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A NEW SPECIES OF RHOPALOMYCES OCCURRING IN FLORIDA

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About 25 days after they had been planted with portions of softened stem or root of bean (*Phaseolus vulgaris* L.) seedlings kindly collected by W. D. Moore near Fort Lauderdale, Florida, on February 17, 1953, more than a dozen maizemeal-agar plate cultures began to show development of a species of *Rhopalomyces* apparently different from any congeneric form hitherto described. The fungus must presumably have originated from Florida, for the seedlings had been received at the Plant Industry Station in a tightly wrapped package, and after the wrapping had been removed the specimens were given adequate protection against contamination by microorganisms in the laboratory. In preparing the young plants for the isolation of any root-rotting oomycetes that might have caused the softening of their cortex they had not been subjected to surface disinfection. Mycelium of *Pythium spinosum* Sawada (1927) had promptly grown out from all the pieces of seedling tissue. Soon various eelworms and rhizopods had multiplied actively in the cultures, with the result that after approximately 10 days predacious and parasitic fungi destructive to these animals had developed increasingly. Different kinds of saprophytic fungi thereupon also came to light, among them being the new *Rhopalomyces,* which arrested attention by bearing its spores distally in a striking hemispherical arrangement; the lower half of the enlargement at the tip of each conidiophore remaining nude and exposed to view (fig. 1, a). A term having reference to its characteristic half-covered appearance may serve as an appropriate epithet for the fungus.

Rhopalomyces semitectus Drechsler sp. nov. Oculo nudo inconspicuus; fertilibus hyphis rigidis, erectis, fuligineis, plerumque raris, vulgo solitariis sed interdum bigeminis, saepe 800–1000 μ altis, magnam partem cylindricis et 9–12 μ latis, apice in caput sporiferum latescentibus; sporifero capite obovoideo, saepe 65–70 μ longo, 45–53 μ lato, deorsum nudo, sursum in apicibus multorum sterigmatum multa (saepe 110–150) conidia ferente; sterigmatis verruciformibus, 2.5–4 μ altis, 2–3 μ latis; conidiis fuligineis, irregulariter elongato-ellipsoideis, 25–35 μ longis, 7–9 μ latis.

Habitat in radicibus *Phaseoli vulgaris* putrescentibus prope Fort Lauderdale, Florida.

Uusually inconspicuous to the naked eye; conidiophores rigid, erect, light brown, mostly rather sparsely scattered, commonly solitary but sometimes arising in pairs, often 800 to 1000 μ high, for the most part 9 to 12 μ wide,

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widening distally into a sporiferous enlargement; sporiferous enlargement obovoid, often 65 to 70 μ long and 45 to 53 μ wide, beset on the distal or hemispherical surface with many (often 110 to 150) wart-like protuberances, commonly 2.5 to 4 μ high and 2 to 3 μ wide, on each of which a single conidium is borne radially; conidia light brown, somewhat irregularly elongate ellipsoidal, 25 to 35 μ long, 7 to 9 μ wide.

Occurring in decaying roots of *Phaseolus vulgaris* near Fort Lauderdale, Florida.

The obovoid shape of the sporiferous enlargement in *Rhopalomyces semitectus* and the development of conidia only on the distal hemispherical surface would seem to distinguish the Florida fungus sufficiently from all congeneric forms known. In Corda's (1839, pl. 2, fig. 3, 4) impressive illustrations of his *R. elegans*, on which species the genus was erected, the terminal enlargement is of subspherical form, and is everywhere beset with sterigmata. Spherical shape of the sporiferous enlargement and distribution of sterigmata everywhere on its surface are evident also in an illustration that Costantin (1888, p. 37, fig. 5: 1, b) gives of his *R. nigripes*. Thaxter (1891) describes the large head of his *R. strangulatus* as being perfectly spherical and in an accompanying figure (1891, pl. 3, fig. 5) shows sterigmata everywhere on its surface. Berlese (1892) characterizes the "vesicula" of his *R. magnus* as "perfecte globosa," and in a relevant illustration (Berlese 1892, pl. 10, fig. 27) shows sterigmata arranged about as closely on its proximal surface as in its equatorial and distal regions. The "vesicula" of *R. macrosporus* Marchal (1893) likewise is set forth as being spherical and as bristling with sterigmata over its entire surface.

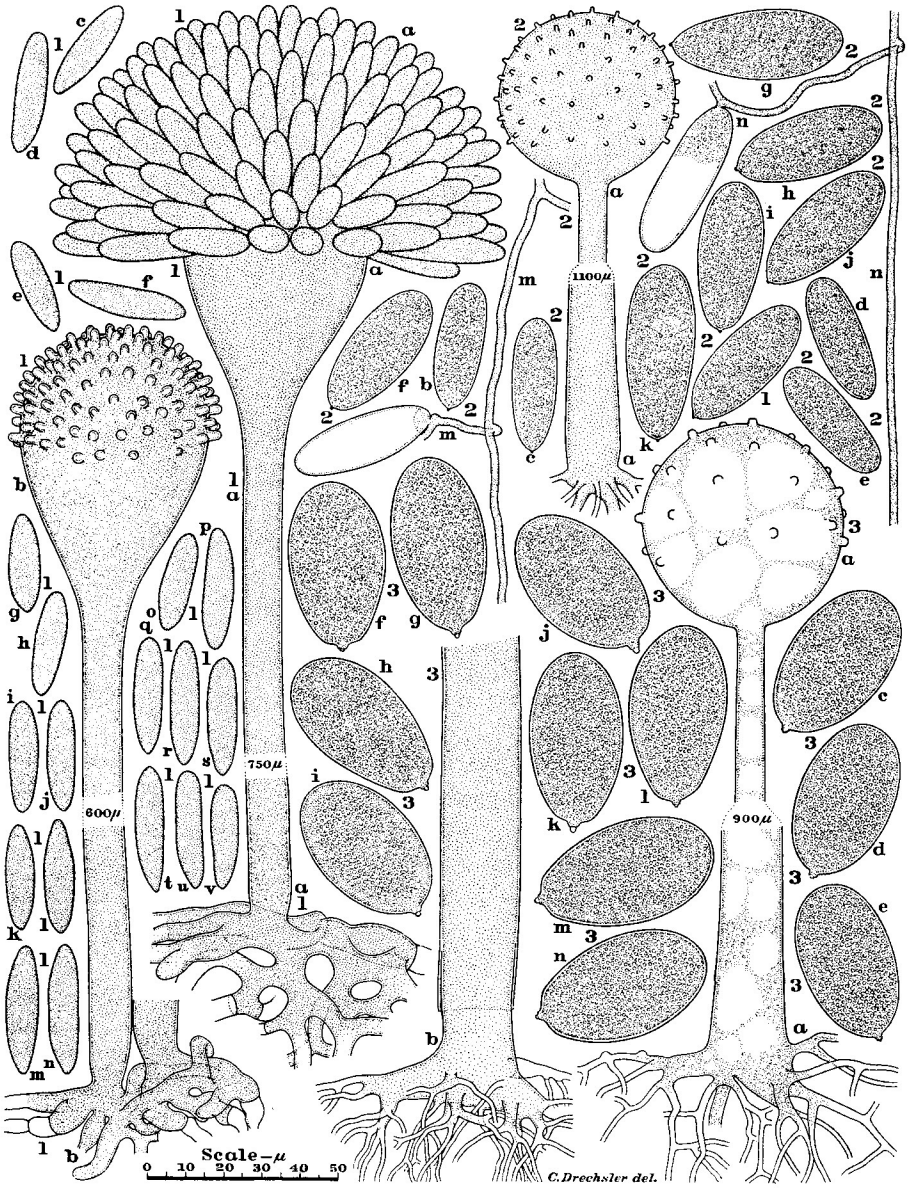
In the Petri plate cultures I have prepared for many years by planting discolored roots or decaying vegetable detritus on maizemeal-agar plates 2 species of *Rhopalomyces* have developed repeatedly, one of them (fig. 2, a–n) agreeing tolerably with the description of *R. elegans* and the other (fig. 3, a–n) with that of *R. magnus*. The sporiferous enlargement in both of these species always appears spherical, its circular outline merging abruptly, rather than gradually, with the outline of the supporting shaft (fig. 2, a; 3, a). When a conidiophore in either species reaches full maturity the enlargement is completely concealed within a handsome subspherical mantle of radially arranged conidia. Nevertheless, when in my cultures the mature conidia have fallen off, the denuded head in many instances is found devoid of sterigmata in a proximal zone of readily noticeable extent (fig. 2, a; 3, a). Apparently the proximal barrenness so conspicuous in the terminal enlargements of *R. semitectus* is not wholly alien to *R. elegans* and *R. magnus,* though in these 2 species the barren areas are usually concealed by the conidia directed radially downward from sterigmata found well below the equator of the enlargement.

While in *Rhopalomyces elegans* and *R. magnus* very little mycelium near

the base of a mature sporophore shows pronounced modification, the circumbasal hyphae in *R. semitectus* become widened and colored for distances of 10 to 50 μ. In the empty filaments partitions are visible here and there (fig. 1, a, b), having apparently been laid down, after the manner usual in many phycomycetes, as retaining walls marking successive stages in the evacuation of protoplasm from the subjacent mycelium. Similar partitions were observed by Marchal in old mycelium of *R. macrosporus*. Owing apparently to better anchorage provided through more extensive widening and induration of the circumbasal hyphae in *R. semitectus,* the sporophores of this fungus often remain standing erect for weeks, whereas those of *R. elegans* and *R. magnus* commonly will fall over in a few days. When eventually a sporophore of *R. semitectus* falls over on an agar substratum its relatively thick-walled terminal enlargement usually retains its original shape, and its sterigmata, apparently larger and sturdier than the sterigmata of any known congeneric species, long remain without any visible change. When a sporophore of *R. elegans* or of *R. magnus* topples, its apical enlargement more often collapses or becomes badly deformed, and soon afterwards its sterigmata tend to vanish from sight.

The conidia of *Rhopalomyces semitectus* (fig. 1, c–v) are markedly smaller than those of *R. elegans* (fig. 2, b–l), *R. magnus* (fig. 3, c–n), and *R. macrosporus*. They would seem, in general, somewhat shorter than the conidia of *R. strangulatus*. From the conidia of *R. nigripes*, however, they evidently differ rather little with respect to dimensions. They nearly always present haphazard irregularities of outline and consequently lack the symmetry of form usual in the conidia of congeneric species. Once they are detached their proximal and distal ends are not always readily distinguished. The spores have not so far been seen to germinate.

However, some of my Petri plate cultures in which *Rhopalomyces elegans* developed showed abundant germination of the conidia of that species. Germination here entails, as an initial step, the yielding of the conidial envelope in a small circular area at the proximal end and adjacent to the hilar scar or protuberance. From the single orifice 2 germ hyphae are extended at a wide angle (fig. 2, m, n). These hyphae, aseptate and mostly 2 to 2.4 μ wide, readily anastomose with the similar germ hyphae (fig. 2, m, n) produced by neighboring conidia. Where numerous conidia germinate in scattered positions an extensive but somewhat scanty mycelium, colorless, continuous, sparsely branched and haphazardly anastomosed, is brought into being. In Petri plate cultures where mature sporophores have toppled over, so that large conidial clusters have been prostrated on the moist agar substratum, the many germ hyphae extended from all conidia in a cluster may anastomose to form a single closely-knit unit that soon sends up a new conidiophore bearing a new head of conidia. Thus, through simultaneous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germination and abundant fusion of germ hyphae, repetitional reproduction not of individual spores but of capitate spore clusters is spectacularly achieved.

In setting forth his view that *Rhopalomyces magnus* did not differ enough from *R. elegans* to merit recognition as a separate species Marchal stated that Thaxter had ascribed to *R. elegans* dimensions as large as those of *R. magnus*. This statement appears not strictly true with respect to conidial width. Thaxter (1891) from observations on various substrata, including bones, dung, potatoes and squash rind, gave 35–55 × 11–22 μ as the spore dimensions of Corda's species; whereas in the diagnosis of *R. magnus* spore measurements of 48–52 × 25 μ were given. In my culture the conidia of the species herein identified as *R. magnus* have commonly been 45 to 51 μ long and 24 to 28.5 μ wide. Although Berlese characterized the conidia of *R. magnus* as being minutely papillate at the base, the basal protrusion in conidia of the American fungus (fig. 3, c–n) considered as belonging to this species is decidedly wider and more prominent than the hilar protuberance often noticeable in the narrower conidia held referable to *R. elegans* (fig. 2, b-1). The sporophores in my material of *R. elegans* usually bear about 100 conidia, whereas three mature sporophores selected at random in my cultures of *R. magnus* were found to have produced 38, 42, and 46 conidia, respectively.

In widening out gradually into its obovoid terminal enlargement the sporophore of *Rhopalomyces semitectus* presents especially strong contrast with the sporophore of *R. strangulatus,* which becomes sharply constricted into a slender neck before swelling abruptly to form a very massive spherical head. As the original description of *R. strangulatus* sets forth the sporophores as being pure white, but does not state whether the spores borne on them are colorless, colored or dark, Berlese suspected that the conidia were probably hyaline, and accordingly proposed that the fungus be excluded from Corda's genus. The proposal, though with some justification at the time, apparently was not urged further and may well have been abandoned after Thaxter (1903, p. 102) stated that all species of *Rhopalo-*

FIG. 1. *Rhopalomyces semitectus:* a, sporophore laden with conidia; b, denuded sporophore; c–v, random assortment of detached conidia. FIG. 2. *Rhopalomyces elegans* as found in a maizemeal-agar plate culture planted with a diseased lupine (*Lupinus* sp.) seedling taken from a greenhouse near Beltsville, Maryland, in February, 1950: a, denuded sporophore; b-l, detached conidia; m, n, two conidia with germ hyphae that have anastomosed with other germ hyphae. FIG. 3. *Rhopalomyces magnus:* a, denuded sporophore produced in a maizemeal-agar culture planted with vegetable detritus collected near Greeley, Colorado, in September, 1943; b, base of sporophore found in a Petri plate culture planted with a small quantity of decaying potato (*Solanum tuberosum* L.) leaves collected near Presque Isle, Maine, in October, 1943; c–e, conidia from the Colorado culture; f–n, conidia from the Maine culture. Owing to lack of space median portions of indicated lengths are omitted from the sporophores shown in figure 1, a; figure 1, b; figure 2, a; and figure 3, a. All figures × 500.

myces have dark spores. Thaxter's extraordinarily large fungus may appear less incongruous with other members of the genus by considering its resemblance to a much more commonplace species that developed very sparingly in a maizemeal-agar plate culture that had been planted with a small quantity of leaf mold collected in deciduous woods near Park Falls, Wisconsin, on November 17, 1954.

When the Wisconsin fungus came under observation all of its sporophores, only 16 in number, had already toppled over on the moist agar substratum. They appeared uniformly of medium brown color. Individually they consisted in large part of a hyphal shaft, about 1 millimeter long, that from the base almost to the tip commonly varied between 15 and 19 μ in diameter (fig. 4, a). In each sporophore, however, a distal portion, usually

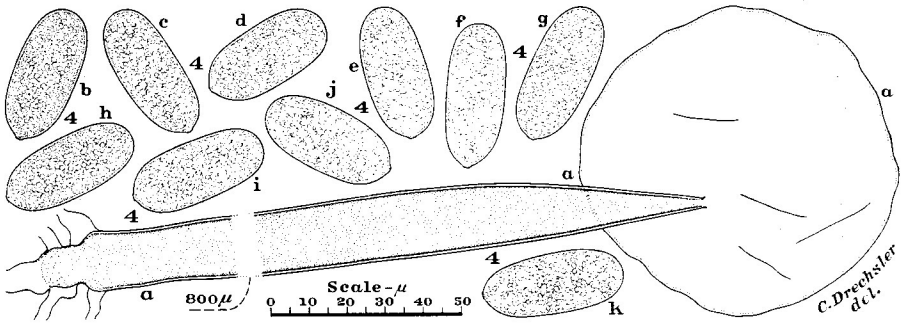

FIG. 4. *Rhopalomyces* sp. obtained from Wisconsin material: a, prostrate sporophore with collapsed membranous envelope of denuded terminal enlargement flattened on substratum; b–k, detached conidia, showing usual variations in size and shape. Owing to lack of space a median portion 800 μ long is omitted from the sporophore shown in figure 4, a. All parts × 500.

60 to 75 μ long, tapered upward to a width of 2.5 μ at the junction of the tubular neck with the globose enlargement, thereby presenting distinctive parallelism with the less gradual constriction characteristic of *Rhopalomyces strangulatus*. Unfortunately the terminal enlargement had collapsed in all instances, but since its flattened envelope measured usually about 80 μ across, the diameter of the head in a living state may have been approximately 55 μ. Strewn thickly around the collapsed enlargements were numerous dark brown conidia with hemispherically rounded ends (fig. 4, b–k). These spores measured 25 to 28 μ in length and 15 to 18 μ in width. Except for a slight basal protuberance, they showed individually a smooth symmetrical outline. They revealed somewhat indistinctly the rather minutely globulose internal structure often observable in conidia of *R. elegans* and *R. magnus*. The fungus thus appeared unquestionably referable to Corda's genus.

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