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ECOFRIENDLY MANAGEMENT OF *M. INCOGNITA* WITH THE COMBINATION OF *PAECILOMYCES LILACINUS* AND ORGANIC AMENDMENTS

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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 *Paecilomyces lilacinus* fungus and organic amendments. *Paecilomyces lilacinus* along with dried leaf powder of *Azadirachta indica* Juss. and oil cake of sesame were tested for their nematicidal activity. Results of pot experiments of integrated nematode management (INM) 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.

Keywords: INM; *Meloidogyne incognita;* Organic amendments; *Paecilomyces lilacinus*; *Vigna radiata.*

Introduction

Green gram is the most important pulse crop in India as well as in South-East Asia. It is grown in almost all the states, being cultivated mainly as a kharif season crop, but is also grown as a rabi season crop in south, where the winter is quite mild. Major mung growing states are Madhya Pradesh, Tamil Nadu, Bihar, Andhra Pradesh etc. The root-knot nematode *Meloidogyne incognita* is an important nematode attacking on pulse crops in India. The crop loss due to this nematode in green gram ranged between 20.4% - 25.3% (AICRP, 1999-2001).

A variety of cultural, physical, biological and chemical methods of control have been tested but all the methods have their own merits and demerits. Pesticides constitute an evolutionary and unacceptable threat to food safety and environment. Thus the search for pest control agents from natural sources[1] and biocontrol measures[2] have started gaining importance. 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 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.

Materials and Methods

The present investigation was undertaken to manage root-knot nematode, *M. incognita* on mung by using fungi *Paecilomyces lilacinus* and organic amendments in integrated manner. *Azadirachta* leaf powder (AP) and sesame oil cake (SC) were tested along with fungus *P. lilacinus.* 15 cm diameter earthen pots were filled with autoclaved soil. Sesame oil cake and *Azadirachta* leaf powder in dose 3g per pot were mixed with the pot soil, watered regularly and allowed to decompose for 15 days. Fungus *P. lilacinus* multiplied on wheat bran was applied 10 days before nematode inoculum @ 4g/pot and surface sterilized seeds of mung variety K-851 were sown in pots. After 10 days each plant was inoculated with 1000 active second stage juveniles of *M. incognita.* Each treatment was replicated five times at each stage. After 60 days of inoculation plants were uprooted and plant growth characters such as shoot-root length, shoot-root weight (fresh and dry) and root-knot index, number of galls and number of egg-masses were recorded. Egg masses were detached from root pieces and examined for fungal infection. Root pieces with galls were also stained with 0.1% cotton blue, cleared in lacto phenol and slides were prepared for the presence of nematophagous fungi (*P. lilacinus*)

Results and Discussion

In this trial leaf powder of *Azadirachta* and sesame oil cakes were used in combination with fungus *Paecilomyces*. Both were found very efficient in reducing the disease incidence. Results presented in Table 1 revealed that there was significant reduction in disease incidence when *P. lilacinus* applied to nematode infected plants along with organic amendments.

In this trial dried leaf powder of *Azadirachta* and Sesame oil cake were used in combination with fungus *Paecilomyces.* All the combinations used were found to be nematotoxic. Fresh shoot weight was maximum in AP+P (4gm) which was 60.02gm followed by SC+P (58.91gm). Dry shoot weight was also corresponding to fresh shoot weight. It was maximum in AP+P (19.91gm.) and minimum of 5.02gm in 'N' alone inoculated plants (Table 1). Fresh and dry root weight in infected plants was 13.83 gm and 1.19gm which increased upto 35.95gm and 2.60gm in SC+P and 36.69gm and 3.05gm in AP+P treatment. Nematode population/root system was maximum in 'N' alone inoculated plants. It decreased with the addition of treatments. Maximum reduction in number of galls and number of egg masses were obtained in AP+P treatment (17.33 and 43.33) followed by SC+P (21.33 and 52.33) treatments while the maximum number (162.66 and 222.33) was recorded in 'N' alone treatment. All the data were found statistically significant.

Fungus *Paecilomyces* was used in combination with sesame oil cake and *Azadirachta* leaf powder. Both were found very efficient in reducing the disease incidence. Similar types of results were noted on okra and other plants[3-5]. When *P.lilacinus* was combined with *Azadirachta* leaf powder gave better results in comparison with *P. lilacinus* combined with sesame oil cakes. Present findings are in the accordance with the work where *P. lilacinus* with neem leaf extracts was found most effective treatment[6].

Individual and concomitant effect of neem cake and nematophagous fungi *Paecilomyces lilacinus* and *Verticillium chlamydosporium* were studied to *evaluate* their compatibility in the nematode management programme. A significant reduction in disease incidence was observed when either of the nematophagous fungus

Table 1 . Integrated management of root-knot nematode *M.incognita* with the combined effect of nematophagous fungi (*Paecilomyces lilacinus*) and organic amendments

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.	SC+P(4gm)	74.00	81.00	58.91	35.95	18.98	2.60	21.33 (4.66)	52.33 (7.27)	162.66 (12.77)	114.33	76.46
2.	AP+P(4gm)	80.66	86.33	60.02	36.69	19.91	3.05	17.33 (4.22)	43.33 (6.62)	173.66 (13.19)	109.66	80.51
3.	'N' alone	40.83	50.66	27.66	13.83	5.02	1.19	162.66 (12.77)	222.33 (14.93)	86.33 (9.32)	179.00	
	SEM±	+0.52	+0.64	+0.20	+0.34	+0.02	+0.07	+0.13	+0.10	+0.05	+0.67	
	CDat 1%	2.72	3.35	1.02	1.76	0.08	0.38	0.66	0.51	0.26	4.34	
	CDat 5%	1.79	2.21	0.68	1.16	0.05	0.25	0.44	0.34	0.17	2.62	
	CV	1.38 %	1.52 %	0.69 %	2.02 %	0.17 %	5.57 %	0.03 %	1.76%	0.72%	0.86 %	

SC = Seasame oil cake ; P = *Paecilomyces lilacinus*
AP = *Azadirachta leaf powder* ; N = *Nematode*
Fig. in parenthesis are $\sqrt{n+1}$ transformed values

was tried. It was observed that *P. lilacinus* along with neem cake gave better results[7].

The root-knot disease is one of the most damaging ones caused by *Meloidogyne* spp. This disease can possibly be managed by integrated nematode management practices. In this practice, the nematophagous fungi play a significant role. In order to establish these nematophagous fungi for the purpose of biological control of root-knot nematode, organic matter are added in harmonious way[8]. Some researches were done to control *M. incognita* by using VAM + *Paecilomyces lilacinus* treatments[9]. Application of neem and castor oil cake both alongwith *Paecilomyces lilacinus* was also found extremely effective[10-11].

Integration of *P.lilacinus* and castor leaves was found effective in increasing the growth of tomato and reducing the infestation of root-knot nematode[12]. Various organic amendments like karanj, neem and mahua cakes supported to increase growth and sporulation of *Paecilomyces lilacinus*[13]. Soil fumigation with metham sodium alone and in combination with neem cake enriched

with bioagents such as *Paecilomyces lilacinus* or *Pseudomonas fluorescence* has been found effective against root-knot nematode infecting tomato and capsicum[14].

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