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EFFECT OF DIFFERENT AM FUNGI ON *MELOIDOGYNE INCOGNITA* (KOFOID AND WHITE) INFECTING *VIGNA RADIATA* L.

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An Experiment was carried out for the management of root - knot nematode, *Meloidogyne incognita* (Kofoid and White) on mungbean (*Vigna radiate L.*) with the help of AM fungi. Significant reduction in nematode population and development of mung plant was observed when mung plants were treated with different AM fungi. Four AM fungi were used in the treatment viz. *Glomus mosseae, Glomus fasciculatum, Gigaspora gigantea* and *Gigaspora margarita*. These fungi were used in 10gm dose. Remarkable reduction in gall formation and disease severity, increased root, shoot weight were observed in AM treated mung plants. The present investigation indicates that the AM fungi specially *Glomus fasciculatum* has a great potential against *M. incognita.*

Key Words: AM fungi, *Gigaspora gigantean, Gigaspora margarita, Glomus fasciculatum, Glomus mosseae, Meloidogyne incognita and Vigna radiata.*

Introduction

Productivity of plants is frequently limited by the low level of phosphorus available in the soil. Therefore, large applications of phosphorus fertilizers are normally required to increase the production. However, with the increasing cost of fertilizers, alternative strategies for minimum fertilizers input and efficient use must be adopted in the future. Among mycorrhizal fungi endomycorrhizal also known as arbuscular mycorrhizal (AM) fungi are known to involve in the cycling of nutrients in the soil, enhance nutrition, growth productivity of plants as well as part of an alternative strategy for nematode management. AM fungi interacts with other microorganisms present in the rhizosphere. It's presence causes some physiological changes in the host plant. In this way it provides nutrients to the plants and plants become strong to fight against diseases[1,2]. The potential role of AM fungi in the biological control of plant parasitic nematodes is also attracting greater attention. This is because of a perceived urgency to develop and adopt environmentally safe and economic and efficient methods for managing nematodes.

Material and Methods

Spores of *Glomus mosseae, Glomus fasciculatum, Gigospora margarita* and *Gigaspora gigantea* were mass cultured on Onion and *Cenchrus* spp. Plant growth

period of 90-100 days gave a large crop of mycorrhizal fungal spores to produce sizable amount of substrate based inoculum. Nematode infection was determined by assessing the number of eggs, egg masses and galls on the roots.

Some sterilized earthen pots were filled with autoclaved soil, and planted with sterilized (0.1% $HgCl_2$) mung seeds. Seven days old seedlings were transplanted to the 15 cm diameter earthen pots containing autoclaved soil in which AM fungi placed just below the seedlings. These seedlings were inoculated with nematode (1000 juveniles per pot after 10 days). Four replicates of each experiment were set. Observations were taken after 60 days of treatment. Treatments were as follows :-

1. Healthy controlled plant
2. N alone
3. GM (10g) + N
4. GF (10g) + N
5. GiG (10g) + N
6. GiM (10 g) + N

After 60 days plants were harvested. Observations were recorded on fresh root-shoot weight and length. Root knot index for assessment of nematode multiplication was observed in the root system. All data were statistically analysed.

Results and Discussion

Significant reduction in nematode population and development was observed when mung plants were treated with different types of AM fungi. Four AM fungi were used in the treatments viz. *Glomus mosseae, Glomus fasciculatum, Gigaspora gigantea* and *Gigaspora margarita*. These fungi were used in 10gm dose.

In healthy control plants, fresh and dry shoot weight was 38.67gm and 8.03gm respectively as compared to 27.67gm and 5.02gm in nematode alone treated plants, which increased with the addition of AM fungi. Fresh and dry shoot weight were 54.99gm and 9.22gm, 59.03gm and 9.53gm, 48.90gm and 8.87gm, 50.31gm and 8.95gm in GM, GF, GiG and GiM treated plants respectively (Table 1). Fresh and dry root weight also showed a similar pattern. It was maximum in GF treated plants (32.28gm fresh weight and 3.39gm dry weight). The nematode inoculated plants showed least fresh (13.83gm) and dry (1.20gm) weight.

No gall formation was observed in untreated control plants, while maximum galls were observed in nematode alone inoculated plants. 15 and 21.66 root galls were recorded in GF and GM treated plants respectively. Likewise increase in number of egg masses were noted in treatments with GF, GM, GiM and GiG respectively. In GF the number of egg masses was 75.33. Maximum number was observed in GiG (95.33) among AM fungi treated plants. *Rhizobium* nodules were also observed maximum in GF treated plants (185.66) followed by GM (178), GiM (166.66) and GiG (162) treated plants. The minimum number was obtained in nematode inoculated untreated plants (86.33).

It is evident from the results obtained from investigations that prior application of all four types of AM fungi helped in decreasing the nematode multiplication as compared to prior nematode inoculation. This can be attributed to the fact that AM fungi establishes itself vastly before nematode attacks and creates an unfavourable environment or modifies it which retards and hinders *M. incognita* development. When the nematode inoculation proceedes the AM fungi application, the damage was already done by the nematode, thus AM fungi could not help much in controlling the disease severity. Maximum growth in plants and reduction in the nematode population was observed by

S. No.	Treatment	Length (cm)		Fresh wt.(g)		Dry wt.(g)		No. of galls/ root	No. of egg masses / Root	No. of modules/ Root	No. of eggs/ egg mass	% decrease in egg masses
		Shoot	Root	Shoot	Root	Shoot	Root					
1.	Control	52.67	66.67	38.67	22.00	8.03	1.57	0.00 (0.71)	0.00 (0.71)	151.66 (12.34)	0.00	-
2.	'N' alone	40.83	50.67	27.67	13.83	5.02	1.20	162.66 (12.77)	222.33 (14.93)	86.33 (9.32)	179.00	-
3.	GM +N	73.00	83.33	54.99	31.48	9.22	2.87	21.66 (4.71)	82.33 (9.10)	178.00 (13.36)	108.00	62.97
4.	GF +N	79.33	89.33	59.03	32.28	9.53	3.39	15.00 (3.93)	75.33 (8.71)	185.66 (13.64)	103.00	66.12
5.	GiG +N	62.33	75.00	48.90	29.85	8.87	2.53	31.66 (5.67)	95.33 (9.79)	162.00 (12.75)	119.00	57.12
6.	GiM +N	66.00	77.00	50.30	30.17	8.95	2.44	28.66 (5.40)	91.33 (9.58)	166.66 (12.93)	113.00	58.92
	Sem+	+0.53	+0.59	+0.39	+0.51	+0.02	+0.01	+0.07	+0.05	+0.04	+0.83	
	CDat 1%	2.30	2.56	1.67	2.19	0.06	0.06	0.28	0.20	0.15	3.72	
	CDat 5%	1.64	1.83	1.19	1.56	0.04	0.04	0.20	0.14	0.11	2.62	
	CV	1.48%	1.40%	1.44%	3.29%	0.30%	1.00 %	2.03%	0.90%	0.50%	1.39%	

TABLE 1: Effect of different types of AM (Arbuscular Mycorrhiza) on *M.incognita* infecting mung

the inoculation of *G. fasciculatum* followed by *G. mosseae*, *Gi margarita* and *Gi gigantea* respectively

Various nematode management options can be employed carefully to enhance the productivity of pulses in soil infested with nematodes. The rhizosphere engineering with the aim to maintain a healthy plant population for better crop and soil health holds great promise for sustainable crop- nematode management[3]. AM fungi forms a beneficial symbiotic association with roots that increases the ability of plants to absorb phosphorus (P), minor elements and water[4]. The extensive colonisation by AM fungi could cause changes in root exudate patterns and nematode penetration[5].

Establishment of *G. fasciculatum* and *G. mosseae* one week prior to *M. incognita* resulted in increased fresh and dry weight of shoot-root and yield as compared to simultaneous inoculation or early establishment of the nematode species. The presence of nematode *M. incognita* reduced the percent mycorrhizal root infection and spore production as mentioned in observation. The early establishment of both the AM fungi in root could reduce the number of galls and egg masses per root of the mung plant. Similar findings have been reported by many workers[6,7,8].

The *G. fasciculatum* helped the plants to overcome the harmful effects of nematodes as it was apparent on the interaction studies of cowpea and *Rotylenchulus reniformis*[9]. AM colonization drastically reduced nematode multiplication as evidenced by the poor galling and nematode population, the AM induced resistance to root-knot nematode and it could be linked to decreased penetration and slower development of root-knot nematode larvae in mycorrhizal roots of cowpea[10].

G. fasciculatum alone as well as in combination with legume bacterium is seen to increase various growth parameters of green gram including pod yeild[11]. In the present investigation *G. fasciculatum* was proved best as compared to other AM fungi. Results of present study are in agreement with results reported by other workers[12,13].

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