PARASITISM OF XIPHINEMA AMERICANUM AND X. RIVESI BY CATENARIA ANGUILLULARAE AND OTHER ZOOSPORIC FUNGI IN SOIL SOLUTION, BAEHRMANN FUNNELS, OR SOIL

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In dilute soil extract, Xiphinema rivesi was more susceptible than X. americanum to Catenaria anguillulae; the virulence of six isolates of C. anguillulae to Xiphinema also differed. When added to Baermann funnels, zoosporic fungi infected significant numbers of Xiphinema spp. but did not affect the number of nematodes extracted. In a greenhouse test, soil naturally infested with X. americanum and X. rivesi was amended with zoosporic fungi and planted with sudan grass. After 3 months, the zoosporic fungi had not reduced nematode numbers but infected significant numbers of Xiphinema in Baermann funnels; thus, the fungal inoculum persisted for 3 months in soil.

Keywords: Dagger nematodes, nematophagous fungi, biocontrol.

In our laboratory, we routinely use elutriation followed by Baermann funnel to extract Xiphinema americanum (sensu stricto) (Lamberti & Bleve-Zacheo, 1979) and X. rivesi Dalmasso from soil (Jaffee et al., 1987). This method provides cleaner samples and significantly higher estimates of nematode numbers than does elutriation followed by centrifugation (Jaffee et al., 1987). Frequently, a few X. americanum and X. rivesi obtained from the Baermann funnel are infected with zoosporic fungi (Catenaria anguillulae Sorokin, Lagenidium caudatum Barron, Leptolegnia sp., and Aphanomyces sp.) (Jaffee, 1986). Catenaria anguillulae infected and killed as many as 90% of a mixture of X. americanum and X. rivesi incubated in dilute soil extracts for 4 days; the other zoosporic fungi infected 13-29% of the nematodes and no infection or mortality occurred among control nematodes (Jaffee, 1986). The relative susceptibility of these two nematodes to C. anguillulae is unknown as is the relative virulence of different isolates of C. anguillulae.

The zoospores of the above fungi usually encyst on the outer anterior cuticle of dorylaimid nematodes, and the fungi appear to penetrate the cuticle directly (Jaffee, 1986). In contrast, parasitism of tylenchid nematodes by C. anguillulae usually involves encystment on and penetration of the stoma, vulva, or anus (Barron, 1977). X. americanum and other dorylaimid nematodes have many

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anterior sensory pores (Bird, 1980; Wright, 1980; Wright & Carter, 1980) which are not easily seen on living specimens examined with light microscopy. These sensory pores may be sites of encystment and penetration and may account for the greater susceptibility of dorylaimid nematodes. It is also possible that the susceptibility of dorylaimid nematodes to zoosporic fungi results from the sensitivity of these nematodes to low O₂ concentration (Teliz, 1967; Van Gundy et al., 1963). The high water potential and low O₂ concentration of the Baermann funnel might provide favorable conditions for infection. Consequently, zoosporic fungi could influence recovery from the funnel and might be more active in the funnel than in field soil.

The purpose of the present study was to compare the susceptibility of X. americanum and X. rivesi to different isolates of C. anguillulae. Also determined were the effects of zoosporic fungi on extraction of Xiphinema spp. by the Baermann funnel and on numbers of Xiphinema spp. in soil.

MATERIALS AND METHODS

Fungi. Isolates (and original substrates) of C. anguillulae obtained from the American Type Culture Collection included No. 22437 (from insect exuviae), No. 24495 (from Panagrellus redivivus), No. 26990 (from Meloidogyne incognita) and No. 58382 (from Xiphinema sp.). Isolates (and original substrates) of C. anguillulae obtained from the Centraal Bureau voor Schimmelcultures included No. 423.65 (from Daphnia magna) and No. 277.76 (from estuarine water, India). Aphanomyces sp. (ATCC No. 58381), Leptolegnia sp. (ATCC No. 58384), and Lagenidium caudatum (ATCC No. 58383), all originally isolated from Xiphinema spp., were also used. Fungi were maintained on cornmeal agar and were subcultured monthly. Fungal-infested poppy seeds (Papaver sp.) were used to introduce the fungi into 2% soil extract, Baermann funnels, or soil (Jaffee, 1986).

Susceptibility of X. americanum and X. rivesi to six isolates of C. anguillulae. The relative susceptibility of X. americanum and X. rivesi to six isolates of C. anguillulae was tested. Pure populations of X. americanum or X. rivesi were obtained from greenhouse pot cultures with sudan grass [Sorghum bicolor (L.) Moench var. bicolor] as the host. Soil containing a pure population of X. americanum was collected from a New York apple orchard and X. rivesi from a Pennsylvania vineyard: species identifications were confirmed by Dr. A. M. Golden. Soil samples (100 cm³) were soaked for 1 hour in 20 ± 2°C tap water, elutriated (Byrd et al., 1976), collected on a 400 mesh screen (38 μm), transferred to a Baermann funnel, and the nematodes collected after 20 hours (Jaffee et al., 1987). Fifteen to 25 vigorous, healthy adult females were transferred to sterile plastic petri dishes (6-cm-diam) containing 6 ml of autoclaved, 2% soil extract (Jaffee, 1986) (electrical conductivity = 35 μmhos, pH = 7.1) and a C. anguillulae-infested (with one of six isolates) poppy seed which was added 12