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PATHOGENICITY OF Meloidogyne javanica TO BEAN (Phaseolus vulgaris L.)

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INTRODUCTION

The common bean (*Phaseolus vulgaris* L.) is cultivated for food in most of the States of Brasil except Amapá, Roraima and Maranhão. In recent vears marked decline in the cultivation of this crop has been noticed due to high sensitivity to varying climatic conditions and attack of pests and diseases. The root-knot disease caused by *Meloidogyne* spp. is of widepread occurrence on a vast number of plant species including common bean (PONTE, 1976). The root-knot nematode, *Meloidogy ne javanica* (Treub, 1885) Chitwood, 1949, has been found caus sing serious losses to bean crop in different parts of the country, as reported by LORDELLO & SANTOS (1960), LORDELLO & ZAMITH (1960), LORDELLO (1964), PONTE et al. (1973), FREIRE (1976), and FREIRE & PONTE (1976).

FREIRE (1976) studied the effect of parasitism by *M. javanica* and *M. incognita* (Kofoid & White, 1919) Chitwood, 1949 separately and in combination on common bean cultivar 'Rico 23' in cement tanks and concluded that both species separately and in combination seriously affected bean production.

This paper reports studies carried out under greenhouse

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conditions at Planaltina, Federal District to assess the pathogenic effect of *M. javanica* (Treub, 1885) Chitwood, 1949 on common bean cultivar Roxinho.

MATERIAL AND METHODS

Pathogenicity of Meloidogyne javanica (Treub, 1885) Chi twood, 1949 to common bean cultivar Roxinho was investigated with five different inoculation levels viz., 0, 10, 100, 1000 and 10000 eggs per kg of sterilized soil (a 50% mixture of Dark Red soil plus river sand) per container. The soil components were separately sieved, sterilized and after one week the mixture was prepared. Lime and fertilizers were applied after receiving the chemical analysis of the mixture. PVC containers with 7.5 cm diameter and 20 cm height, closed at the bottom with nylon gauze, were used for filling the soil. Distilled water was added to all the containers for having a uniformm moisture level equal to field capacity.

Uniformm seeds for colour and size were surface sterilized for 10 minutes with 10% clorox solution and rinsed twice with distilled water and sown singly per container. Plants in two leaf stage were inoculated with predetermined densities, replicating 5 times each treatment. The inoculum was obtained from common bean roots infected with single egg mass isolates of *M. javanica* utilizing COOLEN'S method of egg isolation from plant tissue (COOLEN, 1979). After inoculation, the containers were arranged on greenhouse tables randomly where the temperature ranged from 15-30°C. Moisture was maintained at a level favourable for normal growth of the plants. A complete nutrient solution was prepared from a commercial fertilizer 'Su per Ouro Verde' and applied fortnightly according to manufacturer's recommendations.

The experiment was terminated 52 days after inoculation and each replicate was evaluated separately for plant growth, number of galls, egg masses and final populations in soil. The nematodes were extracted using method described by COOLEN (1979). The data were statistically analysed utilizing DUNCAN'S test (Duncan Multiple Range Test, DUNCAN, 1951).

RESULTS AND DISCUSSION

Plants infected with *M. javanica* were stunded and yellow ish with reduced number and size of leaves in comparison to control plants. The root system of inoculated plants was severely reduced due to nematode attack. The galls in general were small (fig. 1). Similar results were obtained by FREIRE (1976). Data on plant growth and nematode multiplication are present in table 1.

Significant reduction in dry stem weight occurred in all treatments receiving initial inoculum of 1000 and more eggs per kg of soil. Also treatments receiving 10000 eggs per kg of soil showed a significant reduction in fresh root weight (table 1). A negative correlation existed between initial inoculum density and plant growth. These results are in agreement with those reported by SWARUP & SHARMA (1965) in case of tomato, SHARMA & CASTRO (1979) to soybean, SHARMA (1981a, b) to wheat and rice.

Number of galls per plant root system was lowest at the inoculum level of 100 eggs and highest at the highest inoculum level. The number of galls at the highest inoculum level was significantly different from rest of the inoculum levels. The number of egg masses at initial inoculum levels of 10000 was significantly lower than initial inoculum levels of 10, 100 and 1000 eggs per kg of soil (table 1).

Final populations were minimum at the lowest inoculum levels and highest at the highest inoculum level. Significant differences in final populations occurred in all treatments receiving 100 eggs per kg of soil. The multiplication factor was found to be 16.6 and 0.38 times the initial inoculum levels in respect of the lowest and highest rates of inoculum respec tively. A negative correlation existed between the initial ino culum density and the final density (correlation coefficient r = -0,26). These results are in agreement with those reported by SHARMA & CASTRO (1979) to soybean, SHARMA (1981a,b) to wheat and rice.

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Fig. 1 - Effect of *M. javanica* on the root growth of common bean at different levels of inoculum viz. 0, 10, 100 1000 and 10000 eggs per/plant.

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Table	

Inoculum	Dry stem	Fresh root	Number of	Number of	Soil popu- lation	Reprodu- ction
(Pi)	(g)	(g)	plant	cyg iiidaaca /plant	(Pf)	$R = \frac{Pf}{Pi}$
0	1,29 A	3,05 A	0,08	00	00	0 B
10	1,17 A	3,01 A	17,68	830A	166C	16,6 A
100	1,04 A	2,05 A	7,4B	658AB	480 C	4,8 B
1000	(19,04) 0,67 B	(18,03) 1,83 A	24,08	832A	20388	2,048
10000	(48,01) 0,23 B	(40,00) 1,46 B	90,0A	5378	3787A	0,388
	(82,02)	(52,13)				
Average mean	0,92	2,49	27,88	571,28	1294,32	4,75
c.v.%	23,09	24,82	78,69	32,08	87,88	91,48
L.S.D. 5%	0,28	0,83	29,41	245,70	1514,23	5,83
l. Correlatio	n coeffici	ent between i	nitial popul	ation densi	ty (Pi) and	final Toc+)
2. Mean with	the same l	etter are not	at 2% level significant	ly differen	ru Lipie Ma	ide rear

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CONCLUSION

An initial population density of 1000 eggs per kg of soil or l egg per g of soil, may be termed as the minimum den sity level of *M. javanica* for expression of pathogenic effects.

SUMMARY

Considering the widespread distribution and serious log ses caused by the root-knot nematode *Meloidogyne javanica* (Treub, 1885) Chitwood, 1949 to common bean in the Savannah region, a pathogenicity study of same to common bean cv. Roxi nho was made. Five population levels (0, 10, 100, 1000, and 10000 eggs per kg of soil, a 50% mixture of Dark Red soil plus river sand) in PVC containers with bottoms closed with nylon gauze were used as inoculum. Each treatment was replicated five times and the containers were arranged at random on green house tables where the temperature ranged from 15 to 30°C.

Data on plant growth and number of galls and egg masses of nematode per root and population in soil were evaluated separately for each container 52 days after inoculations. Significant growth reductions in dry stem weight and fresh root weight occurred in all treatments receiving initial inoculum levels of 1000 eggs and more per container. A negative correlation existed between initial inoculum density and plant grow th and between initial and final densities.

RESUMO

Tendo em vista a larga distribuição e os sérios danos causados pelo nematóide formador de galhas, *Meloidogyne javanica* (Treub, 1885) Chitwood, 1949, ao feijoeiro na região dos Cerrados, foi desenvolvido estudo sobre a patogenicidade do mesmo ao feijoeiro cv. "Roxinho". Foram inoculados cinco níveis de população por planta (0, 10, 100, 1000, 10000 ovos por kg de solo, um solo composto de 50% de LVE e 50% de areia de rio) em recipientes de PVC com os fundos fechados com tela de nylon. Cada tratamento foi repetido cinco vezes e os vasos foram dispostos, ao acaso, nas mesas da estufa com temperatura variando entre 15 a 30°C. Após 52 dias da inoculação, foram avaliados, separadamente em cada recipiente, os dados sobre o crescimento das plantas, número de galhas e massa de ovos por sistema radicular e as populações no solo.

Nos tratamentos que receberam os níveis de inoculação de 1000 ovos ou mais por vaso, foi verificada uma redução sig nificativa no peso seco da parte aérea da planta e peso fresco da raiz.

Observou-se uma correlação negativa entre a densidade de inoculação inicial e o crescimento da planta e densidades iniciais e finais.

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