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Scutellospora sp. A Mycorrhizal Fungal Species in the Management of Root Knot Nematode, *Meloidogyne incognita* in Tomato

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An experiment was conducted to evaluate the biocontrol potential of arbuscular mycorrhizal fungus, *Scutellospora* sp. against root knot nematode, *Meloidogyne incognita* on tomato under glasshouse conditions. Different dosages of *Scutellospora* sp. @ 5g, 10g, 15g, 20g and 25g/plant were tested against *M. incognita* and compared with carbofuran 3G and an untreated control. Among the various dosages evaluated, application of *Scutellospora* sp. @ 25g/plant was found effective, which enhanced the plant growth parameters to the tune of 58.7% of shoot height, 57.5% of shoot weight, 58.5% of root length, 63.8% of root weight, 59.3% of fruit weight, 63.6% of AM colonization, spore load (167.3/100cc soil) and 0.54% of total phosphorus content and 56.3 and 60.5% reduction in soil and root population of *M.incognita* over untreated control.

Key words: Arbuscular Mycorrhizal (AM) fungus, *Scutellospora* sp., *M.incognita*, Phosphorus content,Tomato

Tomato (*Solanum lycopersicum* L.) is one of the most important and widely grown vegetable crops of the tropics and subtropics. Among the plant parasitic nematodes, root knot nematode, *Meloidogyne* spp. wide in distribution affect many economically important crops including tomato (Sasser, 1979). Research work on AM fungus is now concentrated to use the same as a biocontrol agent for the management of root knot nematodes. Therefore, the present study was undertaken to study the effect of AM fungus, *Scutellospora* sp. for the management of root knot nematode, *M. incognita* in tomato.

Materials and Methods

The starter inoculum of *Scutellospora* sp. was obtained from the Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore were transferred to mud pots containing pot mixture soil. Seeds of maize cv.Co1 were sown in the pots and thinned down to two plants/ pot after germination. It was allowed to grow for 45 days. After 45 days, the number of spores and per cent colonization was assessed.

In a pot culture experiment conducted under glasshouse condition, the mud pots of five kg capacity filled with sterilized pot mixture soil were transplanted with twenty five days old tomato (cv.Co3) seedlings followed by the application of AM fungi *Scutellospora* sp. *viz.,* 5g, 10g, 15g, 20g, 25g, carbofuran 3G and a standard check, untreated control with three replications in a Completely Randomized Design (CRD). Fifteen days after transplanting (DAT), freshly hatched second stage juveniles of *M. incognita* obtained from pure culture of *M. incognita* maintained on tomato were inoculated @ one J_2/g soil. Observations on plant growth characters, *viz.* shoot length, shoot weight, root length, root weight, fruit weight and nematode population in soil and roots were recorded at 90 days after planting. The per cent mycorrhizal colonization, spore load and total phosphorus content were also recorded at the time of termination of the experiment.

Results and Discussion

In the present study, it was evident that *Scutellospora* sp. had significant effect in checking *M.incognita* population in tomato under glasshouse conditions compared to untreated control. Among the different dosages of *Scutellospora* sp., the higher dosage of 25g/plant was found to be most effective to reduce number of females (62.44%), number of egg masses (64.70%), soil (56.30%) and root (60.50%) population of *M. incognita*. The root knot index ranged from 2.5 to 5.0 with different dosages of *Scutellospora* sp. and the least root knot index (2.5) was recorded in plants treated with higher dosage of 25g /plant. The effect of lower dosage of 5 to 20 g/plant of *Scutellospora* sp. in reducing nematode population/ incidence was also significant compared to untreated control.

However, the effect of carbofuran 3G was also found to be on par with the lower dosage of *Scutellospora* sp. (5g/plant) with regard to

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Table 1. Influence of *Scutellospora* sp. on *M. incognita* in tomato

Treatments	No. of females / 5g root	No. of egg masses/5g root	Root knot index	Nematode population/ 250 cc soil	Nematode population / 5g root
Scutellospora sp. @5g/plant	51.34 (42.30)	27.10 (41.00)	3.5	306.30 (38.10)	57.20 (39.21)
Scutellospora sp.@10 g/plant	50.21 (44.84)	26.20 (43.60)	3.5	293.20 (41.83)	56.30 (40.20)
Scutellospora sp.@15 g/plant	44.60 (50.80)	22.60 (50.54)	3.0	265.50 (46.30)	54.10 (42.50)
Scutellospora sp.@20 g/plant	38.20 (57.10)	19.30 (58.60)	2.5	241.40 (51.23)	49.20 (48.10)
Scutellospora sp.@25 g/plant	33.42 (62.44)	16.60 (64.70)	2.5	218.30 (56.30)	37.20 (60.50)
Carbofuran 3G @ 1 kg a.i/ha	52.41 (41.10)	28.00 (39.30)	3.5	321.30 (35.00)	58.00 (38.40)
Untreated Control	89.00	45.70	5.0	494.30	94.10
SEd	1.72	0.76	-	10.30	1.80
CD(p=0.05)	3.45	1.54	-	20.64	3.61

Figures in parentheses are per cent decrease (-) over control.

suppression of nematode population/ incidence (Table 1). The per cent increase in the colonizing ability of different dosages of *Scutellospora* sp. was ranged from 46.6 to 63.6 with spore load of 125.0 to 167.3/100g soil and showed positive relationship with increase in the dosage of *Scutellospora* sp. from 5 to 25g/plant.

Similar results were also obtained by Bagyaraj *et al*. (1979) who demonstrated that inoculation of another AM fungus of *Glomus fasciculatum* in tomato plants significantly reduced the root knot nematode disease severity. The earlier findings of effectiveness of AM fungus, *G.mosseae* in reducing *R. reniformis* population and increasing plant growth and yield of cotton also support the present findings (Seenivasan and Devrajan, 2008). In support of the present study, Odeyemi *et al.* (2010) also reported that inoculation of *G. mosseae* @ 50g (5 spores/g of soil) reduced reproduction factor of *M. incognita* on four improved cowpea varieties.

Increase in phosphorus content as well as plant growth characters were observed followed by the application of different dosage of *Scutellospora* sp. The plant growth promoting effect of *Scutellospora* sp. was superior over untreated control and chemical carbofuran 3G. Among the different dosages of *Scutellospora* sp. evaluated, it was observed that the use of *Scutellospora* sp. @ 25g/plant was most effective to increase all the plant growth characters *viz*. shoot height (58.70 %), shoot weight (57.50 %), root length (58.50 %) root weight (63.80 %) and fruit weight (59.34 %) compared to untreated control and differed significantly from lower dosages of 5 to 20g/plant. It is interesting to note that the efficacy of chemical nematicide, carbofuran 3G was found to be lesser than that of *Scutellospora* sp. at higher dosage (25g/plant) used in improving the plant growth characters of tomato (Table 2). It has been already documented that (1) alteration in root exudates on endomycorrhizae symbiosis that

Table 2. Influence of *Scutellospora* sp. on plant growth of tomato

Treatments	Shoot		Root		Fruit weight (g/plant)	AM colonization (%)	Spore load (100 cc soil)	Total phosphorus (%)
	Height (cm)	Weight (g)	Length (cm)	Weight (g)				
Scutellospora sp. @5g/plant	59.45 (41.20)	15.92 (42.14)	17.54 (42.25)	8.95 (42.10)	517.54 (41.52)	46.6	125.0	0.31
Scutellospora sp.@10 g/plant	60.75 (43.72)	16.12 (43.92)	17.85 (45.60)	9.13 (45.20)	527.23 (44.23)	52.0	130.6	0.34
Scutellospora sp.@15 g/plant	62.70 (47.26)	16.33 (46.10)	18.23 (48.50)	9.54 (51.42)	534.32 (46.20)	56.5	139.3	0.37
Scutellospora sp.@20 g/plant	64.45 (51.25)	16.63 (48.50)	18.64 (51.32)	9.92 (57.46)	557.23 (52.30)	60.3	154.6	0.41
Scutellospora sp.@25 g/plant	67.23 (58.70)	17.65 (57.50)	19.54 (58.50)	10.32 (63.80)	582.43 (59.34)	63.6	167.3	0.54
Carbofuran 3G @ 1 kg a.i/ha	59.37 (40.00)	15.43 (39.20)	17.43 (41.35)	8.74 (39.73)	515.40 (40.00)	-	-	0.35
Untreated Control	42.61	11.20	12.33	6.30	365.7	-	-	0.28
SEd	0.43	0.21	0.48	0.24	12.31	1.21	5.70	0.01
CD(p=0.05)	1.87	0.43	0.96	0.48	24.63	2.42	11.43	0.02

Figures in parentheses are per cent increase (+) over control.

could affect egg hatchability or nematode attraction, (2) competition for nutrient and reduction in reproductive potential of nematodes and (3) direct parasitism over eggs and adult females of nematodes as probable mechanism of AM fungi by Hallmann *et al.* (2009).

Therefore, it is concluded that the application of *Scutellospora* sp. @ 25g/plant could be effective to enhance the plant growth, per cent colonization, spore load and total phosphorus content in tomato plants.

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