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CYLINDROCARPON DESTRUCTANS AS A PARASITE OF *HETERODERA MEDITERRANEA* EGGS

by
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The fungus *Cylindrocarpon destructans* (Zin) Scholten occurs widely in soils infested with *Heterodera avenae* Woll. and has been found in association with other species of nematode-parasitic fungi (Kerry and Crump, 1977; Kerry *et al.*, 1980). Field and greenhouse observations indicated that *C. destructans* may attack and destroy an appreciable number of eggs of *H. mediterranea* Vovlas, Inserra *et* Stone, 1981, a parasite of lentisc (*Pistacia lentiscus* L.) in Italy (Vovlas *et al.*, 1981). However, it is not known whether this fungus could limit the population densities of *H. mediterranea* and other cyst-forming nematode species. Therefore, studies were conducted in Italy to determine the ability of *C. destructans* to parasitize eggs of *H. mediterranea*, *H. carotae* and *H. goettingiana* under natural and laboratory conditions. The results of these trials are presented in this note.

Infection rate of Heterodera mediterranea *eggs by* Cylindrocarpon destructans

The frequency of fungus infection of *H. mediterranea* eggs under field conditions was determined in spring and autumn, by collecting, from lentisc roots, white females with their gelatinous matrices and cysts, containing about 2,000 and 1,500 eggs respectively.

The collected nematodes were surface sterilized with 1% NaClO solution and crushed on glass slides. The fungus-parasitized eggs were counted with the aid of a compound microscope at 400 X.

To study the infection of *H. mediterranea* eggs in the laboratory, two hundred healthy unsegmentd or embryonated eggs, obtained from white females treated for 2-3 minutes with 1% of NaClO and then rinsed with distilled water, were plated on water agar seeded with *C. destructans* microconidia collected from agar cultures. The Petri dishes were kept at 23 ± 2°C and examined under a microscope every 12 hours. Six replicates were made for each observation. After 72 hours fungal hyphae were observed in the unsegmented eggs (Fig. 3). There was no evidence of fungus infection in the embryonated eggs, indicating that the eggs in the early stage of the embryogenic development are not susceptible to the fungus infection. After 7 days the infected eggs were completely covered by the fungus mycelium (Fig. 5).

Under field conditions, 16% of eggs in white females and 12% in cysts of *H. mediterranea* yielded colonies of *C. destructans* in spring time and only 6% of eggs in white females and 4% in cysts were found to be parasitized by the fungus in the autumn (Table I). The numbers of parasitized eggs in the gelatinous matrix of the white females were similar during the two seasons. In the laboratory, only 3% of the eggs were found to be parasitized by the fungus (Table I).

Infection experiments with other nematodes

The ability of *C. destructans* to parasitize eggs of *H. carotae* and *H. goettingiana* was investigated in a glasshouse experiment at 20-22°C. Carrot (*Daucus carota* L.) and pea (*Pisum sativum* L.) plants infested with *H. carotae* and *H. goettingiana* respectively were transplanted into pots containing 500 ml of pasteurized soil. A water suspension of 400 crushed white females of *H. mediterranea* (containing about 15% of fungus-infected eggs) was added to each pot.

No fungal infection was detected on *H. carotae* and *H. goettingiana* eggs collected from carrot and pea plants 40 days after transplanting.

There are several difficulties in adding nematode-parasitic fungi to soil. Nematophagous fungi often do not become established in soil particularly if no nutrient medium is added with the spores. It seems possible that in our experiment eggs were not infected because the fungus did not colonize the soil, rather than that the nematodes were not susceptible.

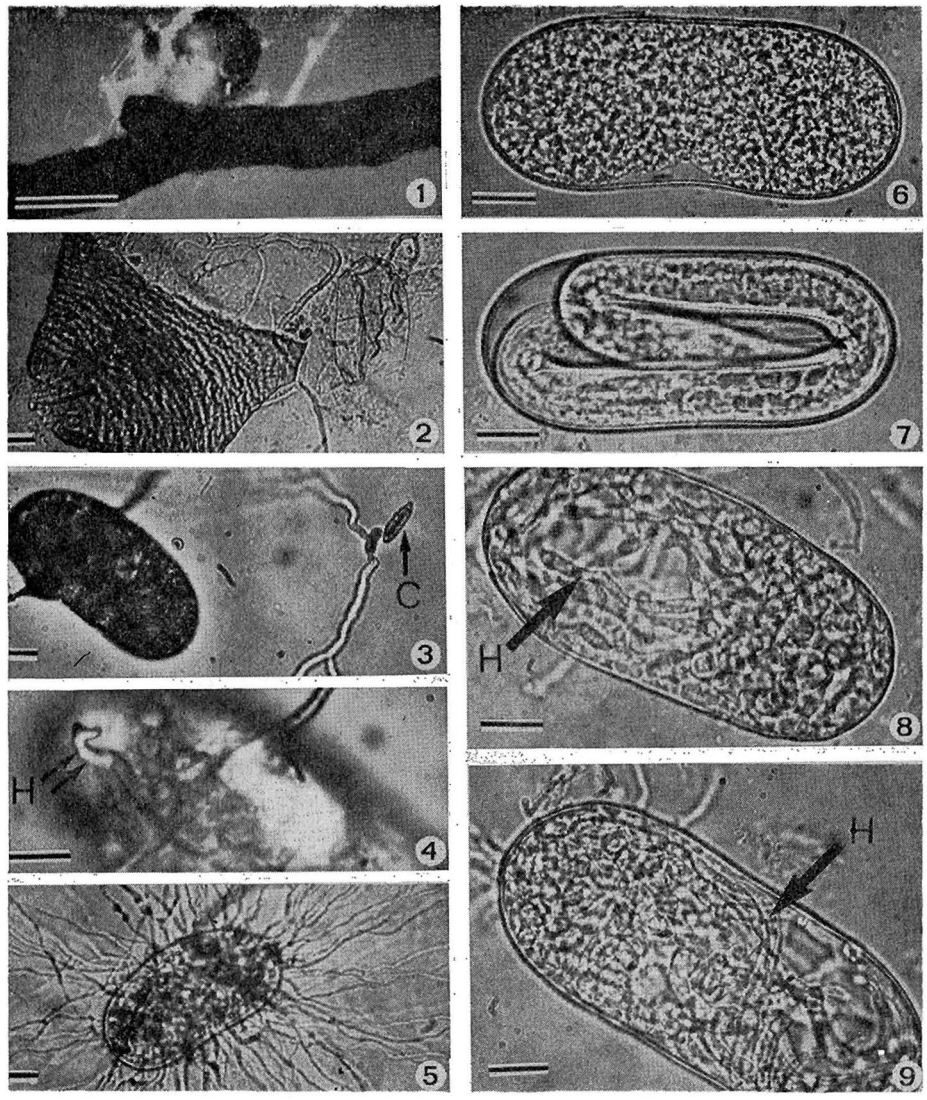

Fig. 1-9 - Female, cyst and eggs of *Heterodera mediterranea* parasitized by *Cylindrocarpon destructans*. 1) A fungus-infected female attached to a lentisc rootlet. 2) Terminal cone of a crushed cyst showing vegetative hyphae of *C. destructans* protruding from both the vulva and the anus-openings. 3) Unsegmented egg penetrated by *C. destructans* mycelium on water-agar medium; c = germinated microconidium. 4) Vegetative hyphae of *C. destructans* 48 hours after mycelium penetration. 5) An artificially infected egg seven days after fungus penetration. 6-7) Unsegmented and embryonated healthy eggs. 8-9) Infected eggs 3-4 days after fungus penetration (H = hyphae). Scale bar = 0.5 mm in Fig. 1; 15 μm in Figs. 2-9.

Table I - *Percentage of eggs of* Heterodera mediterranea *infected* by C. destructans *under natural and experimental conditions.* (*)

Eggs from	Field collections		Experimental infections test
	Spring	Autumn	
White females	16	5.6	3
Cyst	12	4	2.5
Gelatinous matrix	5	4	NT (**)

(*) Data are means of six replicates.

(**) NT = Not tested.

Among the species of nematophagous fungi that have been isolated from eggs of *Heterodera* species, *Verticillium chlamydosporium* Goddard and *Nematophthora gynophila* Kerry *et* Crump are the most pathogenic and are known to have a wide host range (Kerry and Crump, 1977; Kerry *et al.*, 1980). Although *C. destructans* failed to infect the eggs of *H. carotae* and *H. goettingiana*, its ability to parasitize eggs of *H. mediterranea* has been experimentally ascertained. Consequently, *C. destructans* should be included in the list of nematode parasitic fungi that limit the population densities of certain nematodes in the soil.

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