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ABSTRACT

DRECHSLER, CHARLES. (USDA, Plant Industry Sta., Beltsville, Md.) A new nematode-destroying hyphomycete of the genus Harposporium. Amer. Jour. Bot. 50(8): 839–842. Illus. 1963.—A mucedinaceous parasite that destroyed a largish nematode in a maize-meal-agar plate culture to which had been added some leaf mold from an oak wood in central Maryland is newly described as *Harposporium* **dicorymbum**. It permeates the host animal with colorless septate assimilative hyphae, 2.5–8.5 μ wide, that soon put forth procumbent septate conidiophores bearing mostly subglobose phialides with 1–3 sterigmata. Its very distinctive conidia are composed of a minutely pedicellate globose part, 4–7 μ in diameter, together with a cylindrical outgrowth, 3–9 μ long and 2–3 μ wide, which is furnished distally with a short posterior and a longer anterior beak.

THE MUCEDINACEOUS genus *Harposporium* includes various nematode-destroying fungi that attack their animal hosts after the usual manner of parasites, that is, through the germination of conidia. Presumably in adaptation to their infective function the conidia in most species are of markedly distinctive form. In the ubiquitous type-species, *H. anguillulae* Lohde emend. Zopf (Lohde, 1874; Zopf, 1888), as well as in the relatively delicate *H. lilliputanum* Dixon (1952) and the

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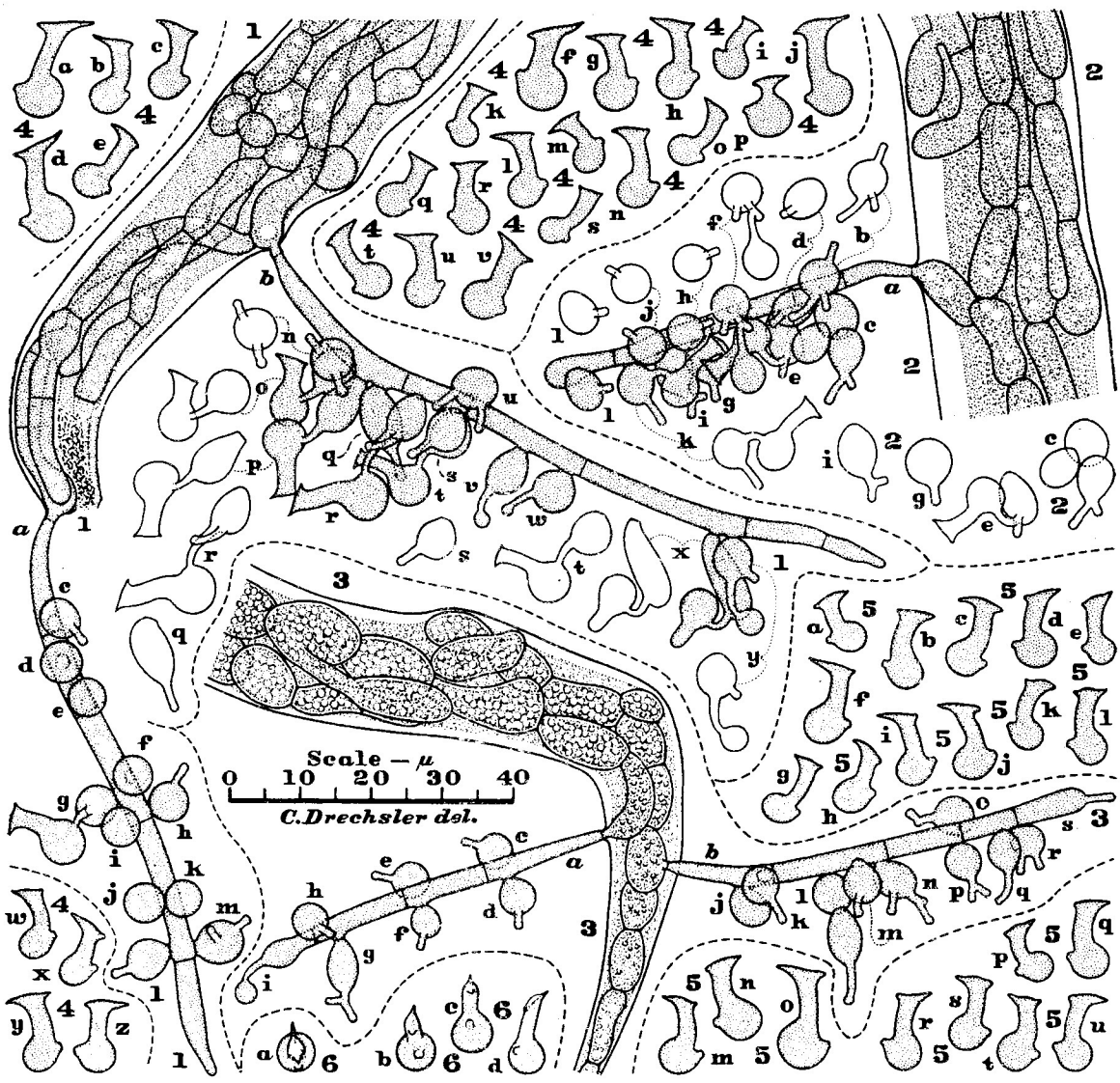

Fig. 1–6. *Harposporium dicorymbum*, × 1000.—Fig. 1. Anterior portion of nematode permeated with assimilative hyphae from which have been extended 2 conidiophores, a-b, that together are supplied with 23 phialides, c-y; outline drawings of some phialides (n-t, x, y) are shown separately nearby.—Fig. 2. Middle portion of nematode permeated with assimilative hyphae from one of which has been extended a conidiophore, a, bearing 11 phialides, b-l, shown attached and also shown separately nearby.—Fig. 3. Posterior portion of nematode permeated with assimilative hyphae from which have been extended 2 conidiophores, a-b, which together have formed 17 phialides, c-s.—Fig. 4, a-z; 5, a-u. Detached conidia in lateral view, showing variations in size and shape.—Fig. 6. Detached conidia showing 2 beaks at tip: a, in top view; b-d, in rear view.

more robust *H. crassum* Shepherd (1955), a crescentic conidium is produced terminally on a slender sterigma arising usually from a globose cell borne laterally on a filamentous conidiophore. Strongly curved conidia are characteristic likewise of the 2 congeneric species I described (Drechsler, 1941) under the binomials *H. oxycoracum* and *H. helicoides*. The bizarre, humerus-like shape of the conidia formed by *H. bysmatosporum* (Drechsler, 1946, 1954) appears helpful in enabling these spores to lodge in the stoma of the host, whence they extend an infective germ tube into the adjacent tissues. A similar adaptation may account for the pod-like shape usual among the conidia of *H. diceracum* (Drechsler, 1941) and possibly also for the curious make-up of the conidia produced by a congeneric fungus that apparently has not hitherto been described.

MATERIALS AND METHODS—The fungus here concerned was found on October 24, 1962, in a maize-meal-agar plate culture which on July 27, 1962, had been planted with a small quantity of

leaf mold freshly collected in an oak (*Quercus* spp.) wood near College Park, Maryland. Evidently the parasite developed only on a single nematode, which unfortunately could not be identified as all its organs and, in its posterior region, even the integument, had become seriously obliterated. The nearly depleted animal, which measured about 26 μ in greatest width and somewhat more than 580 μ in length, was removed (together with a sizable slab of underlying agar) to a microscope slide, covered with a cover-glass, and examined under an immersion objective. Whenever microscopic study was interrupted, the cover-glass was removed to lessen any injury that might accrue from lack of air. Water lost through evaporation was replaced at frequent intervals by means of a small pipette or an atomizer. After 4 days, when observations were concluded, the assimilative hyphae had become partly evacuated, but the protoplasm still contained in them showed no degeneration. Normal internal structure prevailed in all conidiophores and in all of the numerous detached conidia. The material accordingly was used to inoculate 2 nematode-infested plate cultures that 3 months earlier had been planted with leaf mold of the same collection used in preparing the parent culture. However, no other eelworm has been seen infected by the fungus either in the parent culture or in the subsidiary cultures.

RESULTS—Owing especially to marked peculiarities of spore morphology consistently present in the ample conidial apparatus it extended from the single infected eelworm, the fungus is held to merit recognition as a new species.

HARPOSPORIUM **dicorymbum** sp. nov.[2] (Fig. 1–6)—Assimilative hyphae colorless, developing within nematodes, moderately branched, composed of segments mostly 4–25 μ long and 2.5–8.5 μ wide. Conidiophores produced outside of the moribund or dead animal, colorless, often extended procumbently, commonly unbranched, mostly 25–175 μ long and 2–4 μ wide, composed of segments 7–25 μ long; the terminal segment often producing conidia on 1 or 2 sterigmata, the other segments commonly bearing 1–6 sporiferous branches laterally. Sporiferous branches (phialides) composed of a proximal distended part and 1–3 sterigmata; the proximal part commonly globose but sometimes ovoid or obovoid or prolate ellipsoidal, mostly 4.5–13 μ long and 4–6.5 μ wide; sterigmata at first straight and unbranched, later often geniculate or slightly branched, mostly 2–7 μ long and 0.9–1.2 μ wide. Conidia colorless, consisting of a globose proximal part and of a columnar outgrowth arising from it in an equatorial or somewhat more proximal position; the globose part usually 4–7 μ in diameter, furnished with a pedicle often 0.5–1 μ long and about 1 μ wide; the outgrowth mostly 3–9 μ long and 2–3 μ wide, at its tip usually drawn out at nearly right angles to its axis into a short posterior and a longer anterior beak.

From its dimensions *Harposporium dicorymbum* would seem probably more robust than any known congeneric species. The filamentous assimilative hyphae (Fig. 1–3) it extends lengthwise through the host animal undergo conversion here and there into chains of distended ellipsoidal segments. Many of the distended segments, especially some among them that are filled with globuliferous protoplasm of conspicuously coarse texture (Fig. 3), present a more or less indurated appearance. Such appearance, however, is of uncertain significance since only moderate cellular distention is usually observable in the chlamydospores of *H. anguillulae*, and many indurated hyphae of *H. diceraeum* show no distention at all (Drechsler, 1959).

In erupting from an invaded eelworm the conidiophores (Fig. 1a, b; 2a; 3a, b) of *Harposporium dicorymbum* make holes, usually only 1.2–2 μ wide, in the host integument. In all instances the perforated cuticle remains tightly lipped around the base of the conidiophore, thereby effectively preventing any intrusion of alien microorganisms. A gradually widening proximal portion of the conidiophore, mostly 10–15 μ long, usually remains sterile. Beyond this sterile portion phialides are produced in rather haphazard arrangement (Fig. 1, c–y; 2, b–l; 3, c–s). While in some phialides (Fig. 1, p, q, v, x; 3, g) the proximal inflated part, or venter, is markedly elongated, it more often is of the globose shape familiar in *H. anguillulae*. Occasionally a ventricose cell fails to put forth a sterigma directly but instead give rise to 1 (Fig. 3, l) or 2 (Fig. 2, c) secondary phialides.

In a microscope mount under a cover glass, detached conidia (Fig. 4, a–z; 5, a–u) of *Harposporium dicorymbum* usually lie with the short pedicel and the 2 distal beaks extended horizontally. They are therefore commonly seen in lateral view with the 3 protuberances advantageously displayed in profile. The distal contour between the apices of the 2 divergent beaks often seems thick-

[2] Hyphae assumentes incoloratae, intra vermiculos nematoideos evolutae, mediocriter ramosae, e cellulis plerumque 4–25 μ longis et 2.5–8.5 μ crassis constantes. Hyphae fertiles extra animal moribundum vel emortuum evolutae, incoloratae, saepius procumbentes, vulgo simplices, plerumque 25–175 μ longae, 2–4 μ latae, in cellulis 7–25 μ longis consistentes; cellula terminalis saepe conidia in 1–2 sterigmatibus gignens, aliae cellulae vulgo 1–6 ramulos conidiferos a latere ferentes. Ramuli conidiferi (phialae) in parte ventriose inferiore et 1–3 sterigmatibus constantes; pars inferior vulgo globosa sed interdum ovoidea vel obovoidea vel elongato-ellipsoidea, plerumque 4.5–13 μ longa, 4–6.5 μ lata; sterigmata primo recta et simplicia, postea saepius geniculata vel pauciramosa, plerumque 2–7 μ longa et 0.9–1.2 μ crassa. Conidia incolorata, in parte globosa inferiore et ramo superiore constantia; pars globosa plerumque 4–7 μ in diametro, pedicello 0.5–1 μ longo et circa 1 μ lato praedita; ramus cylindraceus plerumque 3–9 μ longus, 2–3 μ latus, in apice paulum carinatus, ibi antico rostro et postico rostro praeditus.

Vermiculum nematoideum consumens habitat in foliis quercorum putrescentibus prope College Park, Maryland. Typus: Figurae 1–6.

ened in a manner suggesting that the apical wall might be coated with adhesive substance. Scattered conidia that are oriented suitably to be seen in top view (Fig. 6, a), or in rear view (Fig. 6, b–d), show the distal end of the columnar outgrowth to be shaped somewhat like the bottom of a collapsible tube of the sort widely used in commerce as containers of ointments and tooth paste.

DISCUSSION—Despite their greater dimensions and more pronounced modification in outward shape, the conidia of *Harposporium dicorymbum* show basic similarity to those of *H. bysmatosporum*—a species which when encountered by Aschner and Kohn (1958) was independently recognized by them as being congeneric with *H. anguillulae*. In view of close parallelism in other respects it appears unlikely that the peculiarities of conidial shape distinctive of *H. bysmatosporum* and *H. dicorymbum* preclude intimate taxonomic kinship with the fungus described by Lohde and Zopf. Equal divergence from the features revealed in *H. anguillulae* occurs elsewhere in the genus, notably, for example, in the frequently much elongated phialides of *H. subuliforme* (Drechsler, 1950) and in the very meagerly developed conidiophores of *H. baculiforme* (Drechsler, 1959).

The single nematode found infected by *Harposporium dicorymbum* showed inside its head a core of disorganized fragments (Fig. 1) with the yellow coloration often observable in the region where an eelworm was initially invaded by a parasitic fungus. Rather probably, therefore, the fungus invades its host, much like *H. bysmatosporum*, through germination of a conidium lodged in the animal's stoma. Only an eelworm with a stoma wide enough to receive the columnar part of the spore would be subject to such attack. As eelworms with stomata more than 2 μ in diameter usually do not become abundant on agar substrata, it is not surprising that the fungus failed to continue development in my cultures.

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