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Effect of organic soil amendments, *Trichoderma viride* Pers. ex Fr. and carbofuran on the nematode trapping fungus *Arthrobotrys cladodes* var. *macroides* (Drechsler, 1944) and plant parasitic nematodes

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ABSTRACT: Studies were conducted in a greenhouse to assess the role of organic amendments, *Trichoderma viride* Pers. ex Fr. and carbofuran in the population of nematode trapping fungus *Arthrobotrys cladodes* var. *macroides* (Drechsler, 1944) and plant parasitic nematodes and their interaction on growth of tomato. Application of organic amendments enhanced the population of the nematophagous fungus. Increase in density of the nematode trapping fungus, *A. cladodes* var. *macroides* was highest in a loamy soil ameliorated with 2 per cent Farm Yard Manure (FYM) or neem cake. Carbofuran at 15 mg a. i. / pot gave the maximum reduction in the population of *Helicotylenchus dihystera*, *Tylenchorynchus capitatus* and *Xiphinema basiri* and was followed by FYM, neem cake and *T. viride*. The plant growth was significantly increased in combination treatments consisting of FYM + carbofuran followed by neem cake + carbofuran. Application of the organic amendments reduced the efficacy of carbofuran.

KEY WORDS: *Arthrobotrys cladodes* var. *macroides*, carbofuran, organic amendments, *Trichoderma viride*

Decomposition of organic matter in the soil changes the rhizosphere adversely, and affects the built up of plant - parasitic nematodes (Goswami and Bhattacharya, 1989). Soil amendments with decomposable organic matter not only supply nutrients but also change the soil environment favourably for higher crop production (Stirling, 1991). The changes in the soil environment brought about by

application of organic matter increase the population of antagonistic soil fungi and bacteria which are inimical to nematodes (Rodriguez and Morgan, 1987; Van Den *et al.*, 1994). The present study was carried out to assess the effect of organic amendments, the antagonist *T. viride* and carbofuran on production of plant parasitic nematodes and the nematode trapping fungus *Arthrobotrys cladodes* var. *macroides* (Drechsler), and the interaction of them on growth of tomato.

MATERIALS AND METHODS

A pot culture experiment was conducted in a greenhouse, Department of Nematology, TNAU, Coimbnatore 641 003 during 1997, with field soil naturally containing the nematode trapping fungus *A. cladodes* var. *macroides* (Drechsler) and the plant parasitic nematodes *Helicotylenchus dihystera* (Cobb, 1890; Sher, 1961), *Tylenchorhynchus capitatus* (Cobb, 1913) and *Xiphinema basiri* (Siddiqi, 1959). Field soil collected from a standing crop of pearl millet was thoroughly mixed and transferred to pots of 250 g capacity. Six soil samples of 500 g each were collected from the field used in this experiment contained *A. cladodes* var. *macroides* at a density of 5+1.5 x 10^4 cfu / g of soil (colony forming units) as determined by serial dilution method using 2 per cent water agar. The nematode population was estimated in 250 ml soil processed by sieving Baermann funnel technique. Three plant parasitic nematodes namely *Helicotylenchus dihystera*, *Tylenchorhynchus capitatus* and *Xiphinema basiri* were found in densities of 108 ± 9, 152 ± 4 and 60 ± 2 / 250 ml soil, respectively.

The experiment consisted of eight treatments each replicated four times. The treatments were application of FYM 2 per cent (w/w), neem cake 2 per cent (w/w), *T. viride* 1 g / pot (5.6 x 10^7 cfu/g), carbofuran at 15 mg a. i. / pot, FYM + carbofuran, neem cake + carbofuran, *T. viride* + carbofuran, and an untreated control. Fifteen day old seedlings of tomato cv. Co3 raised in sterile soil were transplanted to the pots earlier filled with the soil under different treatments. The experiment was concluded 45 days after transplanting and observations on the growth of plants and the density of *A. cladodes* var. *macroides* and plant parasitic nematodes were made. The data were subjected to analysis of variance.

RESULTS AND DISCUSSION

The density of nematode trapping fungus *Arthrobotrys cladodes* var. *macroides* increased significantly in FYM 2 per cent followed by neem cake 2 per cent. *Trichoderma viride* significantly suppressed the multiplication of *A. cladodes* var. *macroides.*

There was a reduction in population of *Helicotylenchus dihystera*, *Tylenchorhynchus capitatus* and *Xiphinema basiri* in all treatments except untreated control. Carbofuran alone gave the maximum reduction in population of

all the three nematodes. Combined application of neem cake with carbofuran gave better control of *H. dihystera* and *X. basiri* whereas *T. capitatus* was suppressed to a higher degree by FYM with carbofuran. Combined application of carbofuran with neem cake and FYM decreased the effectiveness of the carbofuran.

Plant growth was significantly better in all treatments than in the untreated control. Maximum growth was observed under FYM + carbofuran, followed by neem cake + carbofuran (Table 1). Plant growth could be partly due to the nutritional effects (Ahmad and Alam, 1996) in organic matter amended soil. Organic matter input into the soil may stimulate the nematophagous fungi (Cooke, 1962; Mankau, 1962). Soil microflora have been known to influence the metabolisation of pesticides in soil (Felsot *et al.*, 1981) and their density also increased by addition of organic amendments (Duddington *et al.*, 1956). The reason for less effectiveness of carbofuran when applied together with organic amendments may be due to its rapid metabolisation by the increased activity of soil microflora. Carbofuran also has fungistatic effects (Jaffee and McInnis, 1990) and it affects *A. cladodes* var. *macroides*. Combined treatments *viz.*, FYM + carbofuran and neem cake + carbofuran were not superior to organic amendments alone, because of this reason.

Table 1. Effect of different treatments on growth of tomato plant, plant parasitic nematodes and nematode trapping fungus *A. cladodes* var. *macroides*

Treatment	Growth of tomato plant		Density of *A. cladodes* var. *macroides*	Final nematode population / 250 ml soil		
	Shoot weight (g)	Root weight (g)	cfu / g soil	*H. dihystera*	*T. capitatus*	*X. basiri*
FYM 2%	5.89d	2.24c	28.50d	32.0b	46.0d	30.0c
Neem cake 2%	4.66c	1.48b	24.50c	46.0d	56.0d	37.0c
T. viride (1g)	3.83bc	1.86bc	14.75ab	64.0e	98.0f	41.0f
Carbofuran (15 mg)	5.0cd	2.22c	14.50ab	14.0a	16.0a	12.0a
FYM + carbofuran	12.21f	3.1d	16.50b	36.0c	27.0b	34.0d
Neem cake + carbofuran	9.37e	1.37ab	15.0b	31.0b	35.0c	24.0b
T. viride + carbofuran	3.62b	1.37ab	13.50ab	36.0c	79.0g	53.0g
Control	2.62a	0.66a	11.00a	115.0f	146.0h	87.0h
CD (P=0.05)	0.94	0.79	3.55	2.93	2.82	2.94

Column letter followed by different letters are significantly different from each other

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