THE USE OF NEMATODE-TRAPPING FUNGI TO CONTROL ROOT-KNOT NEMATODES

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A series of experiments was conducted to determine whether root-knot disease of tomato and okra (Hibiscus esculentus) could be controlled by the use of nematode-trapping fungi. The fungi did not reduce disease severity; however, three species significantly affected survival of plants in a greenhouse experiment. Immediate protection of crops highly susceptible to root-knot nematodes by the application of predacious fungi does not seem possible.

Experiments to control root-knot nematodes by predacious fungi were first made in Hawaii by Linford & Yap (1939) after Linford, Yap & Oliveira (1938) had shown that marked reductions in root-knot nematode populations occurred during decomposition of plant materials mixed with infested soil. Eleven nematode-trapping fungi were recognized among 52 natural enemies of the root-knot parasite. They tested the abilities of five predacious hyphomycetes, Arthrobotrys oligospora Fres., A. musiformis Drec., Dactylella ellipsoспора Grove, Dactylaria candidа Sacc., and D. thaumasia Drechs., to protect potted pineapple plants from the root-knot nematode. Only Dactylella ellipsoспора restricted nematode injury somewhat; the others were ineffective.

Deschiens, Lamy & Vautrin (1943) used Dactylella bembicides Drec. and Arthrobotrys oligospora to protect Begonia cuttings. The cuttings were grown in pots of infested soil plunged in a bed of peat also infested with root-knot nematodes. Spores of the fungi were added to 21 pots, while 18 others were left as untreated controls. Of the 21 inoculated pots, ten received A. oligospora and eleven D. bembicides. The plants were grown for about 6 months and then examined for root-knot galls. Results for individual plants were not given; however, three of the 21 treated plants were infected (14 %) with a total of five galls observed; eight of the eighteen control plants were infected (44 %) with a total of 85 galls observed on the roots. Although the authors state that the results show an important level of protection due to the addition of the fungi, Duddington (1957) has indicated that the results are not statistically significant.

Mankau (1961) attempted to reduce root-knot damage to tomato and okra by inoculating the predacious hyphomycetes, Dactylaria thaumasia and Arthrobotrys arthrobotryoides (Berl.) Lindau, into soil infested with Meloidogyne incognita.
Chitwood, but was unsuccessful. Soil treatments of wheat germ, straw, and steer manure used in conjunction with the two fungus species gave better plant growth, but did not appear to increase the activity of the fungi.

This report presents the results of further attempts to measure reduction in plant injury by *Meloidogyne incognita* using other predacious fungi under varied circumstances.

**METHODS AND MATERIALS**

The nematodes used originated from greenhouse stock cultures obtained from single egg mass transfers of *Meloidogyne incognita* and subcultured on suitable hosts, usually tomato.

The fungi were grown in broth culture in large medicine bottles incubated horizontally to provide shallow depth and a large surface area suitable for sporulation. The broth medium was prepared by extracting either sugar beet pulp or wheat germ at the rate of 20 g per liter of water for 10 minutes in an autoclave and then dispensing it to culture bottles and autoclaving for 15 minutes at 1.03 kg per sq. cm (15 p.s.i.). Mycelial mats were recovered after 2 to 3 weeks by pouring cultures onto filter paper in a Büchner funnel and separating the broth. The mats were then macerated in distilled water for 30 sec. Each batch of inoculum was checked for viability before use by plating a loopful on corn meal agar. The inoculum was injected into the soil of test pots or microplots with a 50-ml steel syringe.

**EXPERIMENTAL**

In two preliminary experiments to determine the effect of predacious fungi upon a root-knot nematode in the absence of most of the normally associated soil flora and fauna, plants were grown in quartz sand in 1.5-liter plastic containers furnished with lids having a pour-spout and a hole for the plants. The spaces around the stems were closed with glass wool. The plants were irrigated with Hoagland's solution introduced through the capped pour-spout which was opened briefly to minimize aerial contamination.

In the first experiment tomato seedlings (var. Rutgers) and the fungi *Arthrobotrys conoides* and *A. dactyloides* were used. Five egg masses of *M. incognita* were introduced per container. Three treatments were applied: nematodes only, nematodes and fungi, untreated checks. Replication was fourfold.

Fresh top weights recorded at the end of the 90 days' growth (Table I) revealed no significant differences due to the treatments. The root systems of the plants were washed from the sand, examined and scored for root-knot infestation. Plants in the treatment receiving the predacious fungi were as heavily galled as those in the series receiving only nematode inoculum. *A. dactyloides* was recovered from each inoculated container, while *A. conoides* was recovered from two of the four containers.