A new nematode-destroying Harposporium with slender helicoid conidia

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Among the hyphomycetous endoparasites destructive to eelworms that abound in slowly decaying plant materials, as well as in agar plate cultures earlier inoculated with partly decomposed vegetable detritus, *Harposporium anguillulae* Lohde emend. Zopf (1888) is observed much more frequently than allied forms. In seeking an explanation for this more frequent occurrence it would seem highly significant that *H. anguillulae* nearly always gives rise, within the dead host animal, to a considerable number of chlamydospores capable of persisting through long northern winters and other unfavorable periods; whereas chlamydospores are presumably absent in 10 of the 11 parasites hitherto described as additional members of the genus erected by Lohde (1874). Of the several species devoid of chlamydospores, some appear entirely lacking in visible protective modification for enduring through adverse times; while others have such limited protection as is provided, for example, by the slightly indurated portions of assimilative mycelium found in *H. diceraeum* Drechsler (1959) and *H. dicorymbum* Drechsler (1963), or by the cylindrical arthrospores so far known to occur only in *H. bysmatosporum* (Drechsler (1954). A recently described species, *H. cycloides* Drechsler (1968), produces well-differentiated chlamydospores, though much less constantly and less abundantly than *H. anguillulae*. Scanty, haphazard development of chlamydospores likewise occurs in a fungus that merits presentation as a new congeneric species under a specific epithet compounded of two words (λεπτόν σπετρα) meaning "slender" and " coil," respectively.

Harposporium leptospira sp. nov.

Hyphae assumentes incoloratae, intra vermiculos nematoideos viventes evolutae, parce vel mediocriter ramosae, plerumque 2—3μ crassae, primum saepe parce septatae sed deinde vulgo mediocriter septatae. Hyphae fertiles incoloratae, extra animal emortuum evolutae, procumbentes vel in aerem ascendentes, plerumque 20—100 μ longae, 1.5—2.5 μ latae, in cellulis saepius 7—20 μ longis consistentes; cellula terminalis in sterig-

mate vulgo 1.2—1.8 μ longo et 0.5—0.7 μ crasso conidia ferens, aliae cellulae a lateribus 1—4 ramulis conidiferis praeditae; ramuli conidiferi (phialae) globosi vel obovoidei vel elongato-ellipsoidei, plerumque 2.2—3.2 μ longi et 2.2—3 μ lati, nonnulla conidia in apice sterigmatis deinceps ferentes. Conidia incolorata, filiformia, in spiram helicoideam laxam convoluta, plerumque 8—12 μ longa, 0.5—0.8 μ lata. Chlamydosporae in hyphis assumentibus parciter oriundae, in maturitate flavidae, leves vel leviter asperae, continuae vel 1—3-septatae, globosae vel cylindricae, ad septa vulgo constrictae, plerumque 4.5—25 μ longae, 4—7 μ latae.

Vermiculos nematoideos generis Bunonematis necans habitat in acervis foliorum graminum (magnam partem *Poae pratensis)* putrescentium prope College Park, Maryland. Typus: Figura 1, A—L.

Assimilative hyphae colorless, developing within free-living nematodes, often (especially in small host animals) rather sparingly branched, moderately septate, mostly 2—3 μ wide. Conidiophores colorless, growing out from dead host animal, sometimes procumbent on the adjacent materials, sometimes thrust ascendingly into the air, mostly 20—100 μ long, 1.5—2.5 μ wide, consisting of cells often 7—20 μ long; the terminal cell producing conidia on a distal sterigma usually 1.2—1.8 μ long and 0.5—0.7 μ wide; the other cells bearing 1—4 conidiferous branches (phialides) laterally; these conidiiferous branches commonly globose or obovoid or elongate-ellipsoidal, mostly 2.2—3.2 μ long and 2.2—3 μ wide, each giving rise usually on a single sterigma to several conidia that sometimes cohere in a subglobose mass. Conidia colorless, filiform, convolved in a loose helicoid spiral of approximately 1.3 windings, mostly 8—12 μ long (when measured as if straightened), 0.5—0.8 μ wide. Chlamydospores formed (usually rather sparingly) within some dead host animals, generally intercalary, slightly yellowish when mature, smooth or slightly rough, globose or cylindrical, continuous or divided by 1—3 transverse septa, commonly somethat constricted at the septa, mostly 4.5—25 μ long and 4—7 μ wide.

The cultures in which *Harposporium leptospira* came to light were inoculated with matted material taken late in July, 1968, from large heaps of lawn clippings that during the preceding month had been dumped on moist ground to underdo decomposition. Hitherto the fungus has never been observed among the many nematode-destroying parasites that usually develop abundantly in cultures inoculated with the mixture of decaying leaf and stem fragments commonly found lodged between bases of grass culms in fields or in roadside tussocks. With respect to ecological adaptation, the fungus thus shows some parallelism with the nematode-strangulating *Dactylella heterospora* Drechsler (1943, 1952), which likewise has been obtained from piles of lawn clippings and of garden weeds, but never from the scanty deposits of herbacious materials that accumulate spontaneously.

Although the cultures planted with partly decayed lawn clippings permitted abundant multiplication of several other species of nematodes, *Harposporium leptospira* limited its parasitism to individual eelworms plainly referable to the genus *Bunonema*. Owing to the relatively small dimensions of the eelworms subject to attack, young specimens are often invaded only by a virtually unbranched assimilative filament extending from head to tail (Fig. 1, A); and older specimes often require the intrusion only of a somewhat meagerly ramified hyphal system (Fig. 1, B). As the host eelworms never burrow into agar substrata, they live and, of course, succumb to infection on the surface of a plate culture. Consequently the conidiophores of the fungus have no occasion for submerged development, but can at once grow out procumbently or push upward into the air. Small young eelworms ordinarily provide enough substance for 2 conidiophores, one usually being extended from the head (Fig. 1, A, a), while the other is usually extended from the tail (Fig. 1, A, b). Larger individual eelworms also permit development of conidiophores from median positions (Fig. 1, B, a, b), with the result that 8 or 9 fertile hyphae are not infrequently found to originate from parasitized adult animals.

On aerial conidiophores of *Harposporium leptospira*, much as on those of *H. anguillulae*, *H. diceraeum* and *H. bysmatosporum*, the conidia produced successively by each phialide cohere in an irregularly globose cluster attached to the tip of the sterigma (Fig. 1, C). When such conidiophores are mounted in water for closer microscopical examination, the clustered conidia separate and drift apart, leaving the sterigmata largely denuded (Fig. 1, A, a, b; B, a, b). Because of their helicoid shape, the detached conidia (Fig. 1, D, E) show outlines which in some instances resemble the letter "s" or a reversed "s", and in other instances are suggestive of an archer's bow fitted with recurved end pieces. With some allowance being made for occasional deformation incurred from jostling, the conidia, when newly formed, would seem to correspond in geometric design to helices varying from 5 to 7.5 μ in axial length, measuring about 1 μ in inside diameter, about 2.2 μ in outside diameter, and composed of 1.2 to 1.4 turns. They appear bluntly rounded at both base and apex. As in respect to greatest width the helicoid spores average only approximately 0.6 μ, their unusual slenderness must be considered an outstanding diagnostic character. Undoubtedly, this character serves as an adaptation for parasitism on the curiously appendaged and elaborately sculptured host nematode, for very slender conidia are produced likewise by other fungi that attack *Bunonema* sp., including notably the taxonomically unrelated *Euryancale sacciospora* Drechsler (1939), a member of the Zoopagales.

Chlamydospores of *Harposporium leptospira* (Fig. 1, F—L) were produced in 1 out of approximately every 5 specimes of *Bunonema* sp. found infected by the fungus. They developed within an individual

host animal in numbers commonly varying from 1 to 4. The unicellular chlamydospores of *H. leptospira*, like those of *H. cycloides*, are often conspicuously wider than the adjacent segments of the parent hypha (Fig. 1, A, c). For the most part the 3-celled and 4-celled chlamydo-

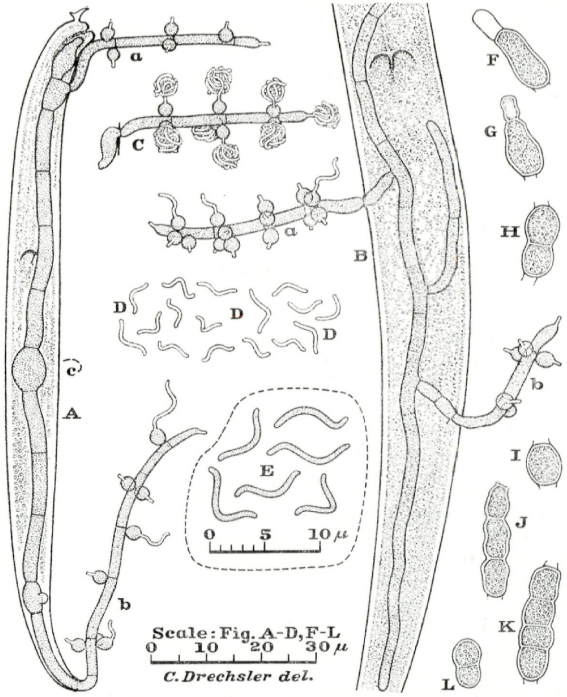

Fig. 1. *Harposporium leptospira*. A, Young host nematode (*Bunonema* sp.) invaded by an unbranched assimilative hypha that has extended 2 conidiophores, a—b, and is giving rise to an intercalary chlamydospore, c; ×1000. B, Median portion of a larger host nematode (*Bunonema* sp.) occupied by a meagerly branched assimilative hypha from which 2 conidiophores, a—b, have been extended; ×1000. C, Aerial conidiophore showing conidia cohering in globose clusters borne distally on the several sterigmata; ×1000. D, Detached conidia; ×1000. E, Detached conidia; ×2000. F—L, Chlamydospores showing variations in size, shape, and cellular make-up; ×1000.

spores of the new species differ little from the similarly multicellular chlamydospores of the long familiar *H. anguillulae*.

References.

Drechsler, C., 1939. Five new Zoopagaceae destructive to rhizopods and nematodes. Mycologia 31: 388—415.

— 1943. A new nematode-capturing *Dactylella* and several related hyphomycetes. Mycologia 35: 339—362.

— 1952. Another nematode-strangulating *Dactylella* and some related hyphomycetes. Mycologia 44: 533—556.

— 1954. Production of aerial arthrospores by *Harposporium bysmatosporum*. Bull. Torrey Bot. Club 81: 411—413.

— 1959. Two new species of *Harposporium* parasitic on nematodes. Jour. Washington (D. C.) Acad. Sci. 49: 106—112.

— 1963. A new nematode-destroying hyphomycete of the genus *Harposporium*. Amer. Jour. Bot. 50: 839—842.

— 1968. A new nematode-destroying *Harposporium*. Amer. Jour. Bot 55: 1251—1253.

Lohde, G., 1874. Über einige neue parasitische Pilze. Tagebl. Versamml. Deutsch. Naturf. u. Ärzte 47: 203—206.

Zopf, W., 1888. Zur Kenntnis der Infections-Krankheiten niederer Thiere und Pflanzen. Nova Acta Leop.-Carol. Deutsch. Akad. Naturf. 52: 314—376, Tab. 17—23.