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EFFICACY OF ORGANIC AMENDMENTS AND AM FUNGI TO MANAGE ROOT-KNOT DISEASE INCIDENCE IN *VIGNA RADIATA*

SWATI SHARMA[1*] and P. C. TRIVEDI[2]
[1]Department of Botany, Govt. P.G. College Tonk, Rajasthan, India
[2]Department of Botany, University of Rajasthan, Jaipur, Rajasthan.
* Corresponding author : E-mail: swati.a7jpr@gmail.com

An experiment was carried out for the management of root-knot nematode, *Meloidogyne incognita* on mungbean *(Vigna Radiata L.)* with the help of integrated management of AM fungi and dried leaf powder. *Glomus fasciculatum* and dried leaf powders of *Azadirachta indica* Juss. and *Bougainvillea spectabilis* Willd. were tested for their namaticidal activity. Results of pot experiments of integrated nematode management (INM) by leaf powders and AM fungi significantly enhanced the plant growth and reduced nematode population. Biomass was increased and disease intensity was reduced by both the combinations but more effectively by *Azadirachta* leaf powder and AM fungi.

Keywords: AM fungi; INM; leaf powder; *Meloidogyne incognita; Vigna radiata.*

Introduction

The plant parasitic nematodes including root-knot nematodes being regarded as serious pests and an important major limiting factor in the production of agricultural crops. The root-knot nematode, *Meloidogyne incognita* is an important nematode attacking pulse crops in India. The crop loss due to this nematode in green gram ranged between 20-25%. A variety of cultural, physical, biological and chemical methods of control have been tested but all the methods have their own merits and demerits. The conventional nematicides have an initial dramatic impact on plant parasitic nematodes. But the high cost of synthetic nematicides poses a serious problem in developing countries like India. Further repeated application of such toxic chemicals cause several ill effects like pest resistance, pesticide residues in food, pollution in water, soil and atmosphere. Thus, the search for pest control agents from natural resources has started gaining importance and it needs to be hastened as plant products being naturally evolved ingredients and biocontrol measures, have an edge over synthetic pesticides in preserving the natural equilibrium in ecosystem. An urgent need was felt to find alternative approaches to pest control in crop production which gave birth to a new philosophy on crop protection, the "Integrated Pest Management" (IPM). The Integrated Nematode management (INM) seeks to stabilise populations of target nematode pest at acceptable levels resulting in favourable long term socio-economic and environmental consequences. The object of INM approach is to maintain the population density below the economic injury threshold.

AM fungi significantly increase plant growth and phosphorus content of plant. Number of galls on infected roots was also significantly reduced by AM fungi[1&2]. Neem and other leaf powder extracts increase nematode mortality[3-5]. In the present studies an attempt was made to observe the effect of AM fungi and organic amendments in integrated manner on *Meloidogyne incognita* infecting mung because when both are combined with each other in INM they can be proved as promising technique for agriculture production and can be used as biofertilizer and biocontrol agent against root-knot nematode.

Materials and Method

The present investigation was undertaken to manage root-knot nematode, *M. incognita* on mung by using AM and organic amendments in integrated manner. *Azadirachta* leaf powder (AP) and *Bougainvillea* leaf powder (BP) along with AM fungi *Glomus fasciculatum* were used.

Fifteen cm diameter earthen pots were filled with steam sterilized soil. Leaves of above mentioned plants were shed dried and powdered in a grinder. The leaf powders were mixed with pot soil in 3gm dose and pots were watered regularly so as to decompose the powder. The pots were kept fortnightly for proper decomposition of leaf powder. Mung seeds of variety K-851 were surface sterilized with 0.1% $HgCl_2$ and sown in pots where AM fungi placed just below the seedlings. These seedlings were inoculated with nematode (1000 juveniles per pot) after ten days. *G. fasciculatum* was applied ten days prior to the nematode inoculation and leaf powders were mixed with soil fifteen days before seed sowing. Each treatment was replicated four-times and one set was served as control. Sixty days after inoculation mung plants were uprooted, washed in running water and various growth parameters in terms of fresh and dry root, shoot weight, numbers of galls and nodules were counted. All the data were subjected to statistical analysis.

Results and Discussion

In this trial leaf powders were tested at their least effective dose with AM against nematodes. The plants treated with *G. fasciculatum* in combination with *Azadirachta* leaf powder and *G. fasciculatum* with *Bougainvillea* leaf powder responded better growth and lesser nematode population as compared to 'N' alone treated plants. These treatments significantly enhanced the plant growth and reduced nematode population. In general, average weight of root and shoot tended to increase in plants grown in amended soil, as compared to non-amended soil (Table-1). Plant growth was enhanced greatly and disease severity was also reduced by both the combinations but more markedly with *Azadirachta* leaf powder. Thus, the organic matter present in abundance in nature can be widely used for nematode control.

Data summarised in Table 1 showed that maximum fresh and dry weight of shoot was observed in G.F. + Neem leaf where it was 60.96gm and 18.57gm respectively. It was followed by G.F. + *Bougainvillea* leaf powder (59.06 and 17.99 gm). Minimum of 27.67gm and 5.02gm fresh and dry shoot weight was recorded in 'N' alone treatment. Root weight (Fresh and dry) also showed variation with the treatments. It was maximum in G.F. + Neem leaf where it was 36.20 gm and 2.86 gm respectively, while the minimum of 13.83 gm and 1.20 gm were recorded in 'N' alone treatment.

Observations revealed that maximum nodulation was observed in G.F. + Neem leaf (177) which was followed by G.F. + *Bougainvillea* leaf powder (170.33) in decreasing order. Maximum reduction in

Table. 1. Integrated management of root-knot nematode *M.incognita* with the combined effect of AM (*G. fasciculatum*) and leaf powders.

S. No.	Treatments	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	% decrease in egg masses
		Shoot	Root	Shoot	Root	Shoot	Root					
1.	AP + GF	77.67	82.33	60.96	36.20	18.57	2.86	18.33 (4.34)	60.66 (7.82)	177 (13.32)	11.66	72.72
2.	BP + GF	73.00	78.33	59.06	35.79	17.99	2.12	23 (4.85)	66.66 (8.20)	170.33 (13.07)	118.66	70.02
3.	'N' alone	40.83	50.67	27.67	13.83	5.02	1.20	162.66 (12.77)	222.33 (14.93)	68.33 (9.32)	179.00	
	SEM±	+0.78	+0.33	+0.19	+0.26	+0.04	+0.02	+0.05	+0.05	+0.03	+0.75	
	CDat 1%	4.07	1.75	1.01	1.37	0.18	0.08	0.28	0.26	0.16	4.85	
	CDat 5%	2.69	1.15	0.67	0.90	0.12	0.05	0.18	0.17	0.12	2.93	
	CV	2.11%	0.82%	0.68%	1.58%	0.44%	1.29%	1.24%	0.82%	0.45%	0.95%	

AP = *Azadirachta leaf powder*
BP = *Bougainvillea leaf powder*
GF = *Glomus fasciculatum*
N = *Nematode*

number was observed in G.F. + Neem leaf, where it was 18.33 and was further increased as 23 and 162.66 in G.F. + *Bougainvillea* leaf powder and 'N' alone treated plants. Likewise similar reduction in egg masses was observed. Number of egg masses was maximum in 'N' alone treated plants (222.33) and was reduced to 60.66 in G.F. + Neem leaf treatment. Data collected showed that maximum reproduction of nematode was observed in only 'N' treated plants. This was significantly checked by G.F. in combination with neem leaf and *Bougainvillea* leaf powders.

Integration of VAM such as *G. mosseae* and *G. fasciculatum* with oil cakes viz. neem cake and mustard cake, combined inoculation of all the four was the best treatment to control *M. incognita* in ornamentals[6]. Some researches were done to control *M. incognita* by using VAM+ *Paecilomyces lilacinus* treatments[7].

Integrated management experiments of *Meloidogyne incognita* on lentil cv. DPL-62 were conducted under field conditions and it was revealed that *Trichoderma harzianum* + carbofuran gave highly effective results in improving the percent nodulation / plant and seed yield and reducing the final nematode population and root-knot index followed by *G. fasciculatum* + carbosulfan, *G. fasciculatum* + *T. harzianum*, carbosulfan alone, *T. harzianum* and *G. fasciculatum* alone, respectively[8].

Treatment with *Trichoderma viride*, *Glomus fasciculatum* and mustard cake showed better disease control, seedling stand and better reduction of galls, egg masses as also nematode population and increased growth parameters and yield. This indicates the effectiveness of the bio agents and mustard cake on management of disease complex (*M. incognita* and *R. solani*) of okra[9]. Amending the soil with *G. aggregatum* in combination with oil cakes was effective in reducing root-knot nematode in chewing tobacco var. VR2. Combination of neem cake and *G. aggregatum* significantly increased plant growth characters and reduced in root-knot nematode population, egg mass production, root galling and root-knot index[10]. Mycorrhizal fungal inoculations of potting mixes during transplanting production of watermelon seedlings may improve early crop establishment[11]. The use of AM fungi in combination with oil cakes in transplantable crops was found to be highly beneficial[12]. AM fungi are beneficial to a wide range of most plants and show antagonistic approach to several phytoparasitic nematodes[13].

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