

## A NEMATODE-CAPTURING PHYCOMYCETE FORMING CHLAMYDOSPORES TERMINALLY ON LATERAL BRANCHES

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(WITH 1 FIGURE)

The genus *Cystopage* was erected in the Zoopagaceae for fungi that subsist by capturing microscopic animals through adhesion to aseptate filamentous hyphae and that reproduce by forming chlamydospores on or in the substratum (1). Three species that I assigned to the genus under the binomials *C. subtilis* (1), *C. ellipsozona* (3) and *C. sphaerospora* (3) are habitually destructive to terricolous rhizopods; while the 2 more robust congeneric forms which I presented under the names *C. lateralis* (1) and *C. intercalaris* (2), signaling the positional relations of their chlamydospores, always prey on free-living nematodes. Another species predacious on eelworms is here described as a sixth member of the genus, under an epithet which, being compounded of 2 words (*κλαδος, σπορα*) meaning "branch" and "seed," respectively, is similarly intended to indicate the usual position of the reproductive bodies.

### *Cystopage cladospora* sp. nov.

Mycelium parce expansum; hyphae incoloratae, continuae, parce ramosae, plerumque 3-6  $\mu$  latae, vermiculos nematoideos glutino primum incolorato mox flavo tenentes, integumentum cujusque animalis capti perforantes, ramulos assumptentes vulgo 2-3  $\mu$  crassos intus evolventes qui carnem exhauriunt; chlamydosporae plerumque sufflavae, globosae vel ellipsoideae, vulgo 20-30  $\mu$  in diametro, protoplasmatis valde granulosis repletae, muro primum levi postremo saepe aliquid undulato circumdatae, plerumque ex ramis rectis vel pravis 2-60  $\mu$  longis et 3-6  $\mu$  latis apice ortae, rarerent paulum (5-25  $\mu$ ) infra apicem rami ejusdem modi interpositae, etiam rarerent ex hyphis longis a latere oriundae vel in hyphas longas intercalatae.

Mycelium sparse but often extensive; mycelial hyphae colorless, continuous, sparingly branched, usually 3 to 6  $\mu$  wide, by means of an adhesive secretion at first colorless but later turning golden yellow capturing motile nematodes, then penetrating the integument of each captive with an infective tube that gives rise to assimilative branches

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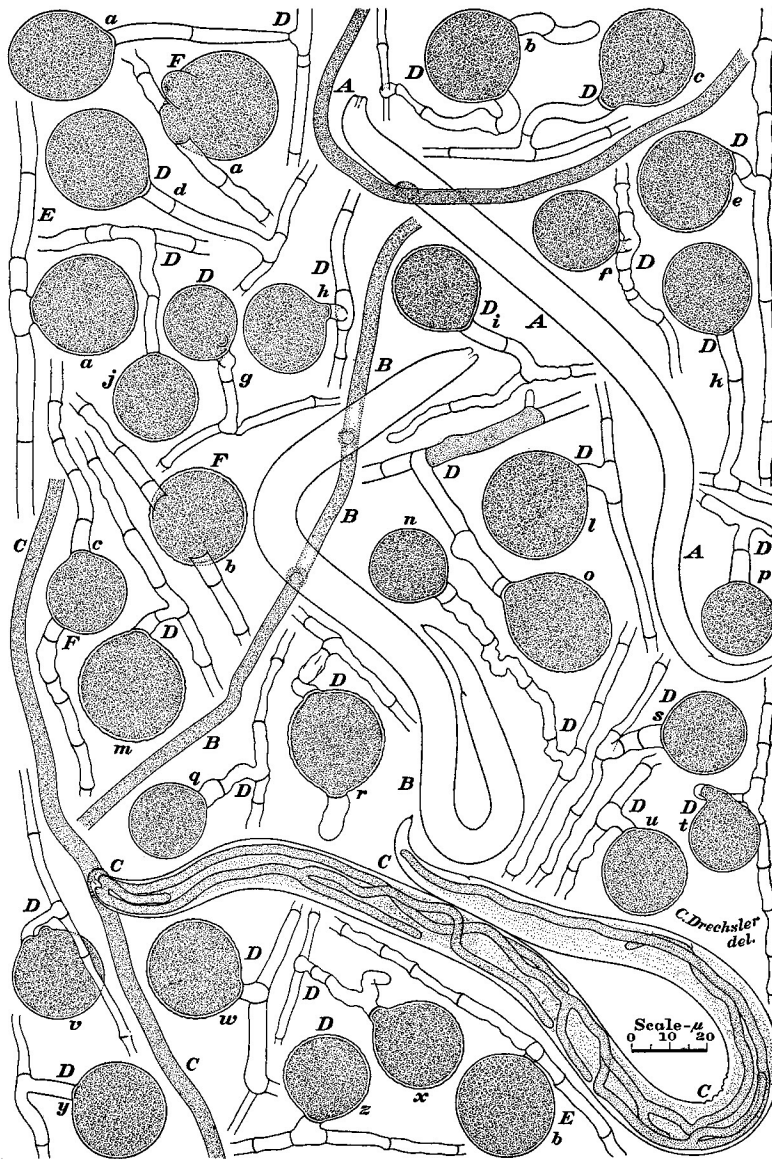


FIG. 1, A-F.

FIG. 1. *Cystopage cladospora* as found in maize-meal-agar plate cultures between 57 and 63 days old;  $\times 500$  throughout. A, B. Portions of mycelial hyphae, each with a newly captured specimen of *Plectus parvus*. C. Portion of hypha from which a captured specimen of *Plectus parvus* has been invaded by assimilative

commonly 2 to 3  $\mu$  wide, which appropriate the fleshy contents; chlamydospores at maturity usually yellowish, globose or ellipsoidal, commonly 20 to 30  $\mu$  in diameter, filled with densely granular contents, surrounded by a wall that is first smooth but later often becomes noticeably undulated, usually borne singly and terminally on straight or somewhat crooked branches mostly 2 to 60  $\mu$  long and 3 to 6  $\mu$  wide, occasionally borne intercalarily on such branches 5 to 25  $\mu$  from the tip, and occasionally, too, formed in lateral or intercalary position on the main mycelial hyphae.

Capturing and consuming nematodes of many species (including *Plectus parvus* Bastian) it occurs on decaying roots of various herbaceous plants and in decaying leaves of deciduous trees (*Quercus*, *Acer*) near Beltsville and College Park, Maryland.

*Cystopage cladospora* was first observed in maize-meal-agar plate cultures which after being overgrown by *Pythium ultimum* Trow had been further planted with small quantities of leaf mold from deciduous woods near Beltsville. It was found also in some Petri plate cultures prepared for the isolation of pathogenic oomycetes from decaying roots of lamb's quarters (*Chenopodium album* L.) and sheep sorrel (*Rumex acetosella* L.) collected on the grounds of the Plant Industry Station on August 18, 1955. All drawings of the fungus given in FIG. 1 were made between December 7 and December 13, 1955, from Petri plate cultures that had been planted on October 11, 1955, with discolored clearweed (*Pilea pumila* (L.) Gray) roots gathered near College Park. As the 2-month-old cultures had been protected against evaporation by being kept tightly covered with a battery jar, the substratum at the time was still moist and soft, permitting ready locomotion of the numerous eelworms present, most of which seemed referable to *Plectus parvus*. Capture of the animals by living hyphae of the fungus was still continuing actively, though the extensive distribution of well-matured chlamydospores on emptied tracts of mycelium showed that destruction of eelworms and reproductive development must have been proceeding for many days.

The mycelial hyphae of *Cystopage cladospora*, like those of *C. lateralis* and *C. intercalaris*, are among the widest produced by animal-capturing members of the Zoopagaceae. In extending radially from decaying

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branches extending from head to tail. *D.* Portions of mycelium, *a-z*, each showing a chlamydospore borne on a short lateral branch; in two instances, *b* and *r*, the chlamydospore is found in subterminal position; in all other instances it is borne terminally. *E.* Portions of main hyphae, *a* and *b*, each with a lateral chlamydospore. *F.* Portions of main mycelial hyphae, *a-c*, each showing an intercalary chlamydospore.

material planted on a suitable agar substratum they show haphazard directional deviations in greater measure than mycelial filaments of *C. lateralis*. Capture of eelworms is effected by them through adhesion of the animals usually in 1 (FIG. 1, *A*) or 2 places (FIG. 1, *B*), but in some instances an animal is found affixed in 3 or 4 places. After narrow penetration of its integument in the adhering area the captive is invaded throughout by assimilative branches (FIG. 1, *C*), which become clearly discernible only when the materials resulting from the destruction of musculature and organs have largely been absorbed by them and conveyed backward into the parent mycelial filament. After the animal's fleshy contents have been wholly expropriated and the assimilative branches have been evacuated through progressive withdrawal of their protoplasm into the parent hypha, the empty integument of the nematode and the empty tubular membranes within it fade completely from sight.

*Cystopage cladospora* is distinguished from *C. lateralis* and *C. intercalaris* by its production of chlamydospores mainly on short lateral branches (FIG. 1, *D*, *a-z*). Most often the chlamydospores are formed terminally on the branches (FIG. 1, *D*, *a*, *c-q*, *s-z*) but in scattered instances they develop subterminally (FIG. 1, *D*, *b*, *r*). Development of chlamydospores laterally on the main hyphae—a feature especially characteristic of *C. lateralis*—can be observed only rarely in *C. cladospora* (FIG. 1, *E*, *a*, *b*). Their intercalary development in the main hyphae (FIG. 1, *F*, *a-c*) after the manner usual in *C. intercalaris* is likewise uncommon in the present fungus. To supply the growing reproductive body, a lengthy adjacent stretch of mycelial filament becomes progressively emptied, and, as in related species, retaining walls, marking successive stages in the withdrawal of protoplasm, are laid down at intervals. When newly formed, the chlamydospores of *C. cladospora* have a smoothly rounded outline (FIG. 1, *D*, *a*, *b*, *d*), but after several days they often present a noticeably undulated contour (FIG. 1, *D*, *m*, *o*, *r*). If, as seems probable, the wrinkling of the wall, or of an outer layer of the wall, results from shrinkage of the globose body, the shrinkage cannot well be attributed to desiccation. In the clearweed-rootlet cultures the chlamydospores acquired undulated sculpture while they were imbedded in agar moist enough to permit lively movement of eelworms.

Because of the less common hyphal relations of its chlamydospores *Cystopage cladospora* may be considered more distinctive than *C. intercalaris*, *C. ellipsospora* and *C. sphaerospora*. The new species would seem, however, not quite as distinctive or quite as readily identifiable as *C. lateralis*, which it was intended to establish as type of the genus by having its diagnosis directly follow the generic diagnosis. Since

according to a recent version of the rules governing botanical nomenclature (4) such arrangement of text has no relevant merit, occasion is here taken belatedly to designate *C. lateralis* as type species of *Cystopage*.

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