



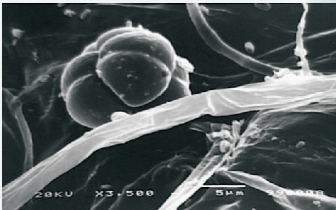
ROTHAMSTED
RESEARCH

Impact of the nematophagous fungus *Pochonia chlamydosporia* on nematode and microbial populations

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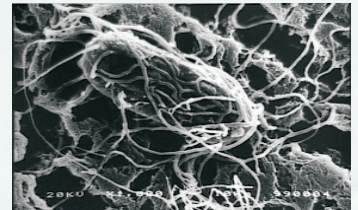
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Objectives: Root knot and cyst nematodes are major agricultural pests causing annual yield losses estimated at \$100 Billion (Sasser & Freckman, 1987). The nematophagous fungus *Pochonia chlamydosporia* has demonstrated its efficacy as a biocontrol agent (BCA) against both root knot and cyst nematodes (Kerry and Bourne 1996; Kerry 2000). Assessing the impact of the fungus on non-target organisms is essential for its registration as a biocontrol agent. Its effects on nematode and microbial communities are reported.



SEM of *P. chlamydosporia* spore

Methods: A pot trial with treatments of tomato and cabbage plants inoculated with *P. chlamydosporia* (5000 spores g⁻¹ of soil), *Meloidogyne incognita* (5000 *M. incognita* juveniles), or both, along with unplanted controls was set up. Soil was obtained from the Great Field meadow, Rothamsted. Total nematode counts were made in 200g of soil from each pot. The bacterial populations were assessed by counting colony forming units (cfu) on selective media viz. PSA (Pseudomonas Selective Agar), 1/10th TSA (Tryptic Soy Agar) for heterotrophs and inoculated 1/10th TSA plates baked at 80 °C 1 h for spore forming heterotrophs and MA (Mac Conkey Agar) for enterics. Fungal populations were assessed by plating onto PDA (Potato Dextrose Agar). Shifts in bacterial populations were also assessed by comparing 95 carbon utilization profiles using Biolog GN plates.



P. chlamydosporia infected *M. incognita* egg

Results: The soil contained 28 different nematode taxa equally distributed amongst the three trophic groups. Total myco/bacteriophagous (BPN) and predatory nematodes (PN) counts showed no obvious trends related to differences in plant species or to the application of *P. chlamydosporia* or *M. incognita* (Fig. 1). Total plant parasitic nematodes (PPN), however, increased in both the presence of the host plants, cabbage (S:SC 1.6 fold) and tomato (S:ST 2.7 fold), and also with the additional stress of *M. incognita* (S:SCN 3.4 fold increase, S:STN of 5.1 fold increase). The addition of the BCA, however, greatly reduced plant parasitic nematodes by a maximum of 78% (Table 1).

Key
S- Soil
C- Cabbage
T- Tomato
P- *Pochonia*
N- Nematode

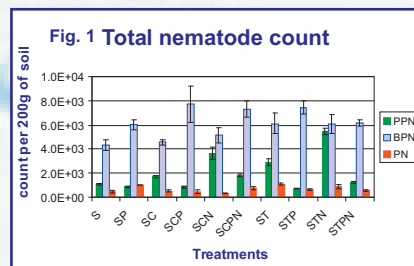
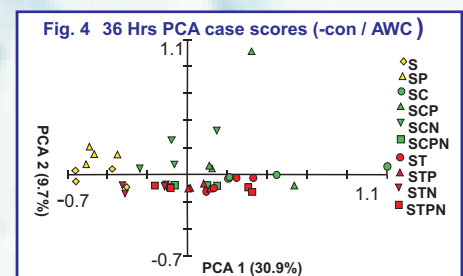
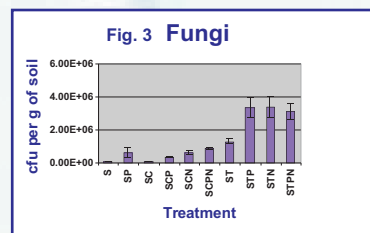
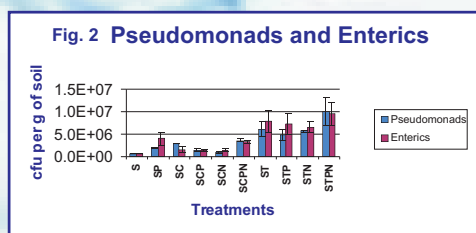


Table 1: Percent reduction in PPN Numbers due to the BCA *P. chlamydosporia*

Treatment	PPN No.	Treatment	PPN No.	% Reduction of PPN
S	1066 ± 67	S + P	876 ± 86	17.9
SC	1731 ± 118	SC + P	852 ± 67	50.8
SCN	3637 ± 506	SCN + P	1834 ± 128	49.6
ST	2901 ± 281	ST + P	704 ± 43	75.7
STN	5464 ± 266	STN + P	1227 ± 98	77.6

The bacterial (Fig. 2) and fungal population densities (Fig. 3) were lowest in unplanted soil. Compared to cabbages, tomatoes supported greater microbial cfu populations with Pseudomonads showing a 10-fold increase, heterotrophs a 2-fold increase while the enterics were 11-fold greater around tomato roots than in unplanted soil. No obvious trends were observed in spore forming heterotrophic bacteria (data not shown). Fungal counts reflected a 24-fold increase in tomato alone and 61-fold increase in combined tomato treatments.

PCA analysis (Fig. 4) of the microbial carbon utilization profiles using Biolog GN plates showed that the major influence on microbial populations was associated with the presence or absence of plants, with a slight discrimination observed between the two plant species. No significant effect was observed with the addition of either *P. chlamydosporia* and/or *M. incognita*.



Discussion: From the above study *P. chlamydosporia* was proved to be an effective biocontrol agent by reducing the numbers of plant parasitic nematodes including *M. incognita*, within the two crops by 50 to 80%. It effectively colonised the rhizosphere, reducing the population of root-knot and migratory ecto-parasitic nematodes. It had a negligible effect on the indigenous microbial and beneficial nematode populations. The impact of plants had a far greater influence on microbial populations than the addition of *P. chlamydosporia*. These results have further confirmed that *P. chlamydosporia* has potential for development as a BCA against root-knot nematodes and have shown that integration into a pest control strategy would not affect beneficial and indigenous micro-fauna.

- References:** Sasser, J.N. and Freckman, D.W. (1987) A world perspective on nematology: the role of society. *Vistas on Nematology* (Eds: J.A. Veech and D.W. Dickson) Society of Nematologists, Maryland, USA. pp 7-14.
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