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DOSE OPTIMIZATION OF PAECILOMYCES LILACINUS FOR THE CONTROL OF MELOIDOGYNE JAVANICA ON TOMATO

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Summary. An experiment was undertaken to establish the optimum/effective dose of the bio-control fungus, *Paecilomyces lilacinus*, against *Meloidogyne javanica* in tomato. The fungus was cultured on gram seeds using 1, 2, 3, 4, 5, 6, 7 and 8 g/kg soil. Four g of gramfungus per kg soil was found to be the optimum dose for effective reduction in the gall index (69%) and second-stage juveniles (86%) of *M. javanica* in tomato with an optimum egg mass infection (58%) and egg destruction (66%). Another experiment showed that gram seeds used as substrate for *P. lilacinus* were independently capable for reducing the nematode population and increasing the growth of the tomato. However, the contribution of the fungus in reducing the nematode population and egg hatch and improving plant growth (height and weight) was significant.

Gram (*Cicer arietinum* L.) seeds have been found to be a suitable substrate for the growth of *Paecilomyces lilacinus* (Thom) Samson which is efficacious against *Meloidogyne javanica* (Treub) Chitw., in tomato (Zaki and Bhatti, 1991). The fungus can be inoculated along with the substrate for establishment in the field. It is necessary, however, to ascertain the fungus substrate dose for the effective control of the nematode and the individual effects of gram seeds and the fungus on nematode control.

Materials and methods

Gram seeds were soaked in water for 12 hours and then dried before steam sterilizing them in Erlenmeyer flasks (500 ml) at 1.0546 kg/cm² pressure for 50 minutes. The flasks were cooled and inoculated with 1 ml of spore suspension of *Paecilomyces lilacinus* maintained on potato dextrose agar. The flasks were incubated at 28±1 °C for 10 days and tumbled daily to achieve a uniform fungal growth; the spore count obtained by the method of Zaki and Bhatti (1988) was 22x10⁷/g substrate. The fungus cultured on gram seeds was used for further experiments.

A pot experiment was undertaken during August-September 1986 to find the optimum fungal dose for control of *M. javanica*. Clay pots were filled with 1 kg steam sterilized sandy soil to which a recommended fertilizer solution was added. Ten egg masses (5,223 eggs) for *M. javanica* and 0, 1, 2, 3, 4, 5, 6, 7 and 8 g per pot of fungus

culture were placed in the prospective root zone, into which were transplanted 35 days old tomato (*Lycopersicon esculentum* Mill. cv. HS-101) seedlings. Each treatment was replicated 4 times and the pots arranged in a completely randomized layout.

In another pot experiment the effects of amendments with gram seeds and gram colonized with the fungus on *M. javanica* infecting tomato were investigated. Four g of fungus culture and an equal amount of sterilized gram seeds, inoculated and uninoculated control plants comprised the treatments with 5 replications. Procedures followed were the same as in the previous experiment. The experiment continued through October, 1986 to January, 1987.

Plant height, fresh shoot and root weight, gall index (after Barker, 1985), second-stage juveniles, eggs/egg mass and juveniles hatched out/egg mass etc. were recorded at the termination of the experiments, 42 and 96 days after transplanting, respectively. The data were subjected to statistical analysis and differences among the various treatments were compared by C. D. at 5 per cent.

Results and discussion

The data showed that even the lowest level (1 g of fungus culture/kg soil) reduced the gall index and number of second-stage juveniles. The response was linear with the increase in fungal dosage up to 4 g/kg soil (Fig. 1) be-

yond which the differences were non-significant. Per cent eggs destroyed in infected egg masses increased up to the 3 g level, although egg mass infection increased up to the 8 g level, probably due to increasing exposure of the latter to higher fungal spore quantum in the higher dosage. However, considering the nematode population reduction and economic factors, 4 g fungus culture/kg soil was considered to be the optimum level.

Previously, gram was found to be the best substrate (Zaki and Bhatti 1991) and 4 g/kg soil worked as the optimum dose for an effective control of *M. javanica* in the above experiment. These observations suggest that gram may be contributing independently as an organic amendment for improved plant growth and nematode control. The experimental evidence revealed that sterilized gram alone improved plant growth over inoculated controls (Fig. 2). This enhanced vegetative growth, may be partly due to additional nutrition by gram [a rich source of N (3.33%), P (340 mg/100 g) and K (808 mg/100 g)] and partly due to

reduction in the nematode population. This latter was confirmed by a significant reduction in nematode population in the treatment with gram alone. However, plant growth was better in gram-colonized with the fungus than gram alone or controls. Gram seeds alone affected 25 and 60.5 per cent reduction in gall index and second-stage juveniles, while gram colonized with the fungus showed 74.7 and 100 per cent reduction in gall index and second-stage juveniles, respectively. This clearly indicates the individual contributions of gram and the fungus in controlling the nematode and improving plant growth. Numbers of eggs per egg mass appeared not to be affected by P. lilacinus as the difference between gram seeds and fungus culture treatments were not significant. However, these numbers in both treatments were significantly lower than in the control, indicating that gram seeds alone were responsible for reducing the eggs per egg mass. Such a reduction, assumed to be due to organic amendment of the soil, was observed by Zaki and Bhatti (1990).

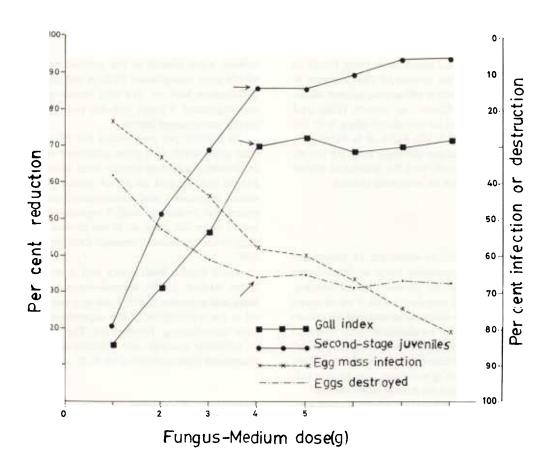


Fig. 1 - Effect of different doses of gram seed medium colonized with Paecilomyces lilacinus against Meloidogyne javanica infecting tomato.

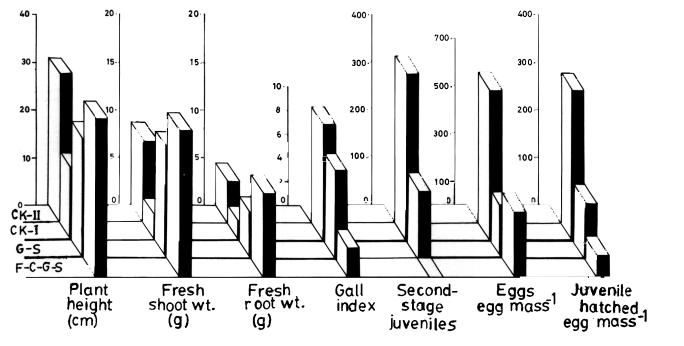


Fig. 2 - Effect of soil amendment with uninoculated gram seeds and gram colonized with *P. lilacinus* on the growth of tomato plant and *M. javanica* infecting it (CK-I = nematode inoculated check; CK-II = un-inoculated check; G-s = gram seed; F-C-G-S- = fungus cultured on gram seeds).

The reduction in juvenile populations in fungus culture treated pots seemed to be more pronounced that in the gall index, and was due to the fungus destroying the eggs in infected egg masses. This was indicated by the conspicuous inhibition (83.1%) of hatch which, in turn, resulted in a striking reduction (100%) of juveniles.

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