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# MYCOLOGY.—*A small* Conidiobolus *with globose and with elongated secondary conidia.*

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Most species of *Conidiobolus* that appear adventitiously in agar plate cultures prepared for the isolation of parasitic oomycetes from decaying roots, or that develop in agar plates canopied with small quantities of slowly decomposing plant detritus, would seem moderately coarse in comparison with microscopic fungi generally. In the main, however, they do not share the large dimensions of the very robust *C. utriculosus* Brefeld (1884) on which the genus was founded and by which almost exclusively, it was known for more than half a century. Among my isolations of readily culturable entomophthoraceous fungi two species of *Conidiobolus* are more particularly characterized

by relatively small dimensions of their hyphal segments and reproductive parts. One of these species was recently described elsewhere under the binomial *C. nanodes* Drechsler (1955). The other is described herein, likewise under an epithet meaning "dwarfish."

**Conidiobolus pumilus,** sp. nov. Mycelium incoloratum sed interdum materiam ambientem vel permeatum tarde obscurans; hyphis sterilibus mediocriter ramosis, plerumque 2–7$\mu$ crassis, mox septatis, hic illic inanitis, cellula eorum extrema saepe 75–400$\mu$ longa, aliis cellulis eorum plerumque 20–75$\mu$ longis; primiformibus fertilibus hyphis singulatum ex cellulis hypharum surgentibus, in parte submersa vulgo 2.2–3$\mu$ crassis, in aerem 8–30$\mu$ ad lucem protendentibus, in parte protendenti saepius 3.5–7$\mu$ crassis, ibi erectis vel acclivibus, apice unum conidium formae globosae ferentibus; conidiis formae globosae violenter prosilientibus, incoloratis, basi papilla 1.2–3.2$\mu$ alta et 3–6$\mu$ lata praeditis, plerumque ex toto 9–18$\mu$ longis et 7.3–14$\mu$ latis; conidiis formae elongato-ellipsoideae incoloratis, interdum 8.8–12$\mu$ longis et 5–7.5$\mu$ latis, in apice hyphae fertilis gracilis oriundis; gracilibus fertilibus hyphis ex conidiis abjunctis singulatim surgentibus, incoloratis, rectis vel aliquid curvis, interdum 30–40$\mu$ altis, basi circa 2$\mu$ crassis, sursum leniter attenuatis, apice circa 0.8$\mu$ crassis.

Habitat in materiis plantarum putrescentibus prope Sanford, Florida.

Mycelium colorless though in many instances causing the substratum or ambient to darken slowly; assimilative hyphae moderately branched, 2 to 7$\mu$ wide, soon divided by cross-walls, when actively growing commonly terminating in a segment 75 to 400$\mu$ long, the other segments mostly 20 to 75$\mu$ long and often disjointed from one another or separated by emptied portions of filament; primary conidiophores colorless, unbranched, arising singly from submerged or prostrate hyphal segments, in their proximal submerged portions often 2.2 to 3$\mu$ wide, extending 8 to 30$\mu$ into the air toward the main source of light, the aerial portion 3.5 to 7$\mu$ wide, erect or inclined, bearing a single globose conidium; globose conidia springing off violently, colorless, mostly 7.3 to 14$\mu$ wide and 9 to 18$\mu$ in total length inclusive of a basal papilla 1.2 to 3.2$\mu$ high and 3 to 6$\mu$ wide; elongate ellipsoidal conidia colorless, sometimes 8.8 to 12$\mu$ long and 5 to 7.5$\mu$ wide, always borne singly on slender conidiophores; slender conidiophores arising singly from individual detached conidia, straight or curved, sometimes 30 to 40$\mu$ tall, 2$\mu$ wide at the base, tapering gradually upward, about 0.8$\mu$ wide at the tip.

Isolated from decaying plant materials collected near Sanford, Fla., on December 31, 1953.

The hyphal segments in *Conidiobolus pumilus*, as in most congeneric forms, vary greatly with respect to size and shape. In the mycelium growing unimpeded on an ample expanse of maize-meal agar substratum the terminal segments of the radially arranged main hyphae at the advancing margin often measure 200 to 400$\mu$ in length and 5 to 6$\mu$ in width (Fig. 1). Increase in size of a mycelium is accomplished mainly by continued apical elongation of each terminal segment, which thereby is enabled from time to time to cut off a shorter segment proximally; the segments thus delimited one after another each occupying at first a penultimate position in the filament. Noticeable changes in the usual sequence of growth and cell division may result from slight modifications in external conditions. Thus when an actively expanding mycelium in an agar slab excised from a Petri plate culture is placed on a slide, covered with a cover glass, and then exposed to the bright illumination necessary for microscopical examination at high magnification, the terminal segments in many instances soon become abnormally shortened through hastening of cell division at the proximal end (Fig. 2). Once a hyphal segment has been delimited in penultimate position it usually undergoes no subsequent division, though its shape may become modified from evacuation of some portion at either end, and from extension of short branches or protuberances (Figs. 3–8).

The darkening of substratum often observable in cultures of *Conidiobolus pumilus* on maize-meal or lima-bean agar, within 10 or 15 days after planting, is noteworthy mainly because other known members of the genus seem generally incapable of bringing about any similar discoloration. Among congeneric forms only *C. rugosus* Drechsler (1955) invites comparison here, owing to the yellow or orange coloration it shows on maize-meal agar and on other agar media suitable for its sexual reproduction. The bright coloration seen in cultures of *C. rugosus* is due entirely to enormous numbers of yellow zygospores pro-

duced by that species, whereas the darkening in cultures of *C. pumilus* appears to come about from changes effected in the substratum.

In *Conidiobolus pumilus*, as in all other segmented congeneric forms, the conidiophores (figs. 9–15) bearing the primary globose conidia originate singly from individual hyphal segments. A conidiophore given off by a rather deeply submerged hyphal segment must grow upward through the overlying material a considerable distance before it reaches the surface (Fig. 9, s; Figs. 11–14: s). Owing to the delay incurred thereby the empty membrane of the hyphal segment, together with the evacuated proximal portion of the conidiophore, has usually vanished from sight when the conidium is fully delimited (Figs. 12–14), and may, indeed, be quite indiscernible even earlier when movement of protoplasm into the growing conidium is still in progress (Figs. 9, 11). Although a hyphal segment on the surface of the substratum sometimes extends its conidiophore procumbently a short distance (Figs. 10, s; 15, s), its empty envelope usually remains clearly visible at the time the conidium becomes walled off basally (Fig. 15).

The conidium of *Conidiobolus pumilus* springs off forcibly through sudden eversion of its concave basal membrane. Since the papilla resulting from this eversion is generally a little wider than the corresponding modification in *C. nanodes* it merges more gradually with the globose contour of the spore. Consequently the detached globose conidia of *C. pumilus* (Figs. 16–54) in general appear less abruptly papillate than those of *C. nanodes*. When lying on a moist surface they often put forth individually a short stout conidiophore on which is produced a conidium of globose shape like the parent (Figs. 55–62). Less commonly they give rise individually to a slender conidiophore bearing on its tip an elongate-ellipsoidal or obovoid conidium (Figs. 63–65) of the secondary type previously observed in *C. heterosporus* Drechsler (1953), *C. rhysosporus* Drechsler (1954), and *C. rugosus*. The elongate conidia here as in the three species described earlier do not spring off forcibly but become detached (Figs. 66–92) on slight disturbance. Elongate conidia of *C. pumilus* have hitherto been seen only in cultures over 15 days old in which the globose conidia serving as parents had been much reduced in size through prolonged repetitional development. It may be presumed that if their production were to take place in relatively young cultures they would show appreciably greater dimensions than have been indicated for them in the diagnosis.

In its ordinary vegetative germination the globose conidium puts forth a germ hypha (Figs. 93–95) that on unoccupied substratum is capable of growing into an extensive mycelium.

Sexual reproduction, which as a rule occurs promptly and abundantly in cultures of *Conidiobolus nanodes*, has so far not been observed in *C. pumilus*.

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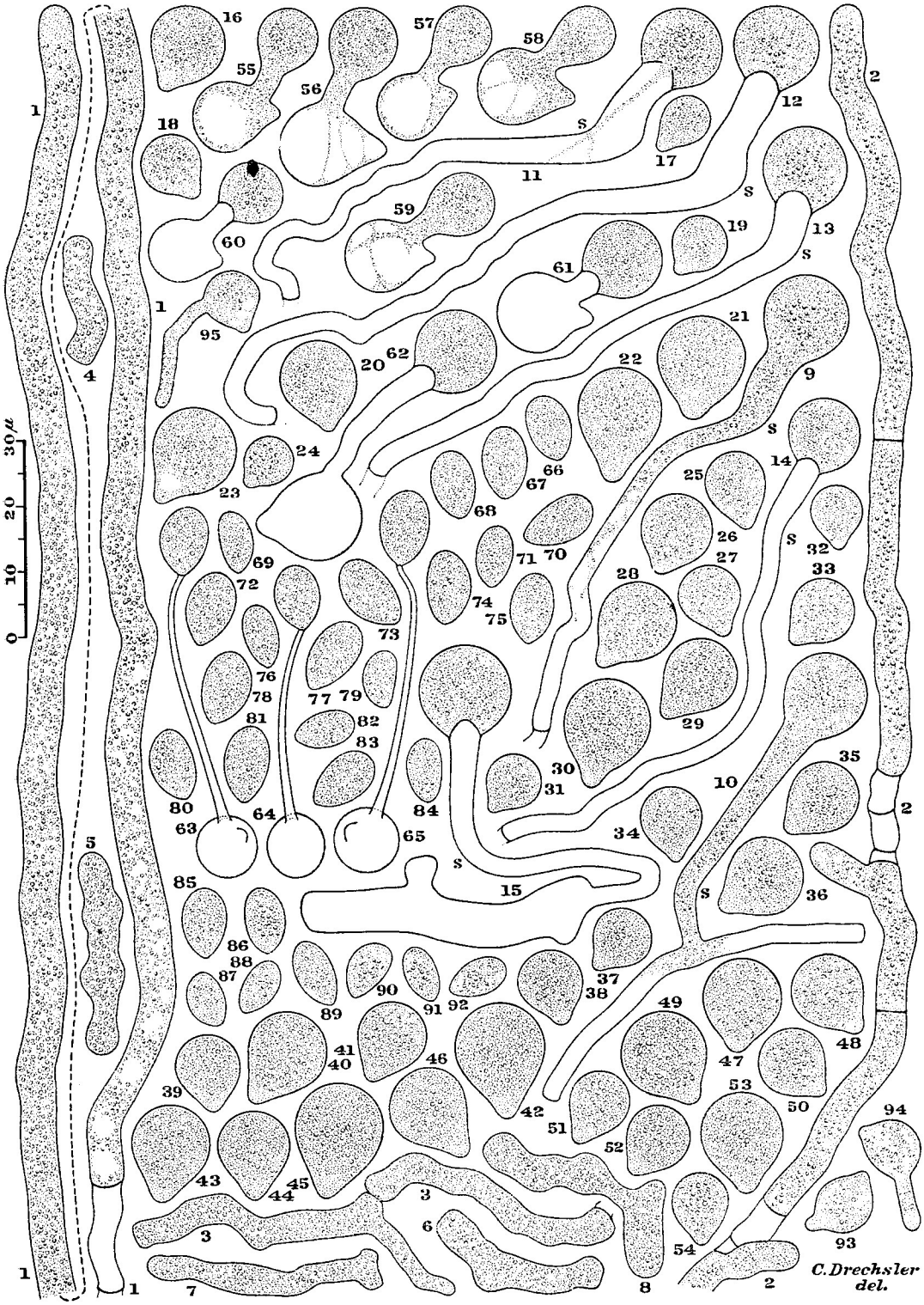
FIGS. 1–95.—*Conidiobolus pumilus* as found in Petri plate cultures of maize-meal agar; drawn at a uniform magnification with the aid of a camera lucida; × 1000: 1, Terminal segment of a main hypha at margin of an actively growing mycelium, shown in two sections whose proper connection is indicated by a broken line; 2, terminal portion of a main hypha at margin of a growing mycelium 45 minutes after material was mounted on a microscope slide and covered with a cover glass; 3, two adjacent hyphal segments in older region of an extensive mycelium; 4–8, individual hyphal segments in central area of an extensive mycelium; 9–11, conidiophores on which globose conidia are being formed (s, surface of substratum); 12–15, conidiophores bearing mature globose conidia (s, surface of substratum); 16–54, detached globose conidia showing variations in size and shape; 55–59, detached globose conidia that are each giving rise to a secondary globose conidium; 60–62, detached globose conidia that have each produced a secondary globose conidium; 63–65, globose conidia that have each produced an elongated secondary conidium on a slender conidiophore; 66–92, detached elongated conidia; 93–95, globose conidia that are each germinating by emission of a vegetative germ hypha.




FIGS. 1-95.—(See opposite page for legend).