

EXAMINATION OF SPECIMENS AND USE OF KEYS

Generally the fructifications of *Monochaetia* and *Pestalotia* are acervuli. Sometimes they show more or less stroma formation. The 4- and 5-celled conical forms show the least stroma, or none of it, and the 6-celled conical forms the most. The stroma in the 6-celled conical forms can be extensive, underlying and enveloping the base and sides of the sporogenous layer as to resemble an apothecoid structure. There is considerable uniformity among the fructifications *in vivo* and considerable variation *in vitro*. The fructifications show variations in form according to the character of the matrix. In general, the fructifications are not considered significant in the definition of species. There are exceptions.

The fructifications are usually borne in the matrix and are freed by the rupture of the epidermis or covering tissue. They are black, carbonaceous, scattered or confluent, and sometimes densely aggregated. The contents are arranged in black coils or masses, leaving a black sooty deposit over the area. The black pustules can be observed with the naked eye, or better with a hand lens or binocular, and they appear in spots or dead areas on leaves, bark, wood, paper, and other plant materials. Their distribution is usually irregular and without order. A punctiform arrangement in leaf spots appears frequently, but the arrangement, number, distribution, and even size of fructing pustules are not significant in the definition of species.

The fruiting area is treated with a speck of water which is allowed to soak into the matrix. The pedicels, exterior hyaline cells, and crest of setulae are essential to the identification of the species, and a smear of water applied to the fructifications aids in the removal of the conidia without the loss of their attachments. A bit of fungus or conidial material is placed in a drop of water on a glass slide and covered for examination under the microscope. The position of the specimen in the author's scheme of classification should be promptly recognized. Are the conidia provided with one, or more than one, apical setulae? Does the specimen belong to *Monochaetia* or *Pestalotia*? [Fig. 1a,c; Fig. 2e,f]. Then determine the number of cells comprising the conidia. The exterior or extreme hyaline cells added to the number of colored cells will total 4, 5, or 6 cells, thus placing the specimen in either the Quercus-, Quinque-, or Sexiloculatae section of the genus [Fig. 2b,c]. From here on, the color of the conidial cells, number and peculiarities of the setulae, and biometric measurements are used to key out the species. Aber-

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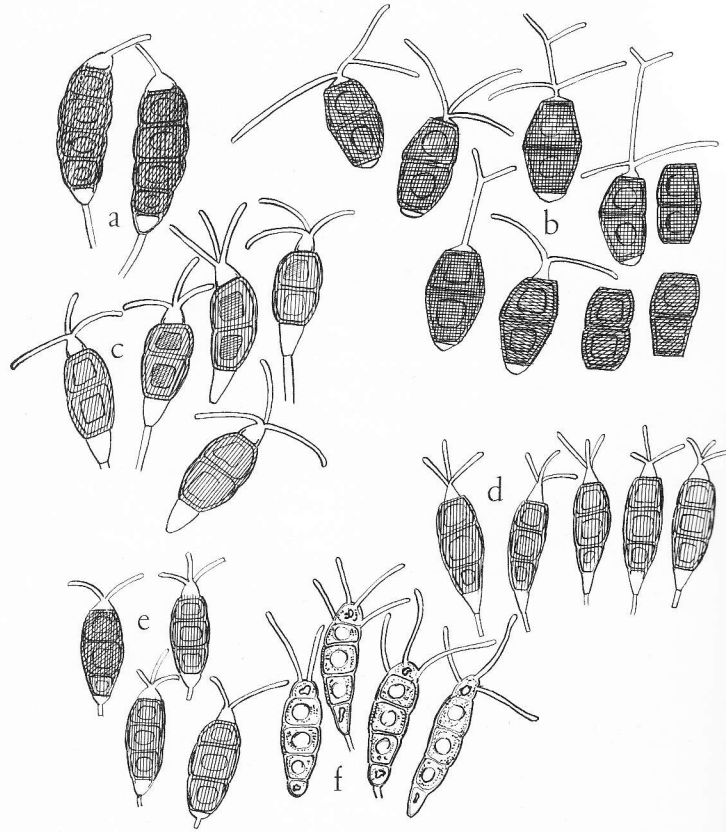


FIG. 1. Conidia of (a) *Monochaetia unicornis*, (b) *Pestalotia hartigii*, (c) *P. stevensonii*, (d) *P. micheneri* (= *P. microspora*), (e) *P. cryptomeriae*, (f) *Pestalozzina unicolor*.

rant conidia and characters should be disregarded. Figures 1-4 will serve to illustrate the variation in number, form, and color of conidial cells and variations of the setulae.

The exterior or terminal cells of the conidia are hyaline or usually so. Rarely are they dilute yellow or faintly colored. The coloration of the intermediate cells is an important diagnostic character. These cells may be faintly colored, brown or yellow-brown, and equally colored (concolorous) [Fig. 1c,d,e]. They may be of two colors or versicolored and slightly or strongly contrasted. The upper two colored cells may be brown or umber in contrast to the pale or yellow-brown color of the lowest of the three colored cells [Fig. 3b,f,g]. These color contrasts appear only among the 5-celled conidial forms with three intermediate colored cells. The upper two colored cells may be dark brown or nearly black and opaque (fuliginous) and most

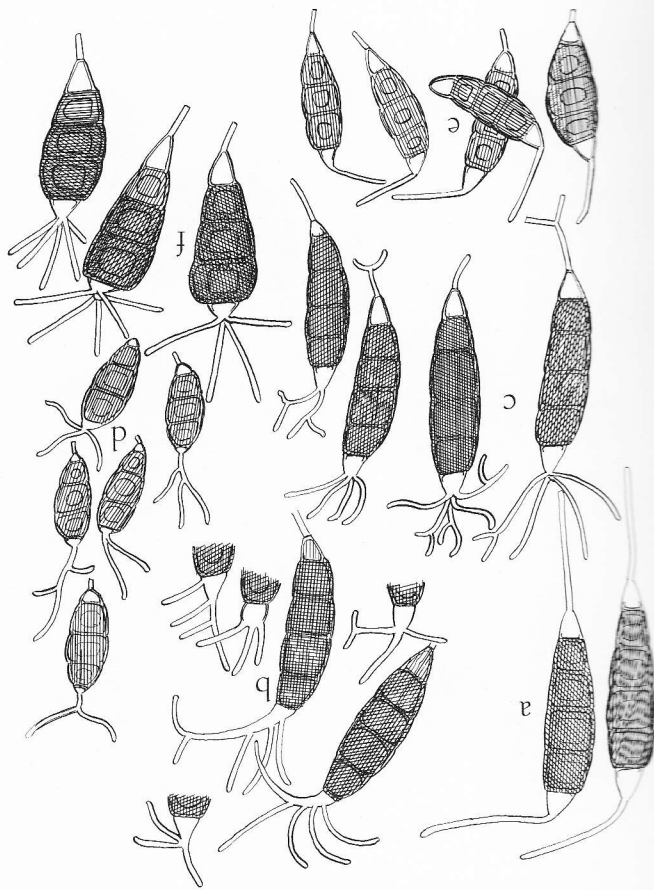


FIG. 2. Conidia of (a) *Monochaetia setridioides*, (b) *Pestalotia cornu-cervae*, (c) *P. setridioides*, (d) *P. guenpinii*, (e) *Monochaetia ilicina* (= *M. monochaeta*), (f) *Pestalotia funerea*.

distinct from the lowest colored cell [Fig. 4b]. This is the extreme color difference between the upper two and the lowest colored cells. The intense dark color can obscure the septum dividing the two upper colored cells. If the conidia of a given specimen have concolorous olivaceous or pale brown cells the specimen belongs in the section *Concolorae, Olive-Pallidae*. A portion of the conidia under observation may show a slight contrast in the coloration of the intermediate cells. If the color contrast is not striking or not consistent throughout the mass of conidia in the microscopic mount, the specimen remains in the section *Concolorae, Olive-Pallidae*, and should be keyed to the species in that category.

If there is a distinct and consistent color difference between the upper two and the lowest colored cells of the conidia, that is, brown or umber vs. olivaceous or yellow-brown, then the specimen belongs in the section *Versi-*

virgii, (e) *P. stevensonii*, (f) *Concolorae, Olive-Pallidae*.

figures 1-4 will serve of conidial cells and coloring or usually so. These cells may be colored (concolorous) and slightly or of the three colored among the 5-celled upper two colored and most

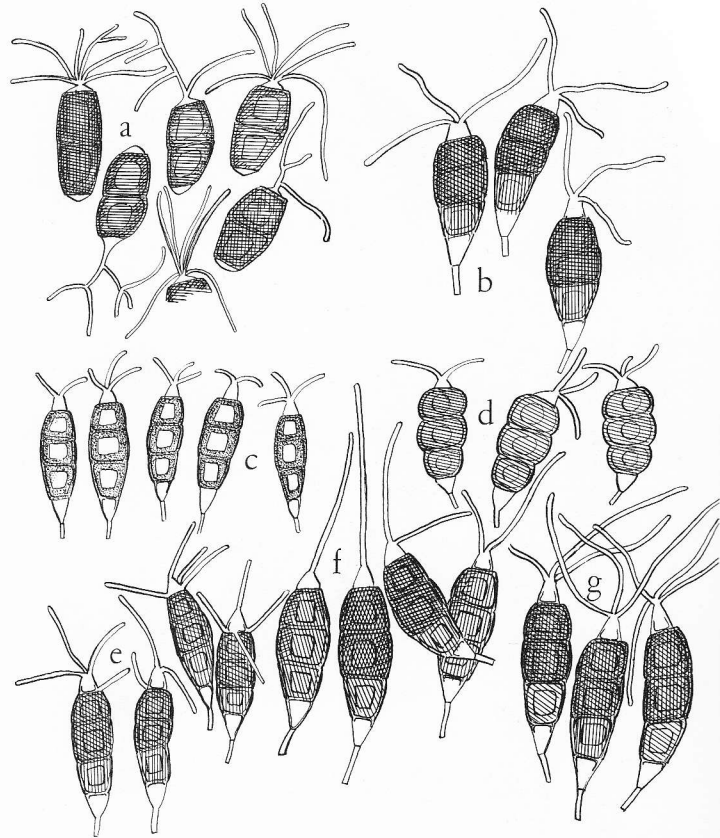


FIG. 3. Conidia of (a) *Pestalotia caulicola*, (b) *P. oleandri*, (c) *P. podocarpi*, (d) *P. torulosa*, (e) *P. gravesii*, (f) *P. monochaetioides*, (g) *P. conigena*.

colorae, *Umbræ-Olivæ*. If the contrast is extreme, that is, the upper two colored cells usually swollen, of an intense or chocolate brown color (fuliginous) and even opaque, the lowest colored cell olivaceous or yellow-brown, then the specimen belongs in the section *Versicoloræ*, *Fuliginæ-Olivæ*. In addition, the conidia may be strongly constricted at the septa dividing the colored cells [Fig. 3d], or usually the fuliginous and the olivaceous colored cells [Fig. 4b]. These color contrasts are illustrated in the text by figures of conidia of representative species embraced within the three categories of the author's system of classification.

The conidia are of different forms. In some species they are clavate, in others narrow fusiform. The exterior hyaline cells may be acute, long or short, cylindric, turbinate, or conic. These peculiarities are useful distinguishing characters in defining species.

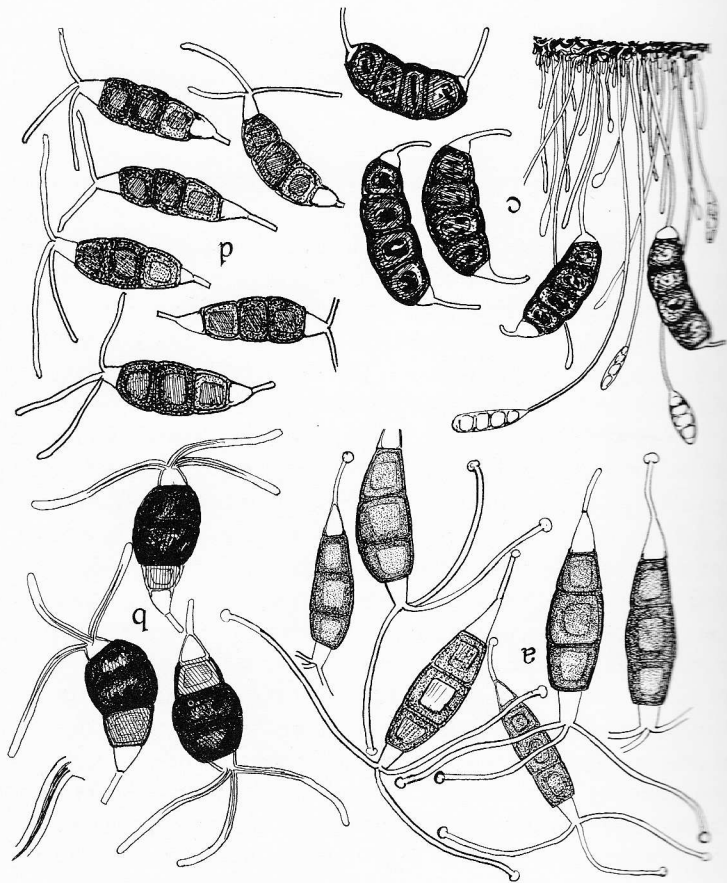
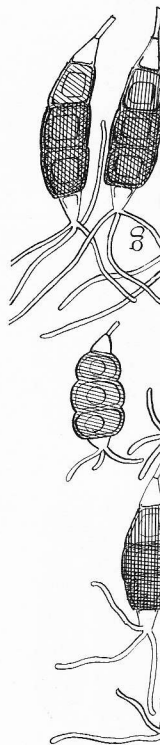


FIG. 4. Variation in form and color of conidia. (a) *Pestalotia theae*: three concolorous intermediate cells; setulae with knobbed or spatulate extremities. (b) *Pestalotia*: conidia with three versicolorous intermediate cells, the upper two of them brown intermediate cells. (c) *Monochaeta cava*: conidia with hyaline exterior cells and four fuliginous, opaque, sporeogenous layer; stout setulae with lumen. (d) *Pestalotia*: conidia with three versicolorous intermediate cells, the upper two of them brown or amber, the lowest one olivaceous or pale brown.

The setulae, in addition to number and size, may show other peculiarities. They may arise together at the summit of the apical cells or they may be disconnected. They may be far apart or they may arise from the slope or even from the bases of the apical cells [Fig. 3e]. The setulae may be filamentous and flexuous or coarse and rigid, projecting forward and widely divergent or reflexed backward. If coarse and thick, they may show a lumen extending from the base of the setulae toward their middle point [Fig. 4b]. They may be simple or branched, or both. The length of the setulae and their number, if reasonably constant, are useful specific characters. The extremities of

P. podocarpi, (d) *P.*

is, the upper two brown color (full- s or yellow-brown, In septa dividing the olivaceous colored text by figures of categories of the they are clavate, in be acute, long or s are useful dis-



the setulae may be capitate or spatulate [Fig. 4a]. Consideration of all these features appears in the keys to the species and the species descriptions.

Units of measure can be useless if the calibration of the microscope is inaccurate or if low-power lenses are used. Measurements are changed by the culture of the fungus on different substrata and they are increased by growth on artificial nutrient media. The subject of variation of the species and the influence of substrate on the form and dimensions of the conidia have been treated by numerous investigators and recently by Tandon (Proc. Nat. Acad. Sci. India 25, 1-2, 11-14, 1956) and Gambogi (Nuovo Gior. Bot. Ital. n.s. 63, 2-3, 248-256, 1956). Therefore, latitude must be recognized in employing the measurements in the text, and small differences in width and length between descriptions and specimens are insignificant. With this approach the keys should be helpful in the identification of specimens and in discouraging the erection of superfluous species.

There are still too many species of *Pestalotia*. The specimen must be distinctly different from anything that is recognized to be considered new. To the student disposed to naming new species, let me advise caution and judgment. If the traditional system of describing new species continues, then some bolder plan of regulation and administration more effective than the present method is necessary to curb the practice. Otherwise a monographic study can be futile and virtually impossible of accomplishment in view of the magnitude of the work and the inaccessibility of type material.

MONOCHAETIA

Melanconiales, Melanconiaceae, Phaeophragmiae

Monochaetia (Sacc.) Allescher, Rabh, Krypt. Flora 1, Abt. 7, 665, 1902. *Seridium* Nees ex Krombh., Abbild. Besch. essb. schäd. verd. Schwämme, 1:6, 1831.

Hydrococcus Dur. & Mont., Flore d'Algérie Crypt., 1846, p. 587.

Fruiting bodies black, carbonaceous, usually true acervuli with or without sporangic area, sometimes pycnidia or pseudopycnidia, but usually without a true ostiole and rarely as loose fertile hyphae without a distinct stratum or stroma. Conidia fusiform, straight or curved, 4- to 6-celled, crowned with a single hyaline setula; exterior cells hyaline or rarely dilutely colored; rarely with contents; intermediate cells equally or variably colored pale brown to almost black, guttulate; pedicels hyaline, simple, attached to the base of the conidia.

Section *Quadrilocularae*

Conidia 4-celled; two intermediate colored cells

Species Nos. 1-8

1. Intermediate cells of conidia greenish
 a. Conidia narrow fusiform, 20-30 × 6-7 μ.
 1. *M. monorhyncha*
2. Intermediate cells of conidia greenish
 a. Conidia 12-16 × 4-5 μ
 c. Setulae 3-7 μ long, sometimes up to 10 μ
 b. Conidia 13-18 × 3-5 μ
 c. Setulae 3-5 μ
 2. *M. saccardiana*
3. *M. rhododendricola*
 a. Conidia 15-17 × 5-6 μ
 c. Setulae 5-7 μ long
 b. Conidia 18-30 μ long
 c. Setulae 18-30 μ long
4. *M. paeoniae*
 a. Conidia 15-17 × 5-6 μ
 c. Setulae 5-7 μ long
5. *M. excipuliformis*
 a. Conidia oblong, pyriform, 15-20 × 6-8 μ
 c. Setulae about 7 μ long
6. *M. depazeaeformis*
 a. Conidia elliptic fusiform, 19-21 × 7.5-9 μ
 c. Setulae 3-5 μ long
7. *M. syringae*
8. *M. berberidicola*

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Section *Quinqueloculatae*

Conidia 5-celled; three intermediate colored cells

Species Nos. 9–25

- a. Intermediate cells olivaceous to umber brown
 - b. Conidia 13–18 × 4–5 μ
 - c. Setulae 4–15 μ long..... 9. *M. bicornis*
 - b. Conidia 18–20 × 4–4.5 μ
 - c. Setulae 12–14 μ long..... 10. *M. camelliae*
 - b. Conidia 15–21 × 5–8 μ
 - c. Setulae up to 19 μ, usually less than 15 μ long 11. *M. monochaeta*
 - 12. *M. alnea*
 - 13. *M. osyrella*
 - 14. *M. rosae-caninae*
 - b. Conidia 18–24 × 6–8 μ
 - c. Setulae 5 μ long..... 15. *M. phyllostictea*
 - b. Conidia 20–23 × 8–9.5 μ
 - c. Setulae 8–10 μ long..... 16. *M. schini*
 - b. Conidia 20–26 × 6–9 μ
 - c. Setulae up to 10 μ long 17. *M. berberidis*
 - c. Setulae 5–15 μ long..... 18. *M. concentrica*
 - c. Setulae 10–38 μ long..... 19. *M. kansensis*
 - b. Conidia 25–35 × 6.5–9.5 μ
 - c. Setulae 9–13 μ 20. *M. hysteriiformis*
 - b. Conidia 30–35 × 7–10 μ
 - c. Setulae 8–10 μ 21. *M. miersii*
 - b. Conidia 35–38 × 7 μ
 - c. Setulae up to 15 μ..... 22. *M. macropoda*
- a. Intermediate cells chocolate brown, fuliginous, opaque
 - b. Conidia 20–23 × 6–9.5 μ
 - c. Setulae 9–13 μ 23. *M. russelliae*
 - b. Conidia 18–29 × 5.5–6.5 μ
 - c. Setulae 12–16 μ 24. *M. osyridella*
 - b. Conidia 22–30 × 7–10 μ
 - c. Setulae 20–32 μ 25. *M. cryptomeriae*

Section *Sexloculatae*

Conidia 6-celled; four intermediate colored cells

Species Nos. 26–41

- a. Intermediate cells olivaceous brown or fuliginous
 - b. Conidia 18–22 × 9–11 μ, fuliginous
 - c. Setulae 8–10 μ 26. *M. terebinthi*

26. *M. terebinthi*
Pestalotia saccardiana Vogl. Atti Soc. Ven.-Trent. Sci. Nat. Padova 9: 233 (reprint, p. 27), 1885, pl. X, fig. 32.
Monochaeta saccardiana (Vogl.) Sacc., Syll. Fung. 22: 1229, 1913.

25. *M. cryptomeriae*
 On withing leaves of *Eugenia uniflora* L. Quilmes, Argentina, July 1881. Saccardo made a species of the variety and also changed the spelling of the specific name to *monorhynca*. The type specimen was not examined so that the position of the species remains uncertain.

24. *M. osyridella*
F. monorhyncha (Speg.) Sacc., Syll. Fung. 3: 798, 1884.
 Conidia 4-celled, 20-30 x 6-7 μ , intermediate cells greenish, exterior cells hyaline, drawn out into beaks at the apices which are often curved.
 13: 22-23, 1882.
Pestalotia decolorata Speg. var. *monorhynca* Speg., Anal. Soc. Ci. Argent. 1: 485, 1906.
Monochaeta monorhyncha (Speg.) Sacc., Syll. Fung. 18: 485, 1906.

Species Descriptions
 Section *Quadriloculatae*
 Species Nos. 1-8

- 41. *M. coryneoides* c. Setula 12 μ
- 40. *M. setridioides* b. Conidia 35-37 x 12 μ
- 39. *M. plagiochaeta* c. Setulae 9-35 μ
- 38. *M. ceratospora* b. Conidia 30-40 x 7.5-9.5 μ
- 37. *M. crataegina* bb. Conidia 9-12.5 μ wide, fuliginous bb. Conidia 7-9 μ wide, umber
- 36. *M. jefferisii* b. Conidia 25-35 μ
- 35. *M. rhododendri* c. Setulae 30-45 μ
- 34. *M. veneta* c. Setulae 23-25 μ
- 33. *M. tecomae* c. Setulae 10-18 μ
- 32. *M. turgida* c. Setulae 6-13 μ
- 31. *M. unicornis* c. Setulae up to 8 μ
- 30. *M. diospyri* b. Conidia 21-32 x 7.5-10 μ
- 29. *M. juniperi* c. Setulae 6-10 μ
- 28. *M. breviaristata* b. Conidia 20-23 x 7.5-8.5 μ , umber
- 27. *M. curtisii* c. Setulae 12-16 μ
- b. Conidia 19-23 x 6-7 μ , olivaceous brown

23. *M. russelliae*
 22. *M. macropoda*
 21. *M. miersii*
 20. *M. hystericiformis*
 19. *M. kansensis*
 18. *M. concentrica*
 17. *M. berberidis*
 16. *M. schinii*
 15. *M. phyllostictae*
 14. *M. rosae-caninae*
 13. *M. osyrella*
 12. *M. alnea*
 11. *M. monochaeta*
 10. *M. camelliae*
 9. *M. bicornis*
 colored cells
 colored cells

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- e. Setulae 4-6, 12-23 μ long.....
 50. *P. caulicola*
51. *P. affinis*
52. *P. chrysanthemi*
- b. Conidia 22-26 \times 7-8 μ
 e. Setulae simple or rarely branched; exterior hyaline
 cells and setulae usually persisting.
 h. Conidia 12-16 μ long
 c. Conidia 5-6 μ wide
 d. Colored cells olivaceous or pale brown
 e. Setulae 2-3, rarely 4, 8-18 μ long.
 54. *P. casuarinae*
55. *P. besselyi*
- d. Colored cells fuliginous
 e. Setulae 4, 18-20 μ long.....
 56. *P. gastrolobii*
- c. Conidia 6-8 μ wide
 d. Colored cells number to fuliginous,
 almost opaque; exterior hyaline cells
 obscure, minute
 e. Setulae 3 up to 8 μ long.....
 57. *P. puyae*
58. *P. maura*
- b. Conidia 16-22 μ long or in a narrower range.
 c. Conidia 5.5-7.5 μ wide
 d. Colored cells olivaceous or pale brown
 e. Setulae 3, 5-7 μ
 59. *P. camphori*
60. *P. stevensonii*
61. *P. maculicola*
- c. Conidia 7.5-8.5 μ wide
 d. Colored cells fuliginous, walls thick
 dark; apical cells obscure, basal cells
 cylindrical
 e. Setulae 3-4, 15-29 μ long.....
 62. *P. jacksoniae*
- c. Conidia 8-10 μ wide
 d. Colored cells brown to fuliginous
 e. Setulae 3, 13-16 μ
 63. *P. pitospora*
64. *P. tenorii*
65. *P. watsoniae*
- b. Conidia 18-26 μ
 c. Conidia 6-8 μ wide
 e. Setulae 2, 26-30 μ long.....
 66. *P. jaczewskii*
67. *P. hordeidaestrava*
68. *P. penzigii*
69. *P. insueta*

- c. Conidia 7.5–10 μ wide
 - d. Colored cells olivaceous or umber
 - e. Setulae 2–5, usually 3, 19–37 μ long 70. *P. berberis*
- b. Conidia 22–27 μ long
 - c. Conidia 3–5 μ wide, colored cells dark
 - e. Setulae 2, 9 μ long 71. *P. siliquastrae*
var. *italica*
 - c. Conidia 6–7 μ wide; interior cells fuliginous
 - e. Setulae 5, 30–40 μ long 72. *P. eupyrena*
 - c. Conidia 7.5–9 μ wide
 - d. Colored cells olivaceous
 - e. Setulae 4, sometimes 3, 30–52 μ
long 73. *P. moorei*
 - c. Conidia 9–10 μ wide
 - d. Colored cells fuliginous
 - e. Setulae 5, 18–35 μ long 74. *P. helichrysi*
- b. Conidia 27–30 \times 10–11 μ
 - d. Colored cells brown, large and cuboid
 - e. Setulae 3, rarely 2, 30–40 μ long ... 75. *P. torrendii*

Section *Quinqueloculatae*

Conidia 5-celled; three intermediate colored cells

Species Nos. 76–258

- a. Setulae knobbed at the extremities (Spathulatae), Nos. 76–90
- b. Colored cells brown, or yellow brown, concolorous
 - c. Conidia 16–22 \times 5–7 μ
 - d. Conidia hardly constricted at septa
 - e. Setulae usually 3, 7–22 μ , usually
up to 15 μ long 76. *P. phoenicis*
 - d. Conidia strongly constricted at septa
 - e. Setulae 2–3, 30–32 μ long 77. *P. javanica*
 - c. Conidia 19–26 \times 5–7 μ
 - e. Setulae 2–4, usually 3, 9–20 μ long 78. *P. fici*
 - c. Conidia 22–32 μ long
 - d. Conidia narrow, 5–8 μ wide
 - e. Setulae 3, 18–35 μ 79. *P. elastica*
 - e. Setulae 2–4, 25–50 μ , sometimes up
to 60 μ 80. *P. theae*
 - d. Conidia broad, 6.5–9.5 μ wide
 - e. Setulae usually 3, up to 25 μ 81. *P. annulata*
82. *P. clavata*
83. *P. capitata*