THE ROLE OF ORGANIC MATTER IN THE POPULATION DYNAMICS OF THE ENDOCASITIC NEMATOPHAGOUS FUNGUS DRECHMERIA CONIOSPORA IN MICROCO SMS

BY

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Addition of organic matter to soil may indirectly enhance nematophagous fungi. The effect of organic amendments on the population dynamics of the endoparasitic nematophagous fungus Drechmeria coniospora was studied in soil microcosm experiments. In one experiment, soil was amended with lucerne meal, and in a second experiment the root system of barley served as the source of organic matter. Indigenous soil bacteria, the bacterivorous nematodes Rhabditis sp. or Acrobeloides bütschlii, and D. coniospora were added as representatives of the first, second, and third trophic level. In lucerne meal amended soil, the conidial density of D. coniospora increased in response to increase in number of nematodes. Rhabditis sp. appeared to be a more susceptible host than A. bütschlii. Nematode population density was suppressed by D. coniospora. In the rhizosphere of barley, a small but significant increase in the conidial density was measured as compared to the control without nematodes, but nematode numbers were not suppressed. In rhizosphere soil from two fields, the densities of endoparasitic and trapping fungi were not related to numbers of nematodes. Drechmeria coniospora was not detected in the field. We conclude that introduction of conidia of D. coniospora in combination with high input of organic matter may lead to suppressive levels of the fungus. The possible application for control of plant-parasitic nematodes is doubtful because of the narrow host range of the fungus.

Keywords: Acrobeloides bütschlii, bacterivorous nematodes, population dynamics, predatory fungi, Rhabditis sp., trophic interactions

Addition of organic matter to soil may support bacterial growth and hence bacterial grazers, including bacterivorous nematodes. Consequently, organic amendment may support the development of nematophagous fungi and bacteria, which may regulate non-bacterivorous nematodes, including plant-parasitic nematodes. Such a linkage between trophic interactions and reduction of root-knot nematodes by nematophagous fungi in response to organic matter input (host plant derived material) was first suggested by Linford (1937; Linford et al., 1938). Cooke (1962a, 1962b, 1963, 1964) showed that the activity of nematode trapping fungi in soil is not simply coupled with nematode populations, but may also be dependent on nutritional factors.

To ascertain the relevance of organic matter in respect to biological control, knowledge of the population dynamics of nematophagous fungi in response to high inputs of organic matter is required. In this study the endoparasitic
nematophagous fungus *Drechmeria coniospora* (Drechsler) Gams & Jansson was chosen as it appears to feed exclusively on nematodes (Barron, 1977) and is considered to be a candidate for biological control of plant parasitic nematodes (Jansson *et al.*, 1985).

The objective of our study was to evaluate the effect of nematophagous fungi, *viz.* *D. coniospora*, on nematode populations in response to organic matter. We conducted two experiments in microcosms with native soil bacteria as first trophic level organisms and with the common bacterivorous nematodes *Rhabditis* sp. and *Acroboloides bütschlii* (De Man) Steiner & Bührer as second trophic level organism. The organic matter sources were either plant residues or plant exudates. In addition, the relationship between the population densities of nematophagous fungi and nematodes in natural (rhizosphere) soil was studied in the field.

**MATERIALS AND METHODS**

*Organisms and cultivation methods:* An isolate of *Drechmeria coniospora* was kindly provided by Professor Dr. U. Wyss, University of Kiel, Germany. The fungus was alternate maintained on 2% corn meal agar (CMA; Oxoid CM103) and 2% water agar (WA), supplemented with axenically grown bait nematode *Panagrellus redivivus* (L.) Goodey (Jansson & Nordbring-Herz, 1979). For propagation of inoculum, *D. coniospora* was reisolated from infected nematodes and transferred to CMA for mass-cultivation at 21°C. Conidial suspensions were made by suspending culture-grown conidia in a few ml of sterile tap water. The resulting crude suspension was filtered through a 40 μm mesh nylon cloth, followed by three washings in tap water before adjusting the conidial suspension to the desired densities.

*Panagrellus redivivus* was also used in a bioassay for quantifying soil densities of *D. coniospora*. For that purpose *P. redivivus* was xenically cultured in 35% oat meal broth (Quaker oats b.v., Zwijndrecht, NL) in 12 cm diam glass vessels for 3 weeks at 21°C. The Baermann funnel method (Barron, 1977) was used to separate the nematodes from the oat meal substrate. The resulting suspension was further diluted in tap water to the desired densities.

*Rhabditis* sp. and *A. bütschlii* were xenically grown on WA supplemented with 0.05% proteose peptone (Oxoid L85) for 3 weeks at 21°C. Following incubation, the nematodes were washed on a 25 μm mesh sieve to remove most adhering micro-organisms before preparing adjusted suspensions in tap water.

A native soil bacteria suspension was obtained from a 1:10 (w/w) soil dilution in sterile tap water, following vacuum-filtration through a 1.2 μm pore diam membrane filter.

*Quantification of nematodes:* Soil-borne nematodes in the microcosms were extracted from the soil using the Oostenbrink elutriator (Oostenbrink, 1960)