



**Research Paper**

**INTERACTION OF *Meloidogyne incognita* AND *Rhizoctonia solani* ON FRENCH BEAN**

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**Abstract**

A pot experiment was conducted to study the interaction of *Meloidogyne incognita* and *Rhizoctonia solani* on french bean in the net house of Department of Nematology, Assam Agricultural University, Jorhat. The results revealed that the dual inoculation treatments significantly decreased plant growth parameters over single inoculation treatments. Simultaneous inoculation of *M. incognita* and *R. solani* showed maximum reduction in plant growth parameters of french bean. However, the number of galls, eggmass and eggs per eggmass and final nematode population was found maximum in single inoculation treatment than dual inoculation treatments. The highest nematode population and number of galls, eggmasses and egg per eggmass were observed in the treatment with *M. incognita*.

Key words: *Meloidogyne incognita*, *Rhizoctonia solani*, interaction, french bean.

**INTRODUCTION**

Plant parasitic nematodes are considered as one of the major limiting factors of successful cultivation of crops. Besides causing direct damage to the plant as a pathogen, they play important and destructive role in disease complex, where they either act as incitant, aggravators or vectors. The importance of disease complex has been a matter of serious concern from the time of first report by Atkinson [2] when wilt resistant cotton became susceptible in presence of root-knot nematode. Many workers have been extensively reviewing on this aspect with different nematode species and fungal or bacterial pathogens ([1]; [5]; [8] and [10]). The presence of single pathogen may cause little damage while more than one may account for serious crop loss. Since fungal infection (*R. solani*) was frequently encountered with french bean, an attempt was made to know the interrelationship, if any, between *M. incognita* and *R. solani* of french bean.

**MATERIALS AND METHOD**

The pot experiment was conducted in the net house, Department of Nematology, Assam agricultural University, Jorhat. The fungus *Rhizoctonia solani* was isolated from diseased french bean seedling showing typical symptoms of collar rot grown in Horticultural orchard of Assam Agricultural University, Jorhat by hyphal tip culture method and grown on Potato Dextrose Agar (PDA). The culture of the pathogen (*R. solani*) was

maintained throughout the period of experimentation on PDA periodically subculturing on fresh media and stored at 4°C. Mass culture of *R. solani* was done in four per cent maize-meal sand medium (MMSM). For soil inoculation, 15 days old culture of *R. solani* grown in MMSM were used. For preparation of MMSM forty grams of maize meal was added to 960 g of clean sand and were mixed thoroughly by pouring 200 ml of distilled water. The medium was then put into polypropylene bags of required size (20.5 x 26.0 cm). The bags containing the medium were plugged with non absorbent cotton and autoclaved at 121°C at 15 lb pressure for 30 minutes. The rate of inoculation for *R. solani* was 1% w/w.

The inoculum of *Meloidogyne incognita* was obtained from a pure culture maintained on tomato plant using single eggmass and inoculated to a french bean crop. The nematode inoculum were collected from the infested french bean crop maintained as pure culture. After processing the number of larvae per ml suspension was counted before inoculation. Just before the inoculation, the feeder roots of the seedlings (10 days old) were exposed by carefully removing the adhering top layer of soil. The required quantity of nematode suspension was poured uniformly all over the exposed roots @ 1 J<sub>2</sub>/g of soil and covered immediately with the top soil. This was followed by light watering of the plants. The treatments of the interaction study of *M. incognita* and *R. solani* were 1) *R. solani* @ 1% w/w, 2) *M. incognita* @ 1000 J<sub>2</sub>/kg of soil, 3) *M. incognita* @ 1000 J<sub>2</sub>/kg of soil + *R. solani* @ 1% after 15 days of inoculation, 4) *R. solani* @ 1% w/w + *M. incognita* @ 1000 J<sub>2</sub>/kg of soil after 15 days of inoculation, 5) *M. incognita* @ 1000 J<sub>2</sub>/kg of soil and *R. solani* @ 1% w/w simultaneous inoculation, 6) Check (UC).

## RESULTS AND DISCUSSION

The results of the experiment exhibited significant reduction of plant growth parameters by either of the pathogens. However, combined inoculation resulted in severe reduction of plant growth than single inoculation. The treatments receiving nematode and fungus simultaneously resulted in higher reduction in plant growth than other treatments. The synergistic effect of concomitant inoculation was also recorded by Batten and Powell [3] in flue cured tobacco. Inoculation of *R. solani* after inoculation of *M. incognita* also exhibited severe reduction of plant growth parameters of french bean. However post inoculation of *M. incognita* to *R. solani* exhibited lesser adverse effect on plant growth (Table 1). The greater damage in plants inoculated with nematode and fungus preceded to nematode may be due to the prior invasion of nematode into the roots thereby making the host more suitable for fungal infection providing a metabolic rich substrate and / or nematode might also modify the rhizosphere thereby favouring the fungal growth [9]. On the other hand fungus inoculation followed by nematode caused less reduction in plant growth. The fungus made the roots less favourable for nematode attack or the fungus secretion produced adverse effects on nematodes [7]. However, Al-Hammouri *et al.* [1] failed to notice any adverse effect on dry weight and physiological measurement of chilli due to co infestation of *R. solani* and *M. incognita*.

Maximum number of root galls along with higher multiplication parameters were recorded when nematodes were inoculated alone. The nematode multiplication and number of root galls were reduced in presence of fungus. Maximum number of galls eggmass and egg per eggmass was found in the treatment with *M. incognita* @ 1000 J<sub>2</sub>/kg of soil. Final nematode population of the nematode in soil was also maximum in the treatment with *M. incognita* @ 1000 J<sub>2</sub>/kg of soil (Table 2) which

may be due to the impairment of nutrient supply to the developing eggs and laying adult nematodes through giant cells (Hasan, 1993). The results are in agreement with the findings of Bhagawati *et. al.* [4] that nematode reproduction in soil was significantly higher when nematodes were inoculated alone and lower in dual inoculation treatments in okra. Al- Hammouri *et. al.* [1] reported that soil infestation with *R. solani* had little or no effect on *M. incognita* reproduction factor or egg cou.

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**Table 1. Effect of interaction of *Meloidogyne incognita* and *Rhizoctonia solani* on plant growth parameters of french bean (Mean of 10 replications)**

Treatments	Shoot length (cm)	Fresh weight of shoot (g)	Dry weight of shoot (g)	Fresh weight of root (g)	Dry weight of root (g)
T <sub>1</sub> : <i>Rhizoctonia solani</i> @ 1% w/w	22.28 <sup>b</sup>	15.54 <sup>b</sup>	1.87 <sup>b</sup>	1.67 <sup>b</sup>	0.84 <sup>b</sup>
T <sub>2</sub> : <i>Meloidogyne incognita</i> @ 1000 J <sub>2</sub> /kg of soil	21.01 <sup>b</sup>	15.04 <sup>b</sup>	1.84 <sup>b</sup>	1.63 <sup>b</sup>	0.80 <sup>c</sup>
T <sub>3</sub> : <i>M. incognita</i> @ 1000 J <sub>2</sub> /kg of soil + <i>R. solani</i> @ 1% after 15 days of inoculation	15.9 <sup>d</sup>	10.45 <sup>d</sup>	0.91 <sup>d</sup>	1.10 <sup>d</sup>	0.28 <sup>e</sup>
T <sub>4</sub> : <i>R. solani</i> @ 1% w/w + <i>M. incognita</i> @ 1000 J <sub>2</sub> /kg of soil after 15 days of inoculation	16.41 <sup>c</sup>	12.89 <sup>c</sup>	1.34 <sup>c</sup>	1.31 <sup>c</sup>	0.56 <sup>d</sup>
T <sub>5</sub> : <i>M. incognita</i> @ 1000 J <sub>2</sub> /kg of soil and <i>R. solani</i> @ 1% w/w simultaneous inoculation	11.09 <sup>e</sup>	8.27 <sup>e</sup>	0.68 <sup>e</sup>	0.89 <sup>e</sup>	0.16 <sup>f</sup>
T <sub>6</sub> : Check (UC)	29.2 <sup>a</sup>	19.17 <sup>a</sup>	2.57 <sup>a</sup>	2.07 <sup>a</sup>	1.08 <sup>a</sup>
S.Ed.±	1.05	0.32	0.04	0.02	0.02
CD <sub>0.05</sub>	2.10	0.64	0.07	0.04	0.03

Means followed by the same letter in the superscript(s) are not significantly different

Check (UC) = Check (Uninoculated Control)

**Table 2. Effect of *Meloidogyne incognita* and *Rhizoctonia solani* on the development of *Meloidogyne incognita* on french bean (Mean of 10 replications)**

Treatments	No. of galls	No. of egg masses	No. of eggs per eggmass	Final nematode population / 250 cc soil
T <sub>1</sub> : <i>Rhizoctonia solani</i> @ 1% w/w	0.00 (0.71) <sup>e</sup>	0.00 (0.71) <sup>e</sup>	0.00 (0.71) <sup>e</sup>	0.00 (0.71) <sup>e</sup>
T <sub>2</sub> : <i>Meloidogyne incognita</i> @ 1000 J <sub>2</sub> /kg of soil	126.50 (11.27) <sup>a</sup>	67.50 (8.24) <sup>a</sup>	171.30 (13.10) <sup>a</sup>	518.54 (22.78) <sup>a</sup>
T <sub>3</sub> : <i>M. incognita</i> @ 1000 J <sub>2</sub> /kg of soil + <i>R. solani</i> @ 1% after 15 days of inoculation	82.60 (9.11) <sup>b</sup>	55.80 (7.50) <sup>b</sup>	132.60 (11.53) <sup>b</sup>	421.32 (20.54) <sup>b</sup>
T <sub>4</sub> : <i>R. solani</i> @ 1% w/w + <i>M. incognita</i> @ 1000 J <sub>2</sub> /kg of soil after 15 days of inoculation	45.60 (6.79) <sup>d</sup>	30.50 (5.56) <sup>d</sup>	98.50 (9.94) <sup>d</sup>	303.00 (17.40) <sup>c</sup>
T <sub>5</sub> : <i>M. incognita</i> @ 1000 J <sub>2</sub> /kg of soil and <i>R. solani</i> @ 1% w/w simultaneous inoculation	74.20 (8.64) <sup>c</sup>	38.20 (6.22) <sup>c</sup>	106.90 (10.36) <sup>c</sup>	380.42 (19.51) <sup>d</sup>
T <sub>6</sub> : Check (UC)	0.00 (0.71) <sup>e</sup>	0.00 (0.71) <sup>e</sup>	0.00 (0.71) <sup>e</sup>	0.00 (0.71) <sup>e</sup>
S.Ed.±	0.080	0.083	0.119	0.209
CD <sub>0.05</sub>	0.161	0.166	0.240	0.419

Values within parentheses are square root ( $\sqrt{x + 0.5}$ ) transformed data

Means followed by the same letter in the superscript(s) are not significantly different

Check (UC) = Check (Uninoculated Control)