - | - | + | - | - | - | + | - |
| 28578 | + | + | + | - | - | + | - | - | - | - | - | - | - | + | - | - | + | - |
| *T. jerovecii* | | | | | | | | | | | | | | | | | | |
| 34499 | + | + | + | + | + | + | + | + | + | + | + | - | + | + | + | - | + | + |
| *T. pullulans* | | | | | | | | | | | | | | | | | | |
| 9331 | + | + | + | + | + | + | + | + | + | + | + | - | + | + | + | + | + | + |
| 10677 | + | + | + | + | + | + | + | + | + | + | + | - | + | - | + | - | + | + |
| *Trichosporon* sp. | | | | | | | | | | | | | | | | | | |
| 4151 | + | + | + | + | + | + | + | + | + | + | - | - | + | + | + | + | + | + |
| 10266 | + | + | + | + | + | + | + | + | - | - | + | + | + | + | + | + | + | + |
| 20187 | + | + | + | + | + | + | + | + | - | - | + | - | + | + | + | + | + | + |
| 28330 | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

a Accessioned as *T. cutaneum* var. *antarcticum*.

TABLE IV. (continued)

| ATCC No. \ C-Source | D-Glucosamine | Ethanol | Glycerol | i-Erythritol | Adonitol (Ribitol) | Dulcitol (Galactitol) | D-Mannitol | D-Sorbitol(D-Glucitol) | α-Methyl-D-Glucoside | Salicin | Inositol | DL-Lactic Acid | Citric Acid | Succinic Acid | L-Valine | Glycine | L-Proline | L-Arginine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *T. aquatile* | | | | | | | | | | | | | | | | | | |
| 22310 | + | + | + | + | - | - | - | + | + | - | - | - | - | - | + | + | + | - |
| 28574 | + | + | - | + | - | - | - | + | + | + | - | - | - | - | - | + | + | - |
| *T. beigelii* | | | | | | | | | | | | | | | | | | |
| 4155 | + | + | + | + | + | + | - | + | + | + | + | + | - | - | - | + | + | + |
| 10267 | + | + | + | + | - | - | + | + | + | + | - | - | - | - | + | + | + | - |
| 11115 | + | + | + | + | - | - | + | + | + | + | + | - | - | - | + | + | + | - |
| 14905 | + | + | + | + | - | - | + | - | + | + | - | - | - | - | + | + | + | - |
| 22164[a] | + | + | + | + | + | + | - | + | + | + | + | + | - | - | + | + | + | + |
| 22375 | + | + | + | - | - | - | - | + | - | + | + | - | - | - | + | + | + | + |
| 28592 | + | + | + | + | + | + | - | + | + | + | + | + | - | - | - | + | + | + |
| *T. brassicae* | | | | | | | | | | | | | | | | | | |
| 24124 | + | + | + | - | + | - | + | + | - | - | + | + | - | + | + | + | + | + |
| *T. capitatum* | | | | | | | | | | | | | | | | | | |
| 10663 | - | + | + | - | - | - | - | - | - | - | - | + | + | + | - | - | - | - |
| 28575 | - | + | + | - | - | - | - | - | - | - | - | + | + | + | - | - | + | + |
| 28576 | - | + | + | - | - | - | - | - | - | - | - | + | + | + | + | - | + | + |
| 28591 | - | + | + | - | - | - | - | - | - | - | - | + | + | + | + | - | + | + |
| *T. eriense* | | | | | | | | | | | | | | | | | | |
| 22311 | - | + | + | - | - | - | + | + | - | + | - | + | + | + | + | + | + | + |
| *T. fermentans* | | | | | | | | | | | | | | | | | | |
| 10675 | - | + | + | - | + | - | + | + | - | + | - | + | + | + | + | + | + | + |
| 28577 | - | + | + | - | + | - | + | + | - | + | - | + | + | + | + | + | + | + |
| 28578 | - | + | + | - | + | - | + | + | - | + | - | + | + | + | + | + | + | + |
| *T. jerovecii* | | | | | | | | | | | | | | | | | | |
| 34499 | + | + | + | + | - | + | + | + | + | + | + | - | - | - | + | + | + | + |
| *T. pullulans* | | | | | | | | | | | | | | | | | | |
| 9331 | - | + | - | + | + | - | + | + | + | + | + | - | - | + | - | - | + | - |
| 10677 | - | + | - | + | + | - | + | + | + | + | + | - | - | + | - | - | + | - |
| *Trichosporon* sp. | | | | | | | | | | | | | | | | | | |
| 4151 | + | + | + | + | - | - | + | + | - | - | + | - | - | + | + | + | + | + |
| 10266 | + | + | + | + | - | + | + | + | + | - | + | - | - | - | + | + | + | + |
| 20187 | + | + | + | + | + | + | - | - | + | + | + | + | - | - | + | + | + | + |
| 28330 | + | + | + | + | + | + | - | + | + | + | + | + | - | - | - | | | |

TABLE V. REACTIONS TO MISCELLANEOUS PHYSIOLOGICAL TESTS BY STRAINS ACCEPTED IN *TRICHOSPORON* SPECIES

| Name and ATCC No. | Growth at 30C | 37C | 45C | Growth on Nitrogen From $KNO_3$ | $NaNO_2$ | $C_2H_5NH_2 \cdot HCl$ | Growth -Vitamins | Enzyme tests Urease | Arbutin[a] | Glucose Ferm. |
|---|---|---|---|---|---|---|---|---|---|---|
| *T. aquatile* | | | | | | | | | | |
| 22130 | + | + | - | - | - | + | - | + | - | - |
| 28574 | + | + | - | - | - | + | - | + | - | - |
| *T. beigelii* | | | | | | | | | | |
| 4155 | + | - | - | - | - | + | - | + | - | - |
| 10267 | + | - | - | - | + | + | - | + | - | - |
| 11115 | + | + | - | - | + | + | - | + | - | - |
| 14905 | + | + | - | - | + | + | - | + | - | - |
| 22164 | + | - | - | - | + | + | + | + | - | - |
| 22375 | + | - | - | - | + | + | - | + | - | - |
| 28592 | + | - | - | - | + | + | - | + | - | - |
| *T. brassicae* | | | | | | | | | | |
| 24124 | + | - | - | - | - | + | + | + | - | - |
| *T. capitatum* | | | | | | | | | | |
| 10663 | + | + | + | - | - | + | - | - | - | - |
| 28575 | + | + | + | - | - | - | - | - | - | - |
| 28576 | + | + | + | - | - | + | - | - | - | - |
| 28591 | + | + | + | - | - | + | - | - | - | - |
| *T. eriense* | | | | | | | | | | |
| 22311 | + | - | - | - | - | + | - | - | + | - |

a Splitting of arbutin

TABLE V. (continued)

| Name and ATCC No. | Growth at 30C | 37C | 45C | Growth on Nitrogen From $KNO_3$ | $NaNO_2$ | $C_2H_5NH_2 \cdot HCl$ | Growth -Vitamins | Enzyme tests Urease | Arbutin[a] | Glucose Ferm. |
|---|---|---|---|---|---|---|---|---|---|---|
| *T. fermentans* | | | | | | | | | | |
| 10675 | + | + | - | - | - | + | + | - | - | + |
| 28577 | + | + | - | - | - | + | + | - | - | + |
| 28578 | + | + | - | - | - | - | + | - | - | + |
| *T. jerovecii* | | | | | | | | | | |
| 34499 | + | - | - | - | + | + | - | + | - | - |
| *T. pullulans* | | | | | | | | | | |
| 9331 | - | - | - | + | + | + | + | + | + | - |
| 10677 | - | - | - | + | + | + | + | + | - | - |
| *Trichosporon* sp. | | | | | | | | | | |
| 4151 | + | + | - | - | - | - | - | + | - | - |
| 10266 | + | + | - | - | + | + | - | + | - | - |
| 20187 | + | + | - | - | + | + | - | + | - | - |
| 28330 | + | - | - | - | - | + | - | + | - | - |

*T. capitatum* strain ATCC 28575 produced budding cells on M40Y agar. All of the strains listed in Table III readily produced the unicellular budding phase under all conditions. The budding phase of *Trichosporon capitatum* is unique within the genus (Figs. 4-6). The spores are produced in succession from a phialidic protuberance.

Physiology. For those strains in which the production of arthroconidia was observed or reported by King & Jong (1976b), and in which a unicellular budding phase was observed, the carbon assimilation results are presented in Table IV, and the results of the other physiological tests are presented in Table V. All strains utilized glucose and ethanol as carbon sources, and $NH_4NO_3$ as a nitrogen source.

Considering *T. beigelii* and strains designated *Trichosporon* sp. together, all strains utilized as carbon sources all disaccharides except sucrose (negative only for ATCC 22375), soluble starch, D-xylose, D-ribose, glycine and L-proline (except possibly strain ATCC 28330 for the last two, on which it was not tested). Also, all of these strains showed a positive urease reaction, and failed to grow at 45 C, utilize nitrate, or ferment glucose. All but one (*T. beigelii* strain ATCC 22164) failed to grow in vitamin-free medium. All of them also failed to utilize lactic and citric acids as carbon sources.

The strains of *T. capitatum* were most notable for the few carbon sources utilized. Of the carbon sources tested, these strains failed to utilize the triose, tetroses, pentoses, disaccharides, trisaccharides, and the sugar alcohols except for glycerol. Most notable among the other responses these strains exhibited was the utilization of the organic acids, growth at 45 C, and negative responses for the nitrate, vitamin-free growth, urease and glucose fermentation tests.

The responses of the *T. fermentans* strains were more variable than those referable to *T. capitatum* with respect to groups of carbon compounds utilized. These strains utilized L-sorbose, but failed to utilize the di- and tri-saccharides, except for cellobiose. Their responses to the sugar alcohols were variable. These strains utilized all the organic and amino acids, grew at 37 C and in the absence of vitamins, and fermented glucose. They showed neg-

ative responses to the nitrate and urease tests.

The *T. pullulans* strains were very similar in their responses to those of *T. beigelii* and were distinguished mainly by utilizing nitrate and failing to grow at 30 C. They also grew on vitamin-free medium.

The two strains of *Trichosporon aquatile* could not be distinguished from *T. beigelii*. They failed to utilize L-rhamnose and D-mannitol, but so did *T. beigelii* strain ATCC 22375. *Trichosporon* sp. strain ATCC 20187 also failed to utilize D-mannitol. *Trichosporon jerovecii* was also very similar to *T. beigelii*.

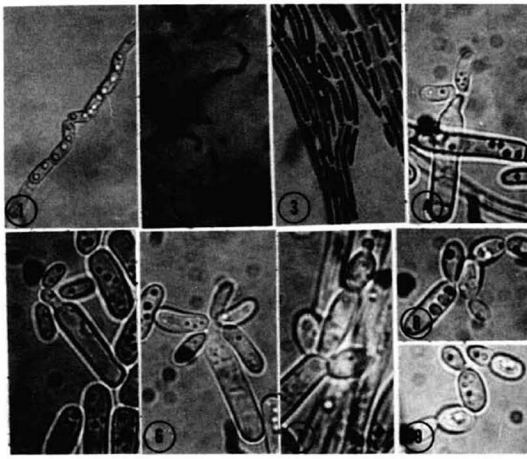
The responses of *T. eriense* were similar to *T. capitatum*. However, this strain utilized mannitol, sorbitol, salicin, and glycine. The one strain tested also splits arbutin, an ability shared by only one other strain, *T. pullulans* strain ATCC 9331. The single strain of *T. brassicae* tested failed to utilize trisaccharides and did utilize the amino acids as carbon sources; no single character separated it from all other strains.

## DISCUSSION

Experimental. Regarding the morphological portion of this study, it was found that identification of arthroconidia could be effected only on solid media. In broth culture, hyphal segments as well as arthroconidia broke apart. Thus, a gradual transition over a large size range was observed and it was impossible to distinguish which of the fragments were indeed arthroconidia. The relationships of the arthroconidia in chains to the vegetative mycelium must be observed to identify them as arthroconidia. This can be accomplished only on solid media.

The unique blastoconidia of *Trichsoporon capitatum* (Figs. 4-6) are unlike those of any other member of the genus. However, *Trichosporon* is probably a heterogenous assemblage of fungi, and less confusion will result by retaining *T. capitatum* in the genus until the natural relationships of the members of this group are worked out.

There were differences from the methods of Wickerham (1951) and Lodder (1970) in the methodology that was found to be best for the fermentation and nitrogen source utili-



Figs. 1-2. Arthroconidia produced by ATCC 9331 (*Trichosporon pullulans*) from CM agar culture; 1. *ca.* X 560, 2. *ca.* X 275. Fig. 3. Arthroconidia produced by ATCC 28575 (*Trichosporon capitatum*) from Dextrose-salts agar culture (King & Jong, 1976), *ca.* X 560. Figs. 4-6. Blastoconidia produced by type strain ATCC 10663 of *Trichosporon capitatum* from 16 day stationary GYEP broth culture, *ca.* X 1,350 Fig. 7. Blastoconidia produced by type strain ATCC 10675 of *Trichosporon fermentans* from 10 day YM agar culture grown at 37 C, *ca.* X 1,350. Figs. 8-9. Blastoconidia-like figures produced by type strain ATCC 18019 of *Geotrichum penicillatum* (=*T. penicillatum*) from 10 day and 16 day GYEP broth culture, respectively, *ca.* X 1,350.

zation tests. These differences were due at least in part to the filamentous nature of *Trichosporon*.

The detection of the ability to ferment several carbon sources, including glucose and galactose, was attempted using the Durham tube technique. A small amount of gas was produced by one strain of *T. fermentans* in one of the duplicate tubes for the glucose fermentation test, and no gas was produced from any carbon source by the other strains of *T. fermentans* or the strain of *Geotrichum penicillatum* (=*T. penicillatum*). With the OF method of testing for glucose fermentation that we used, production of gas was obvious in all strains of *T. fermentans* within 2 days, and in the strain of *G. penicillatum* within 7 days.

All strains were tested for utilization of nitrogen sources (nitrate, nitrite, and ethylamine) using the method of Wickerham (1951). Using this method, there was often too much growth in the second set of tubes containing Difco Yeast Nitrogen Base (YNB) plus the nitrogen source for the test to be considered negative by strains that should not have been able to utilize the particular nitrogen source. Replacing the YNB in the second set of tubes with a simpler basal medium consisting of salts plus vitamins solved this problem satisfactorily.

The results of the physiological tests for those species examined by Carmo-Sousa (1970) were in good agreement with her results. The discrepancies were apparently due for the most part to the examination of more strains by Carmo-Sousa and thus detecting a greater degree of variation in some of the species. In a few instances, differences in methodology appeared to account for the discrepancy. This applied primarily to the utilization of organic acids as carbon sources, the tube method employed by us yielding results more similar to the auxanographic method, and to the glucose fermentation tests. Carmo-Sousa reported latent results for *T. fermentans* whereas the OF method provided rapid, obvious results.

The results for *T. aquatile* and *T. eriense* were in poor agreement with those reported by Hedrick & Dupont (1968). In the results for *T. aquatile* there were 8 discrepancies in the physiological tests and for *T. eriense* there were 5. Since our results were in close agreement with those of Carmo-Sousa (1970) on the species studied by

her, and the type strains of *T. aquatile* and *T. eriense* were examined, we choose to accept our results for these two species. The tests for which there were discrepancies, however, have been avoided in constructing the key to species.

Although Goto *et al.* (1969) reported the strain ATCC 22164 (described as *T. cutaneum* var. *antarcticum*) to split arbutin, it failed to do so in our experiments. For *T. brassicae*, our results differ from those of Nakase (1971) in the utilization of starch and citric acid, growth in vitamin-free medium and splitting of arbutin. These differences could be explained by methodology. We found growth of *T. brassicae* at 37 C to be absent whereas Nakase detected growth at this temperature.

Taxonomic. Carmo-Sousa (1970) provided a diagnosis for this genus which is generally acceptable. The primary criteria for identifying members of *Trichosporon* are the presence of true mycelium, budding cells and arthroconidia (=arthrospores). The criteria that we can add to the characterization of *Trichosporon* are that the structures are hyaline, proper criteria for the identification of arthroconidia must be observed (see introduction), and fermentative ability, when present, is not necessarily weak or latent if an appropriate method (e. g., OF) is employed.

Von Arx *et al.* (1977) recently expressed a modification of the traditional criteria by which the genera *Geotrichum* and *Trichosporon* are separated. According to their concept, members of *Geotrichum* usually lack blastoconidia and blastoconidia are usually present in members of *Trichosporon*. It is generally conceeded that taxa of the Fungi Imperfecti are artificial assemblages at best, and to introduce uncertain criteria such as these to delimit the taxa only confuses current concepts in the taxonomy of this difficult group.

Throughout this paper we have referred to the type species of the genus as *Trichosporon beigelii* (Kuck. & Raben.) Vuillemin. Carmo-Sousa (1970) refers to this species as *T. cutaneum* (De Buerm. *et al.*) Ota. Carmo-Sousa notes that *T. beigelii* has priority over *T. cutaneum*, but that Diddens & Lodder (1942) designated the type species *T. cutaneum*.

*Plurococcus beigelii* Kuchenmeister & Rabenhorst *in* Rabenhorst (1867) was brought into the genus *Trichosporon* Behrend (1890) as *T. beigelii* (Kuch. & Raben.) Vuillemin (1902). The basionym of *Trichosporon cutaneum* is *Oidium cutaneum* de Beurmann *et al. in* de Beurmann & Gougerot (1909). According to Diddens & Lodder (1942), Lodder & Kreger-van Rij (1952), and Carmo-Sousa (1970) the valid publication of this species was de Beurmann, Gougerot & Vaucher, Bull. Mem. Soc. Med. Hop., Paris *28:* 256, 1909. All three stated that this publication was not available. The correct citation is de Beurmann, Gougerot & Vaucher *in* de Beurmann & Gougerot, Mem. Soc. Med. Hop., Paris *28:* 256, 1909. It should be noted, however, that de Beurmann *et al.* (1910, p. 938) definitely state they are proposing the name *Oidium cutaneum* for the fungus in question and do not cite a previous reference. *Oidium cutaneum* de Beurmann *et al.* (1909) was renamed *Mycoderma cutaneum* (de Beurmann *et al.*) Neveu-Lemaire (1921) and was subsequently brought into *Trichosporon* as *T. cutaneum* (de Beurmann *et al.*) Ota (1926).

Carmo-Sousa is mistaken in stating that the nomenclatural situation concerning the proper name for the type species of *Trichosporon* is not clear according to the International Rules for Botanical Nomenclature. This is a simple case of priority, and *T. beigelii* is the proper name for the type species. It should be noted that the reasons that Emmons *et al.* (1977) give for considering *T. beigelii* and *T. cutaneum* separate taxa (i. e., *in vivo* morphology and the diseases caused) are somewhat questionable in a taxonomic sense. However, it must also be recognized that in a taxon as cosmopolitan and heterogenous as *T. beigelii* obviously is, it may be more realistic in the future, with the advent of new data (or a different treatment of existing data), to consider this group of strains as comprising more than one taxon.

Due to the great variation exhibited by *T. beigelii,* we do not believe that recognition of varieties significantly clarifies the taxonomy of this taxon. The species that we accept in *Trichosporon* are:

*Trichosporon beigelii* (Kuch. & Raben.) Vuillemin, Arch. Parasit. *5:* 59. 1902.

=*Trichosporon cutaneum* (de Beurmann, Gougerot & Vaucher) Ota, Ann. Parasitol. Hum. Comp. *4:* 12. 1926.

=*Trichosporon cutaneum* var. *antarcticum* Goto, Sugiyama & Iizuka, Mycologia *61:* 767. 1969.

=*Trichosporon aquatile* Hedrick & DuPont, Antonie van Leeuwenhoek *34:* 475. 1968.

=*Trichosporon jerovecii* Fragner, Ceska Mycol. *23:* 160. 1969.
(See Carmo-Sousa, 1970, for additional synonyms).

*Trichosporon brassicae* Nakase, J. Gen. Appl. Microbiol. *17:* 417. 1971.

*Trichosporon capitatum* Diddens & Lodder, Die Anaskosporogenen Hefen. II Halfte. p. 453. 1942.
(See Carmo-Sousa, 1970, for synonyms).

*Trichosporon eriense* Hedrick & DuPont, Antonie van Leeuwenhoek *34:* 476. 1968.

*Trichosporon fermentans* Diddens & Lodder, Die Anaskosporogenen Hefen. II Halfte. p. 457. 1942.
(See Carmo-Sousa, 1970, for synonym).

*Trichosporon pullulans* (Linder) Diddens & Lodder, Die Anaskosporogenen Hefen. II Halfte. p. 410. 1942.
(See Diddens & Lodder, 1942, for synonyms).

Von Arx *et al.* (1977) transferred *Trichosporon capitatum, T. fermentans,* and *T. penicillatum* to *Geotrichum. Trichosporon capitatum* and *T. fermentans* produce well defined blastoconidia (Fig. 4-7) and their inclusion in *Geotrichum* is unacceptable. With *T. penicillatum* on the other hand, we have been unable to conclusively demonstrate a budding phase, although suggestive figures are quite common (e.g., Figs. 8-9 ). In view of the observation by Carmichael (1957) that figures suggestive of multiplication by budding are often seen in *Geotrichum candidum* although this

type of multiplication does not occur, the transfer of *T. penicillatum* to *Geotrichum* as *G. penicillatum* appears to be warranted.

In constructing a taxonomic key, it is necessary to select characters that are constant within the taxa keyed, and it is preferable to choose obvious characters. Several *Trichosporon* species are quite variable in their physiological responses, particularly *T. beigelii*, and it is difficult to select constant characters. The key of Hedrick & Dupont (1968) is unacceptable. They indicated fermentation for only *T. fermentans* and not for *G. penicillatum* (as *T. penicillatum*), attempted to separate *T. beigelii* (as *T. cutaneum*) using characters for which this species is variable and made several other mistakes that made separation of *T. pullulans* and *T. aquatile* impractical. Dennis & Buhagiar (1973) determined the assimilations of 29 carbon sources for 15 strains of *T. pullulans*. They noted variability among these strains in the assimilation of 5 carbon sources for which Carmo-Sousa (1970), who tested 13 strains, found none.

The key of Carmo-Sousa (1970) successfully separated the species considered. The only exception we have found is that one strain of *T. fermentans* (ATCC 28577) failed to utilize D-xylose. However, this key depends on the presence or absence of single characters in the individual couplets. Fungi are notoriously mutable, and the failure to utilize any one of a few compounds could make it impossible to identify a strain that was indeed little different from other strains of the appropriate species.

The synoptic key outlined by Korf (1972) appears to reduce the problems of identification presented by the possibility of mutation, or simply an uncharacteristic strain, provided a sufficient number of characters are used. The following key has therefore been constructed to separate the recognized species of *Trichosporon*. In the key the numbers refer to (1) *T. beigelii*, (2) *T. capitatum*, (3) *T. fermentans*, (4) *T. pullulans*, (5) *T. eriense*, (6) *T. brassicae*. A species number following a character indicates that the species is positive for that character. An underlined species number indicates that the species may be either positive or negative for that character.

| | |
|---|---|
| A. Fermentation of glucose | 3 |
| B. Utilization of nitrate | 4 |
| C. Urease activity | 1, 4, 6 |
| D. Lactose assimilation | 1, 4 |
| E. α-Methyl-D-glucoside assimilation | 1, 4 |
| F. Ribitol (adonitol) assimilation | 1, 3, 4, 6 |
| G. Cellobiose assimilation | 1, 3, 4, 5 |
| H. Salicin assimilation | 1, 3, 4, 5 |
| I. Vitamin-free growth | 1, 3, 4, 6 |
| J. D-mannitol assimilation | 1, 3, 4, 5, 6 |
| K. L-arginine assimilation (as carbon) | 1, 2, 3, 5, 6 |

We agree with the exclusions from the genus proposed by Carmo-Sousa (1970). The species we do not accept in the genus that were considered by her and that have been described since her treatment of the genus are listed below.

*Trichosporon aculeatum* Phaff *et al.*, Antonie van Leeuwenhoek *22*: 160. 1956.

=*Aciculoconidium aculeatum* King & Jong, Mycotaxon *3:* 407. 1976.

*Trichosporon arenicola* Lima & Quieroz, Publicacao Inst. Micol. Recife No. *690:* 2. 1972.

=*Candida* sp. (based on the type strain ATCC 32301).

*Trichosporon fennicum* Sonck & Yarrow, Antonie van Leeuwenhoek *35:* 174. 1969.

=*Candida* sp. (based on the type strain ATCC 18895).

*Trichosporon inkin* (Oho) Carmo-Sousa & van Uden, Mycologia *59:* 653. 1967.

=*Sarcinosporon inkin* (Oho) King & Jong, Mycotaxon *3:* 93. 1975.

*Trichosporon melibiosaceum* Scott & van der Walt, Antonie van Leeuwenhoek *36:* 393. 1970.

=*Candida* sp. (based on the type strain ATCC 28580 and strain ATCC 28681).

*Trichosporon oryzae* Ito *et al.*, Agric. Biol. Chem. *38:* 1599. 1974.

=*Candida edax* van der Walt & Nel, 1968 (Jong and King, 1977).

*Trichosporon penicillatum* Carmo-Sousa, Antonie van Leeuwenhoek *31:* 153. 1965.

=*Geotrichum penicillatum* von Arx *et al.*, CBS Studies in Mycology No. 14. 1977.

A new combination to accommodate *Trichosporon hellenicum* is proposed.

*Candida hellenica*, comb. nov.

=*Trichosporon hellenicum* Verona & Picci, Ann. Microbiol. Enzim. Univ. Pisa *8:* 106. 1958.

Based on the type strain ATCC 15542 and strain ATCC 28579, *Candida hellenica* has the following profile:

Fermentation:

| | | | |
|---|---|---|---|
| Glucose | + | Sucrose | + |
| Galactose | + | Lactose | - |
| Maltose | - | Cellobiose | + |

Carbon Assimilation:

| | | | |
|---|---|---|---|
| Glucose | + | D-Glucosamine | + |
| Galactose | + | Ethanol | + |
| L-Sorbose | + | Glycerol | + |
| Sucrose | + | i-Erythritol | - |
| Maltose | + | Adonitol (Ribitol) | + |
| Cellobiose | + | Dulcitol (Galactitol) | + |
| Trehalose | + | D-Mannitol | + |
| Lactose | - | D-Sorbitol (Glucitol) | + |
| Melibiose | - | α-Methyl-D-Glucoside | + |

| | | | |
|---|---|---|---|
| Raffinose | + | Salicin | + |
| Melezitose | + | Inositol | + |
| Inulin | - | DL-Lactic Acid | - |
| Starch | + | Citric Acid | + |
| D-Xylose | + | Succinic Acid | + |
| L-Arabinose | + | L-Valine | ± |
| D-Arabinose | - | Glycine | - |
| D-Ribose | ± | L-Proline | + |
| L-Rhamnose | + | L-Arginine | + |

Other Tests:

| | |
|---|---|
| Assimilation of $KNO_3$ | - |
| Assimilation of $NaNO_2$ | - |
| Assimilation of Ethylamine HCl | + |
| Growth in Vitamin-Free Medium | - |
| Growth at 37 C | + |
| Growth at 45 C | - |
| Hydrolysis of Urea | - |
| Splitting of Arbutin | + |

In spite of attempts to obtain cultures of the type strains of the following species, cultures were not available for this study:

*Trichosporon luchetti* Redaelli & Ciferri, 1941.
*Trichosporon intermedium* Florenzano, 1950.
*Trichosporon merulioides* Kobayashi, 1953.
*Trichosporon neofermentans* Kobayashi, 1953.
*Trichosporon yamanashiensis* Yokotsuka & Goto, 1955.
*Trichosporon terrestre* van der Walt & Johannsen, 1975.

ACKNOWLEDGMENTS

This work was supported in part by the Brown-Hazen Grant BH 846 from Research Corporation, New York.

LITERATURE CITED

Ainsworth, G. C. 1971. Ainsworth and Bisby's Dictionary of the Fungi. 6th. ed. Commonwealth Mycological Institute, Kew, Surrey, England.

Arx, J. A. von, L. Rodrigues de Miranda, M. Th. Smith, and D. Yarrow. 1977. The genera of yeasts and the yeast-like fungi. Studies in Mycology No. 14, Centraalbureau voor Schimmelcultures, Baarn, The Netherlands.

Batista, A., J. Silveira, and G. Silveira. 1959. Um novo *Trichosporon* isolado de apendice cecal humano. Rev. Assoc. med. Brasil *5:* 351-352.

Behrend, G. 1890. Ueber trichomycosis nodosa. Berlin Klin. Wochenschr. *27:* 464-467.

Beurmann, L. de, and H. Gougerot. 1909. Les Exascoses. Saccharomycoses (Mycose de Busse-Buschke) et Parasaccharomycoses. Zymonematoses (Mycose de Gilchrist). Parendomycoses et Endomycoses (Muguet). Bull. Mem. Soc. Med. Hop. *28:* 250-263.

_____, _____, and Vaucher. 1910. Oidiomycose gommeuse ulcereuse disseminee. Mycose nouvelle due a un parasite noveau: l'*Oidium cutaneum*. Rev. de Med. *30:* 937-958.

Buchwald, N. F. 1939. Fungi Imperfecti (Deuteromycetes). Kandrup & Wunsch Bogtrykkeri, Copenhagen.

Carmichael, J. W. 1957. *Geotrichum candidum*. Mycologia *69:* 820-830.

Carmo-Sousa, L. do. 1965. *Trichosporon penicillatum* sp. n. Antonie van Leeuwenhoek *31:* 153-156.

_____, 1970. *Trichosporon* Behrend. *In* The Yeasts, a taxonomic study ed. J. Lodder pp. 1309-1352. North-Holland Pub. Co., Amsterdam.

_____, and N. van Uden. 1967. Reisolation of *Saccinomyces inkin* and its transfer to the genus *Trichosporon*. Mycologia *59:* 653-657.

Ciferri, R., and P. Redaelli. 1935. Contribuzioni alla sistematica delle Torulopsidaceae. Arch. Mikrobiol. *6:* 9-72.

Cole, G. T. 1975. The thallic mode of conidiogenesis in the Fungi Imperfecti. Can. J. Bot. *53:* 2983-3001.

Dennis, C., and R. W. M. Buhagiar. 1973. Comparative study of *Aureobasidium pullulans, A. prunorum* sp. nov. and *Trichosporon pullulans*. Trans. Br. mycol. Soc. *60:* 567-575.

Diddens, H. A., and J. Lodder. 1942. Die Anaskosporogenen Hefen. II Halfte. Amsterdam.

Emmons, C. W., C. H. Binford, J. P. Utz, and K. J. Kwon-Chung. 1977. Medical Mycology. Lea and Febiger, Philadelphia.

Florenzano, G. 1950. Due nuove specie di lieviti asporigini, isolati da vini. La Ricerca Scientifica *20:* 1494-1498.

_____, 1953. *In* Trattato di Enologia Vol. II (ed. P. G. Garoglio), Firenze (cited by Carmo-Sousa 1970).

Fragner, P. 1969. *Trichosporon jeroveci* sp. nov. Ceska. Mycol. *23:* 160-162.

Gentles, J. C., and C. J. La Touche. 1969. Yeasts as human and animal pathogens. *In* The Yeasts Vol. 1 eds. A. Rose and J. Harrison, pp. 107-182. Academic Press, New York.

Goto, S., J. Sugiyama, and H. Iizuka. 1969. A taxonomic study of Antarctic yeasts. Mycologia *61:* 748-774.

Hedrick, L. R., and P. D. Dupont. 1968. Two new yeasts: *Trichosporon aquatile* and *Trichosporon eriense* spp. n. Antonie van Leeuwenhoek *34:* 474-482.

Hugh, R., and E. Liefson. 1953. The taxonomic significance of fermentative versus oxidative metabolism of carbohydrates by various gram negative bacteria. J. Bacteriol. *66:* 24-26.

Ito, H., H. Iizuka, and T. Sato. 1974. A new radio-resistant yeast of *Trichosporon oryzae* nov. sp. isolated from rice. Agr. Biol. Chem. *38:* 1597-1602.

Jong, S. C., and D. S. King. 1977. Identity of *Sterigmatomyces aphidis* and *Trichosporon oryzae*. Mycotaxon *6:* 11-16.

Jungerman, P. F., and R. M. Schwartzman. 1972. Veterinary Medical Mycology. Lea and Febiger, Philadelphia.

King, D. S., and S. C. Jong. 1975. *Sarcinosporon:* A new genus to accommodate *Trichosporon inkin* and *Prototheca filamenta*. Mycotaxon *3:* 89-94.

_____, and _____. 1976a. *Aciculoconidium*: a new hyphomycetous genus to accommodate *Trichosporon aculeatum*. Mycotaxon *3:* 401-408.

_____, and _____. 1976b. Induction of arthroconidia in *Trichosporon*. Mycopathologia *59:* 61-63.

Kobayashi, Y. 1953. Bull. Nat. Sci. Mus. Tokyo, No. *33:* 40 (cited by Carmo-Sousa, 1970).

Korf, R. P. 1972. Synoptic key to the Pezizales. Mycologia *64:* 937-994.

Lima, S. M. de, and L. A. de Quieroz. 1972. Uma nova especie de *Trichosporon* Behrend. Univ. Fed. Pernambuco Inst. Micol Publ. *690:* 1-8.

Lodder, J. 1970. The yeasts, a taxonomic study, ed. North-Holland Pub. Co., Amsterdam.

_____, and N. J. W. Kreger-van Rij. 1952. The yeasts, a taxonomic study. North-Holland Pub. Co., Amsterdam.

Nakase, T. 1971. New species of yeasts found in Japan. J. Gen. Appl. Microbiol. *17:* 409-419.

Neveu-Lemaire, M. 1921. Precis de parasitologie humaine, Ed. 5me. Paris.

Ota, M. 1926. Sur quelques champignons pathogenes du type *Trichosporon beigelii* Vuillemin. Ann. Parasitol. Hum. Comp. *4:* 1-13.

Phaff, H. J., E. M. Mrak, and O. B. Williams. 1952. Yeasts isolated from shrimp. Mycologia *44:* 431-451.

_____, M. W. Miller, and M. Shifrine. 1956. The taxonomy of yeasts isolated from Drosophila in the Yosemite region of California. Antonie van Leeuwenhoek *22:* 145-161.

Rabenhorst, L. 1867. Zwei parasiten an den todten haaren der cignons. Hedwegia *6:* 49.

Redaelli, P., and R. Ciferri. 1941. Nuovi Reperti de *Trichosporon* ed osservazioni interno a questo genre. Mycopathologia *3:* 203-224.

Rippon, J. W. 1974. Medical Mycology. W. B. Saunders Co., Philadelphia.

Scott, D. B., and J. P. van der Walt. 1970. Three new yeasts from South African insect sources. Antonie van Leeuwenhoek *36:* 389-396.

Siepman, R., and W. Hohnk. 1962. Uber hefen und einer pilze (Fungi imp., Hyphales) aus dem Nordatlantik. Veroff. Inst. Meeresforsch. Bremerhaven *8:* 79-98.

Sonck, C. E., and D. Yarrow. 1969. Two new yeast species isolated in Finland. Antonie van Leeuwenhoek *35:* 172-177.

Van der Walt, J. P., and E. Johannsen. 1975. *Trichosporon terrestre* sp. nov. Antonie van Leeuwenhoek *41:* 361-365.

_____, and E. E. Nel. 1968. *Candida edax* sp. n. Antonie van Leeuwenhoek *34:* 106-108.

Verona, O., and G. Picci. 1958. Ann. Microbiol. Enzim., Univ. Pisa *8:* 106 (cited by Carmo-Sousa, 1970).
Vuillemin, B. 1902. *Trichosporon* et trichospories. Arch. Parasit. *5:* 38-66.
Wickerman, L. J. 1951. Taxonomy of yeasts. U.S.D.A. Tech. Bull. No. 1029.
Yokotsuka, I., and S. Goto. 1955. J. Agr. Chem. Soc. Japan *29:* 132 (cited by Carmo-Sousa, 1970).

MYCOTAXON

Vol. VI, No. 2, pp. 418-420 October-December 1977

# NOTES ON ARACHNOPEZIZA FITZPATRICKII AND A. RHOPALOSTYLIDIS

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The first Discomycete which I described as "new to science" was *Arachnopeziza fitzpatrickii* Korf (1952), known from a single collection which I had obtained on old wood in Coy Glen, Ithaca, New York, on May 15, 1947. The total collection consisted of about 20 apothecia, each well under a millimeter in diameter, on an obvious subiculum covering the wood. The species is so distinctive in its possession of a toothed margin composed of agglutinated, fasciculate hairs that I had no difficulty in recognizing it as undescribed. Though I returned frequently to Coy Glen and the same log to search for more material, I never found it again, and determined to describe it from the one collection. In the ensuing quarter century the type locality has been inundated by perhaps a meter of gravel from a major gravel-digging operation just above the site, and my hopes of ever seeing the species again dimmed perceptibly.

In 1975 my student, Martha A. Sherwood, called to my attention her collection No. 2127, on wood of a decorticated tree, collected in a *Kalmia* woods, in Alleghany National Forest, about 2 miles east of Heart's Content, Pennsylvania, on October 18, 1975, which she had correctly identified as *A. fitzpatrickii*. This is a huge collection of several hundred apothecia, part of which is deposited in CUP 54718, and part of which is being distributed as duplicates to FH, K, and NY. This second collection extends not only the geographical and seasonal ranges, but allows modification of the original diagnosis. No apothecia exceed the size (300-600 µm diam) originally reported, but many have fewer fascicles (perhaps 10, compared to the more than 30 on the apothecium photographed and illustrated originally), and the fascicles may consist of many more than the 10 or so hyphae reported. The ascospores in the original description are given as 13.6-22.5 × 2.7-4.8 µm, while I measure those of this collection to be 12.4-15.4 (-21.2) × 2.9-3.3 (-4.0) µm.

Recently Dr. John H. Haines, New York State Museum, called to my attention a collection taken by S. J. Hughes on 8. V. 1963 of *Arachnopeziza rhopalostylidis* Dennis (1961). Like the type specimen, it was collected on dead leaves of *Rhopalostylis sapida*, a palm, and the specimen (DAOM 156811) was obtained near the type locality, at Waiatarua, Waitakere Range, Auckland Province, New Zealand. It is unquestionably the species described by Dennis, and has densely gregarious apothecia totally devoid of a subiculum, with filiform ascospores that remain non-septate for a long time (but, as shown to me by Dr. Haines, eventually develop 1-3 septa). Dennis drew smooth hairs, but they are distinctly finely granulate; some are thick-walled apically, others not; some are tipped by a resinous material (FIG. 1). The thick-walled asci have a tapering, J+ pore-wall (Dennis wrote, "apice ultimo obsolete jodo coerulescente") (FIG. 1). Significantly, the hyphae of the ascocarp are all long-celled and glassy-walled, bound in a gel (except for the loose hairs). This is no *Arachnopeziza*, and the species must even fall outside of the Hyaloscyphoideae. It fits rather well within the concept of the Trichoscyphelloideae (Korf, 1973), and since it differs only in minor respects from species I now range in *Lachnellula* Karst. *emend.* Dennis (inclusive of *Trichoscyphella* Nannf.) I propose its transfer:

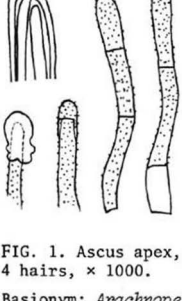

FIG. 1. Ascus apex, 4 hairs, × 1000.

LACHNELLULA RHOPALOSTYLIDIS (Dennis) Korf, *comb. nov.*

Basionym: *Arachnopeziza rhopalostylidis* Dennis, Kew Bull. 15: 302. 1961.

Assignment of Dennis's species to *Lachnellula* is in keeping with the current, broad concept of the genus, no longer restricted to spherical-spored species such as *L. chrysophthalma* ("Pers.") Karst. [= *L. suecica* (Fuckel) Nannf. *in* Lund. & Nannf.], but with the oval-spored and filiform-spored species previously treated as members of *Trichoscyphella*. This emendation by Dennis (1962) has been followed by such workers as Dharne (1965) and Raĭtviĭr (1970). In its earlier, more restricted sense, the species assigned to the genus were normally on coniferous hosts, but in its broader delimitation, hosts of many families occur. Whether such anomalous species as *L. theiodea* (Cke. & Ell.) Sacc. (*cfr.* Korf, 1962) can

still be accommodated in the genus is open to serious doubt (Dennis, Dharne, and Raĭtviĭr, *loc. cit.*, all fail to mention this species). But quite clearly an interface exists between the Trichoscyphelloideae (with its one genus, *Lachnellula*) and species that have been placed in the Phialeoideae, particularly in such genera as *Cyathicula* (inclusive of *"Phialea," cfr.* Dumont & Korf, 1977) and *Belonioscypha*, on the one hand, and species still ranged in *Dasyscyphus* (in its broad sense) on the other. Whether *L. rhopalostylidis* needs to segregated into some as yet undescribed genus will have to wait for further data. Information on tropical members of the Hyaloscyphaceae currently being undertaken by Dr. Haines should throw light on affinities in this group. But clearly the species cannot be accommodated in *Arachnopeziza*, and its transfer out of the genus now at least calls attention to its probable relatives.

*ACKNOWLEDGEMENTS*

I wish to thank Susan M. Gruff and Robert Dirig for technical assistance, and Drs. Sherwood and Haines for calling the specimens to my attention. Financial support of National Science Foundation grant DEB75-23557 is gratefully acknowledged.

*LITERATURE CITED*

DENNIS, R.W.G. 1961. Some inoperculate Discomycetes from New Zealand. Kew Bull. 15: 293-320.

____. 1962. A reassessment of *Belonidium* Mont. & Dur. Persoonia 2: 171-191.

DHARNE, C.G. 1965. Taxonomic investigations on the discomycetous genus *Lachnellula* Karst. Phytopath. Z. 53: 101-144.

DUMONT, K.P. & R.P. KORF. 1977. The generic name *Phialea*, nomen rejiciendum propositum. Taxon 26: (in press).

KORF, R.P. 1952. A monograph of the Arachnopezizeae. Llyodia 14: 129-180. '1951.'

____. 1962. A rare North American Discomycete, together with some comments on the genus *Lachnellula*. Trans. Mycol. Soc. Japan 3: 47-50.

____. 1973. Discomycetes and Tuberales. *In* G.C. Ainsworth, et al., [eds.], The Fungi: An advanced treatise 4A: 249-319. Academic Press, New York & London.

RAĬTVIĬR, A. 1970. Synopsis of the Hyaloscyphaceae. Scripta Mycol. 1: 1-115.

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