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RELATIONSHIP OF *PASTEURIA PENETRANS* SPORE ENCUMBERANCE ON JUVENILES OF *MELOIDOGYNE INCOGNITA* AND THEIR INFECTION IN ADULTS

by

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Summary. Investigation of the relationship of *Pasteuria penetrans* spore encumberance of juvenile *Meloidogyne incognita* and their infection in adults revealed that infection of *P. penetrans* occurred only in 20 and 28 percent of females in tomato root system developed from the J_2 encumbered with one and two spores of this bio-agent, respectively. Infection by *P. penetrans* occurred in 64% of females of root-knot nematodes developed from the J_2 encumbered with 8-12 spores of *P. penetrans*. Hence, it is necessary to infect nematode juveniles with several spores of *P. penetrans* to have optimum encumberance to ensure high infection rates of females.

Pasteuria penetrans (Thorne) Sayre *et* Starr is a potential biocontrol agent of root-knot nematodes because it parasitises females and prevents their reproduction (Stirling, 1984, Gowen and Channer, 1988). The life cycle of *P. penetrans* is in synchrony with that of the root-knot nematode and at its completion, parasitised females may contain upto two million spores (Stirling, 1984). Infection of the nematode with *P. penetrans* is dependent on many variables of which the number of spores attached to a juvenile is considered to be important. There are no precise studies on the role of this variable on the infection of nematodes by *P. penetrans*. However, Stirling (1984) reported that attachment of more than 5 spores per nematode was required to ensure 90% infection. In preliminary studies, we found that inoculation of tomato with juveniles of *Meloidogyne incognita*, each attached with more than 10 spores of *P. penetrans* resulted in infection in only 60% of the females and the rest were healthy and produced egg masses. Hence, an experiment was conducted to study the relationship between *P. penetrans* spore attachment to *M. incognita* (Kofoid *et* White) Chitw. juveniles and their infection in adult females.

Materials and methods

A spore suspension of an isolate of *P. penetrans* from Australia (PP1) was prepared from infected tomato roots following the technique

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of Stirling and Wachtel (1980). Second stage juveniles of *M. incognita* (Race 1) originating from India were collected from infested roots by picking off egg masses and allowing them to hatch. One day old juveniles were added to *P. penetrans* spore suspension (20,000 spores/ml) at a room temperature of 18-23 °C. After one hour, individual nematodes were observed for spore attachment using a microscope at X100 magnification and juveniles with a specific number of spores attached were collected. Nematodes with 1 or 2 or 3-5 or 8-12 spores per each juvenile were collected separately. These juveniles were added to soil around the roots of 30 day old seedlings of tomato, *Lycopersicon esculentum* Mill., cv. Tiny Tim, transplanted into a commercially produced soil based compost contained in a plastic Petri dish (10 cm dia). Part of the Petri dish was left open to allow the plant to grow, to receive water and for inoculating the nematodes. One week after transplanting, each seedling was inoculated with 25 juveniles encumbered with a specific number of spores of *P. penetrans*.

Each treatment was replicated five times. In the control, each tomato seedling was inoculated with 25 healthy juveniles of *M. incognita*. Forty five days after inoculation, the experiment was terminated. Roots of each tomato plant were washed gently and all the females from the roots were collected and observed for the presence of *P. penetrans* infection by squashing each female separately. Observations were made on the total number of females in each root system and the number of females with or without *P. penetrans* infection. To evaluate the number of eggs/egg mass, three egg masses from each root system were collected and treated with 1% sodium hypochlorite solution and the number of eggs were counted.

Results and discussion

Infection of *P. penetrans* was observed in 20 and 28% of females developed from the juveniles encumbered with one and two spores of *P. penetrans*, respectively. Infection of *P. penetrans* was noticed in only 40% of females developed from juveniles encumbered with 3-5 spores of *P. penetrans* and 64% in the females developed from the juveniles encumbered with 8-12 spores of *P. penetrans* (Table I). These observations are in disagreement with Stirling (1984) who reported 90% infection in the females developed from the juveniles encumbered with five spores of *P. penetrans*.

In all of the treatments, 56-60% of juveniles inoculated developed into adult females, except in the treatment where the juveniles were en-

TABLE I - *Relationship of* Pasteuria penetrans *spore attachment to juveniles of* Meloidogyne incognita *and their infection to females.*

No. of spores encumbered per J_2	Mean total no. of females in root system	% J_2 developed into female nematodes	Mean no. of female infected	% Females infected	Mean no. of eggs/egg-mass
1 spore	15	60	3	20	472
2 spores	14	56	4	28	484
3 to 5 spores	15	60	6	40	378
8 to 12 spores	11	44	7	64	325
Control	14	56	Nil	Nil	496
CD-5% -	2.12	8.36	0.74	6.21	57.95

cumbered with 8-12 spores and only 44% of the juveniles became adult females (Table I). This is presumably due to the fact that some juveniles with 8-12 spores encumbered could not penetrate or could not develop inside the root system. Significantly, a fewer number of eggs/egg mass were observed in the treatment where females had developed from the juveniles encumbered with 3-5 or 8-12 spores of *P. penetrans* (Table I). From these studies, it is concluded that the number of spores of *P. penetrans* encumbered on the juveniles is an important factor in deciding the infection of *P. penetrans* in adult females of root-knot nematodes. Hence, necessary care has to be taken to have optimum encumberance of *P. penetrans* spores on the juveniles to ensure high rates of infection of females with this bio-control agent.

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