INTERNATIONAL JOURNAL OF PLANT, ANIMAL AND ENVIRONMENTAL SCIENCES
IJPAES

Volume-5, Issue-1, Jan-Mar-2015 **Coden: IJPAJX-USA, Copyrights@2015 ISSN-2231-4490**

Received: 20th Nov-2014 ***Revised: 30th Nov-2014*** ***Accepted: 1st Dec-2014***

Research article

INTERACTION OF *MELOIDOGYNE INCOGNITA* AND *RHIZOCTONIA SOLANI* ON BRINJAL

Th. Sunita Devi, B. Mahanta and Debanand Das

Department of Nematology, Assam Agricultural University, Jorhat 785013, India
E-mail: nao.thangjam@gmail.com

ABSTRACT: Interaction of *Meloidogyne incognita* and *Rhizoctonia solani* on brinjal was evaluated under the net house condition. 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 brinjal. However, the root knot index and final nematode population was found maximum in single inoculation treatment than dual inoculation treatments. The maximum disease intensity was observed in *M. incognita* @1000 J_2 /kg of soil + *R. solani* @ 1 % w/w after 15days of inoculation.

Key words: *Meloidogyne incognita, Rhizoctonia solani,* interaction, brinjal

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 when wilt resistant cotton became susceptible in presence of root knot nematode which was first reported by Atkinson [2] in Alabama on cotton. Many workers have been extensively reviewing on this aspect with different nematode species and fungal or bacterial pathogens [1, 5, 7, 9]. The damage caused by nematode alone is less as compared to damage cause by association of one or more than one pathogen with nematode, which may result in serious crop loss. *Rhizoctonia solani* is typically a pathogen of vegetable seedlings, responsible for damping-off disease, but it can also cause wilting and death in mature plants. In the same way, wilting, stunting and chlorosis may occur in plants infected with *M. incognita*. Both the organism is reported to show synegestic effect of host plant leading to death of the plant. Therefore, attempt was made to evaluate the effects of interaction of root-knot nematode, *Meloidogyne incognita* and *Rhizoctonia solani* on brinjal under net house condition.

MATERIALS AND METHODS

The pot experiment was conducted in the net house, Department of Nematology, Assam Agricultural University (AAU), Jorhat-13. *Rhizoctonia solani* was isolated from diseased French bean seedling showing typical symptoms of collar rot grown in Horticultural orchard of A.A.U. 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. For soil inoculation, 15 days old culture of *R. solani* grown in MMSM (40 grams of maize meal was added to 960g 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 26.0cm). The bags containing the medium were plugged with non absorbent cotton and autoclaved at 121◦C at 15 lb pressure for 30 minutes) were used. *R. solani* was inoculated at the rate of 1% w/w before sowing of seeds. Pure culture of root-knot nematode, *Meloidogyne incognita*, was raised on French bean from a single eggmass and was maintained in the net house of Department of Nematology, AAU, Jorhat-13. Each plant was inoculated at the feeder root zone with 1000 freshly hatched second stage juvenile of *M. incognita* collected from the pure culture. Nematode inoculation was followed by light watering. Properly cleaned and sterilized earthen pots of 1kg size were filled with sterilized sand, soil and cowdung mixture, at the rate of 1:2:1. The pots were sown with three seeds of brinjal (var. Pusa Purple Long). All the pots were arranged in CRD with 10 replications and kept in the Net House, Department of Nematology, AAU, Jorhat.

Ten days after germination, the pots were thinned to keep one healthy seedling. The treatments of the interaction study of *M. incognita* and *R. solani* were, T_1 = *R. solani* @ 1% w/w, T_2 = *M. incognita* @ 1000 J_2/kg of soil, T_3 : *M. incognita* @ 1000 J_2/kg of soil + *R. solani* @ 1% after 15 days of inoculation, T_4 = *R. solani* @ 1% w/w + *M. incognita* @ 1000 J_2/kg of soil after 15 days of inoculation, T_5 = *M. incognita* @ 1000 J_2/kg of soil + *R. solani* @ 1% w/w simultaneous inoculation, T_6 = Un inoculated Check (UC).

RESULT AND DISCUSSION

The results of the experiment exhibited significant reduction of plant growth parameters by either of the pathogens however, combined inoculation resulted severe reduction of plant growth than single inoculation. Simultaneous inoculation of both the fungus and nematode resulted maximum reduction in shoot length, fresh and dry weight of shoot and root. 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 brinjal. 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 proceeded 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 [8]. On the other hand fungus inoculation followed by nematode caused less reduction in plant growth. The fungus made the roots less favorable for nematode attack or the fungus secretion produced adverse effects on nematodes [6]. 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 egg mass was found in the treatment with *M. incognita* @ 1000 J_2/kg of soil. Final nematode population of the nematode in soil was maximum in the treatment with *M. incognita* @ 1000 J_2/kg of soil (Table 2). The results are in agreement with the findings of Bhagawati *et al.* [4] that nematode reproduction in soil was significantly higher in the treatment with nematode alone and lower in dual inoculation treatments in okra. Al-Hammouri *et al.* [1] Soil infestation with *R. solani* had little or no effect on *M. incognita* reproduction factor or egg cou

Table 1. Effect of interaction of *Meloidogyne incognita* and *Rhizoctonia solani* alone and in combinations on plant growth parameters of brinjal

(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_1 : *Rhizoctonia solani* @ 1% w/w	17.09^{b}	11.48^{b}	1.36^{b}	1.27^{abc}	0.70^{b}
T_2 : *Meloidogyne incognita* @ 1000 J_2/kg of soil	14.30^{c}	11.10^{b}	1.35^{b}	1.24^{bc}	0.67^{b}
T3 : M. incognita @ 1000 J2/kg of soil + R. solani @ 1% after 15 days of inoculation	10.43de	9.06d	0.89c	1.00c	0.24d
T4 : R. solani @ 1% w/w + M. incognita @ 1000 J_2/kg of soil after 15 days of inoculation	11.46_{d}	9.93_{c}	1.02_{c}	1.38_{ab}	0.50_{c}
T_5 : *M. incognita* @ 1000 J2/kg of soil + *R. solani* @ 1% w/w simultaneous inoculation	9.05_{e}	8.07_{e}	0.69_{d}	0.74_{d}	0.14e
T_6 : Check (UC)	20.49a	13.06a	1.69a	1.62a	1.09a
S.Ed.±	0.81	0.29	0.06	0.14	0.09
$CD_{0.05}$	1.64	0.58	0.13	0.28	0.19

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* alone and in combinations on host infection, nematode multiplication and disease intensity on brinjal

(Mean of 10 replications)

Treatments	No. of galls	No. of egg masses	No. of eggs per eggmass	Final nematode population / 250 cc soil	Disease intensity
T_1	0.00 $(0.71)^e$	0.00 $(0.71)^d$	0.00 $(0.71)^e$	0.00 $(0.71)^e$	3.34 $(1.96)^c$
T_2	121.10 $(11.01)^a$	63.40 $(8.00)^a$	170.60 $(13.08)^a$	451.00 $(21.24)^a$	0.00 $(0.71)^d$
T_3	82.90 $(9.05)^b$	54.80 $(7.43)^b$	131.00 $(11.46)^b$	415.10 $(20.38)^b$	4.85 $(2.31)^a$
T_4	43.60 $(6.60)^d$	29.10 $(5.44)^c$	87.10 $(9.35)^d$	272.50 $(16.52)^d$	3.99 $(2.10)^b$
T_5	73.80 $(8.59)^c$	34.70 $(5.89)^c$	98.00 $(9.92)^c$	362.30 $(19.03)^c$	4.77 $(2.29)^a$
T_6	0.00 $(0.71)^e$	0.00 $(0.71)^d$	0.00 $(0.71)^e$	0.00 $(0.71)^e$	0.00 $(0.71)^d$
S.Ed.±	0.19	0.27	0.18	0.21	0.02
$CD_{0.05}$	0.38	0.54	0.37	0.42	0.04

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)

REFERENCES

[1] Al-Hammouri, A.Lindemann, W. Sanogo, S. Thomas, S. and Steiner, R. 2013. Interaction between *Rhizoctonia solani* and *Meloidogyne incognita* on chile pepper in soil infested simultaneously with both plant pathogens. Canadian Journal of Plant Science, 93(1): 67-69

[2] Atkinson, G. F. 1892. Some diseases of cotton. 3. Frenching. Bull. Ala. Agric. Exp. Stn. 41:19-29.

[3] Batten, C. K. and Powell, N. T. (1971). The *Rhizoctonia-Meloidogyne* Disease Complex in Flue-cured Tobacco. J Nematol. 3(2): 164–169

[4] Bhagawati, B.; Das, B.C and Sinha, A.K. 2006. Interaction of *Meloidogyne incognita* and *Rhizoctonia solani* on okra. Ann.Pl. Protec. Sci. 15(2): 469-539.

[5] Hoseini S M N, Pourjam E, Goltapeh E M. 2010. Synergistic studies on interaction of nematode-fungal system of tea plant in Iran. J. Agric. Technol. 6: 487-496.

[6] James, G.L. 1966. Effect of the causal fungus of brown root-rot of tomatoes on the hatch of the potato root-rot eelworm, *Heterodera rostochinenis* Wall. Nature 212: 1466.

[7] Kumar, V. and Haseeb, A. 2009. Interactive effect of *Meloidogyne incognita* and *Rhizoctonia solani* on the growth and yield of tomato. Indian J. Nematol. 39: 387- 388.

[8] Owens, R.G. and Specht, H.N. 1966. Biochemical alternations induced in host tissues by root-knot nematode. *Contrib. Boyce.* Thomson Inst. 23: 181-188.

[9] Vidya Sagar, B.; Krishna Rao, V. and Varaprasad, K.S. 2012. Interaction of *Rhizoctonia solani* and *meloidogyne incognita* on tomato. Indian J. Nemato. 42: 66-70.

.