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EFFECTS OF INOCULUM SEQUENCE OF AM FUNGI ON ROOT - KNOT DISEASE OF MUNG (*VIGNA RADIATA L.*)

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An experiment was conducted to study the effect of inoculum sequence of different AM fungi on the disease severity of Root-knot nematode *Meloidogyne incognita (Kofoid* and *White)* on *Vigna radiata* (*L*). In this study two different AM Fungi *Glomus mosseae* and *Glomus fasciculatum* were inoculated before and after the nematode infection. It is evident from the results obtained from present investigations that prior application of both types of AM fungi helped in decreasing the nematode multiplication as compared to prior nematode inoculation. AM fungi establishes itself vastly before nematode attacks and creates an unfavourable environment for *Meloidogyne incognita* development.

Key words: AM fungi, *Glomus fasciculatum, Glomus mosseae, Meloidogyne incognita, Vigna radiata.*

Introduction

Arbuscular mycorrhizal fungi are obligate root symbionts that can protect their host plant against biotic stress factors such as plant parasitic nematode infection. Various mechanisms have been proposed to play a role in the bio-control effect of AM fungi against plant parasitic nematodes. Arbuscular mycorrhiza are characterized by the formation of unique structures, arbuscles and vesicles by fungi of the phylum Glomeromycota. AM fungi helps plants to capture nutrients such as phosphorus, sulfur, nitrogen and micronutrients from the soil. AM fungi enhance plant tolerance by higher nutrient uptake, altered root morphology, direct competition for nutrients and space, inducing systemic resistance and altering rhizosphere interactions[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, economic and efficient methods for managing nematodes.

Materials and Methods

Spores of *Glomus mosseae* and *Glomus fasciculatum* were mass cultured on onion and *Cenchrus* spp. Plant growth period of 90-100 days gave large crop of mycorrhizal fungal spores to produce sizable amount of substrate based inoculums. 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 15cm diameter earthen pots containing autoclaved soil in which nematodes and AM fungi are applied in different sequences at

the interval of 10 days.

1. N (1000) → GM
2. GM → N (1000)
3. N (2000) → GM
4. GM → N (2000)
5. N (1000) → GF
6. GF → N (1000)
7. N (2000) → GF
8. GF → N (2000)

Proper care was taken during the crop season. Data on plant growth characters, nematode multiplication were recorded after 60 days depending upon time of inoculation of nematode. All data were statistically analysed.

Results and Discussion

Observations recorded in the present experiment revealed that relative efficacy of the AM fungi depends on the time of its application (Table). Observations made on fresh weight of shoot revealed that GF (10 days prior) + N 1000 (59.33gm) was more suitable than N 1000(10days prior) + GF (57.71gm). Shoot weight of GM (10 days prior) +N 1000 (54.99gm) was more than the treatment N 1000 (10 days prior) + GM (52.77). Dry weight of shoot also followed the similar pattern.

Fresh root weight was 32.28 gm in GF (10 days prior) + N1000, 31.47 gm in N 1000 (10 days prior) +GF, 31.52gm in GF (10 days prior) + N 2000, 31.01gm in N 2000 (10 days prior) + GF treated plants. In the plants treated with *Glomus mosseae* fresh weight of root was 31.48gm in GM (10 days prior) + N 1000, 30.64gm in N 1000 (10 days prior) + GM, 30.98gm in GM (10 days prior) + N 2000 and 30.04gm in N 2000 (10 days prior) + GM. Dry weight of root also followed the same trend.

Maximum number of galls were produced in N 2000 (10 days prior) + GM (37.33) and minimum number in GF (10 days prior) + N 1000 (15) treated plants. Plants with other treatments showed results in between. Similar type of results were obtained in case of number of egg masses per plant. Minimum and maximum numbers of egg masses per plant recorded were 75.33 in GF (10 days prior) + N 1000 and 94.66 in N 2000 (10 days prior) + GM treated plants. *Rhizobium* nodules were maximum (185.66) in GF (10 days prior) + N 1000 and minimum (159) in N 2000 (10 days prior) + GM treated plants. Plants with other treatments showed results in between. Remarkable reduction in gall formation and disease severity with increased root, shoot weight were observed in AM treated mung plants. In the roots of AM treated plants there is extensive development of intercellular hyphae, coiled intracellular hyphae and arbuscles in cortical parenchyma. All the data recorded were found to be statistically significant.

It is evident from the results obtained from present investigations that prior application of both 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 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 precedes the VAM application, the damage was already done by the nematode, thus VAM could not help much in controlling the disease severity[3,4,5]. AM fungi forms a beneficial symbiotic association with roots that increases the ability of plants to absorb phosphorus (P), minor elements and water[6]. The extensive colonization by AM fungi could cause changes in root exudate patterns and nematode penetration[7].

VAM fungi acts as a bio-fertilizer and shows a promising perspective in terms of cost effectiveness and energy saving. The significance of VAM in augmenting food production is far wide, so these can be used in sustainable agriculture. Mycorrhiza are root symbionts which absorb organic

S. No	Treatment	Length (cm)		Fresh wt.(g)		Dry wt.(g)		No. of galls/ root	No. of egg masses / Root	No. of nodules/ Root	No. of eggs/ egg mass
		Shoot	Root	Shoot	Root	Shoot	Root				
1.	GM→N(1000)	73.00	83.33	54.99	31.48	9.22	2.87 (5.08)	25.33 (9.10)	82.33 (13.36)	178	102.00
2.	N(1000) →GM	65.67	76.00	52.77	30.64	8.99	2.74 (5.49)	29.66 (9.44)	88.66 (13.02)	169	113.00
3.	GM→ N(2000)	67.33	77.67	53.13	30.98	9.08	2.78 (5.40)	28.66 (9.39)	87.66 (0.02)	171.33	110.66
4.	N(2000)→ M	61.33	69.33	51.93	30.04	8.90	2.50 (6.18)	37.33 (9.76)	94.66 (0.04)	159	123.00
5.	GF→ N(1000)	79.33	89.33	59.03	32.28	9.53	3.39 (3.94)	15.00 (8.71)	75.33 (0.04)	185.66	95.33
6.	N(1000)→ GF	73.33	81.00	57.71	31.47	9.24	2.85 (5.28)	27.33 (9.32)	86.33 (0.04)	174	109.33
7.	GF→ N(2000)	75.00	84.67	55.01	31.52	9.30	2.92 (4.71)	21.66 (9.01)	80.66 (0.02)	182.66	97.66
8.	N(2000) →GF	60.67	78.67	55.15	31.01	9.19	2.81 (5.64)	31.33 (9.57)	91.00 (0.02)	132.33	116.66
	Sem±	+0.55	+0.58	+0.51	+0.04	+0.01	+0.01	+0.06	+0.04	+0.03	+0.69
	CDat 1%	2.07	2.39	2.10	0.17	0.04	0.03	0.23	0.17	0.12	2.81
	CDat 5%	1.50	1.73	1.52	0.13	0.03	0.02	0.17	0.12	0.08	2.08
	CV	1.23%	1.25 %	1.60 %	0.23 %	0.19 %	0.44 %	1.86 %	0.76%	0.36%	1.10%

Table 1 : Effect of Inoculum sequences of AM and nematode on Mung

GM = *Glomus mosseae* GF = *Glomus fasciculatum* N = Nematode

Figs. in parenthesis are $\sqrt{n+1}$ transformed value

compounds from the plant and provide mineral elements like N, P,K, Ca, S and Zn to the host plant[8].

Previous work on peaches and tomatoes also showed that prior establishment of VAM fungi interfere with the establishment and multiplication of *H. cajani*[9,10]. The presence of VAM adversely affected the nematode reproduction. Results of present study are in agreement with the results reported by other workers[11,12].

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