CHAPTER 40

## *PLECTOSPIRA* Drechsler
J. Agric. Res. 34:294. 1927

"Mycelium slender, sparingly or moderately branched. Zoosporangia composed of inflated elements, often compacted into an irregular complex, within which zoospores are differentiated in two or more series, together with a prolonged filamentous element within which zoospores are formed in one series and by which the entire organ is evacuated. Zoospores encysting at the mouth of the efferent hypha, later escaping from their cysts and swarming. Oogonia intercalary or terminal. Antheridia absent or present. Oospores single and somewhat eccentric (subcentric) in internal structure." (Drechsler, *loc. cit*.)

### *Plectospira myriandra* Drechsler
J. Agric. Res. 34:294, figs. 1, 2. 1927

"Mycelium 1.8 μ to 6 μ in diameter. Inflated elements of sporangia 6 to 18 μ in diameter; efferent hyphae usually 5 μ to 10 μ at base, generally tapering more or less to a diameter 3.5 μ to 4.5 μ at tip. Sporangia sometimes very extensive and compound; then provided with plural efferent hyphae, each delivering up to an approximate maximum of 500 zoospores. Zoospores, after encystment, 6 μ to 12 μ in diameter, usually 9 μ to 10 μ, developing a papilla 2.5 μ to 3 μ in diameter and 1 μ long, the cylindrical wall of which after evacuation persists on the empty cyst wall. Oogonium mostly terminal on short branches, more rarely laterally intercalary or intercalary, subspherical, smooth, 15 μ to 33 μ in diameter, usually 23 to 29 μ, provided with a wall generally approximately 0.5 μ more rarely up to 1 μ in thickness. Antheridia absent, or frequently 25 to 55 in number, mostly rudimentary, the smallest approximately 3 μ in diameter and 5 μ in length, often without delimiting septum; the largest, up to 6.5 μ in diameter and 25 μ in length, delimited by septum and often potentially functional in appearance; mostly straight, distended cylindrical or curved cylindrical; diclinous in origin, borne in close arrangement on a number of branching systems arising from delicate hyphae. Oospore, single, 13 μ to 30 μ, usually 20 μ to 27 μ in diameter, provided with a wall 1.1 μ to 1.9 μ, usually 1.5 μ in thickness, slightly eccentric in internal structure." (Drechsler, *loc. cit*.)

CONFIRMED RECORD: -- UNITED STATES: Drechsler (*loc. cit*.)

### *Plectospira gemmifera* Drechsler
J. Agric. Res. 38:358, figs. 15-17. 1929

"Mycelium 2 to 7 μ in diameter. Inflated sporangial elements 6 to 20 μ in diameter; efferent hyphae usually 5 to 10 μ at base, tapering generally to a diameter of 3 to 5 μ at tip. Sporangia sometimes very extensive, then often provided with plural efferent hyphae of which several may function, each delivering up to 400 or more zoospores. Gemmae produced in quantity, typically subspherical or pyriform, 35 to 60 μ (average 44.7 μ) in diameter; germinating without resting period, often as a sporangium, then giving rise to 25 to 100 zoospores, sometimes with the production of several supernumerary evacuation hyphae in addition to the one or two functional ones, or, especially after aging several months, germinating directly by the production of one or several vegetative hyphae. Zoospores on encystment usually 7 to 10 μ, in oversized examples up to 17 μ, in diameter; diplanetic, the cyst membrane after evacuation revealing a persistent cylindrical papillar modification approximately 2.5 μ in diameter. Oogonia mostly terminal on short branches or on longer hyphae, subspherical, 22 to 29 μ (average 25.2 μ) in diameter, provided with a wall 0.5 to 1 μ in thickness. Antheridia always present, 20 to 45 visible in upper and equatorial aspects, the total number probably ranging from 30 to 65 or more; mostly rudimentary, the smaller ones approximately 3 μ in diameter and 5 μ in length and usually without delimiting septum, the larger ones up to 8 μ in diameter and 15 μ in length, delimited by septum and evidently capable of function; mostly straight distended cylindrical, or curved cylindrical; borne in close arrangement on branches enveloping the oogonium, which arise from one or less often two or more hyphae separate from the hypha bearing the female organ. Oospore single, colorless, usually 19 to 25 μ (average 21.9 μ) in diameter, provided with a wall 1.1 to 1.8 μ (average 1.5 μ) in thickness, slightly eccentric (subcentric) in internal structure." (Drechsler, *loc. cit*.)

CONFIRMED RECORD: -- UNITED STATES: Drechsler (*loc. cit*.)

With the removal of *Plectospira dubia* (D. Atkins, 1954b) and its assignment to the Haliphthoraceae as the type genus of Vishniac's (1958) *Atkinsiella* [*see* Sparrow and Gotelli (1969) who found septate thalli in *A. dubia* and thus believed the species to be eucarpic], the genus retains only the two species originally described by Drechsler. *Plectospira myriandra* was isolated from rootlets of *Lycopersicum esculentum* Mill. growing in a greenhouse, and *P. gemmifera* from a rootlet of *Saccharum officinarum* L. Neither has been again collected, hence the only existing descriptive matter is that provided by Drechsler.

In general vegetative and asexual habit, the species of *Plectospira* are much like members of *Aphanomyces*. The behavior of discharged spores certainly recalls representatives of de Bary's genus, but sporangium structure would appear to separate the two genera. The basal complex of lobed, cylindrical, or inflated elements from which one or more evacuation hyphae (efferent filaments) develop separates *Plectospira* species from those of *Aphanomyces*. In the Plectospiras, the spores are in two or more rows in the inflated basal portions of the sporangium complex, but in a single row in

the evacuation hypha. It appears that both species in the genus generally produce an abundance of antheridial branches, and these characteristically enwrap the oogonia (more so in *P. gemmifera* than in *P. myriandra*).

As the figures provided by Drechsler show, the oospores are subcentric, and possess a single, very obvious "pellucid spot." Drechsler (1929:356) was not certain whether *Plectospira gemmifera* produced fertilization tubes, nor did he report any such structures in *P. myriandra*. Of the latter he wrote (1927:292) that the oospores in oogonia provided with attached antheridial branches were "… considerably slower in maturing and slightly more subject to degeneration…" than the parthenogenetic ones. He concluded that oosporogenesis was not dependent upon antheridial function.

In *Plectospira gemmifera*, the oogonia are evidently unpitted, but in *P. myriandra*, some were described by Drechsler (1929) as having minute, scattered, pit-like depressions in the wall. As these were not as large and conspicuous as ones ordinarily found in saprolegniaceous fungi, he was reluctant to view them as true pits. *Plectospira gemmifera* produces gemmae but *P. myriandra* does not, and the former appears to have a greater degree of sporangial lobe and branch development than does the latter. The evacuation or efferent hyphae, Drechsler believed, were homologous with the filamentous sporangia of *Aphanomyces* species, but the lobed complex from which these efferent filaments developed had no homologue in species of de Bary's genus.

It is quite surprising that these two species of *Plectospira* have not been collected subsequent to Drechsler's discovery of them, and especially so since nearly fifty years of intervening work by phytopathologists has not yielded specimens. It is possible, of course, that these fungi have indeed been recovered, but simply were mistaken for species of *Aphanomyces* (because of the pattern of spore discharge). In any case, one of us (RLS) has cultured many soil samples from localities in Hawaii (where the late F. K. Sparrow reported earlier (communication) that Plectospiras were abundant), but without success. Indeed, we have not found any representatives of the genus in over ten years of collecting in a wide variety of geographical areas and habitat types.

*Plectospira* sp.

RECORDED COLLECTIONS: -- CUBA: Sparrow (1952a). UNITED STATES: Scott (1960b), Sparrow (1965).

Scott (1960b) stated that the specimens he collected produced asexual structures like those of *Plectospira* species, but he saw no oogonia or antheridia. It is unfortunate that neither Scott nor Sparrow provided illustrations or descriptions of their material.