

Effect of different inoculum levels of *Rhizoctonia solani* kuhn. on disease development and growth of chilli (*C. annuum*) cv. G-4

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ABSTRACT

Chilli (*Capsicum annuum*) is one of the most important spice crop in the world having nutritive value especially rich in Vitamin C. It suffers excess yield loss by the infection of root rot caused by *Rhizoctonia solani* worldwide. The present study was conducted to determine the effect of different inoculum levels of *R. solani* on growth and disease development of chilli cv. G-4 under pot conditions. The observations of this study revealed that *R. solani* is a potential pathogen, significantly reduced the length, fresh and dry weight of shoot and root of chilli cv. G-4 and increase root infection upto 5-65.7 per cent. The highest reduction in shoot length (27.5%), root length (10.3%), shoot fresh weight (15.5%), root fresh weight (4.3%), shoot dry weight (6.7%) and root dry weight (1.3%) were observed at highest inoculum level of 4 g culture/kg soil. However, highest root infection (65.7%) was observed at highest inoculum level *i.e.* 4g culture/kg soil, while root infection was least (5.0 %) at lowest inoculum level *i.e.* 0.5 g culture/kg soil.

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INTRODUCTION

Vegetable crops are important for daily human diet and having rich source of vitamins such as niacin, riboflavin, thiamin and vitamins A. India is the second largest producer of vegetables in the world, next to China. These are grown in about 6 million hectares forming 3 per cent of the total cropped area. Chilli (*Capsicum annuum* L.) is one of the most important valuable

vegetable crop, belongs to the family Solanaceae. It has contain large amount of vitamins *viz.*, C, B and B₁₂ and very high amount of potassium, magnesium and iron. India is one the largest producer of chillies in the world followed by China and Pakistan (Hussain and Abid, 2011) and is contributing about 7.29 lakh ha of area with an annual production of 13.76 lakh tones (Indian Horticulture Database 2013). Major chilli producing states in India

are Andhra Pradesh (49%) followed by Karnataka (15%), Maharashtra (6%) and Tamil Nadu (3%) which constitute nearly 75 per cent of the total area under chilli cultivation (Jagtap *et al.*, 2012). The production of chilli is affected by various biotic and abiotic stresses worldwide. In all biotic stresses, approximately thirty nine different fungal pathogens have been reported to cause diseases in chilli (Saha and Singh, 1988). The most serious disease of cultivating chilli are anthracnose (*Colletotrichum* spp.) and root rot (*Rhizoctonia solani*) (Vudhivanich, 2003). Amongst major fungal pathogens, *Rhizoctonia solani* Kuhn is an important soil-borne pathogen, causing root rot of chilli and responsible to cause heavy yield losses in susceptible crops under favourable condition (Rehman *et al.*, 2013). Rusty-brown, dry sunken lesions on stems and roots near the soil line are a characteristic symptom caused by *Rhizoctonia* infection. Seedlings or older plants may develop these infections and become stunted, yellow and may wilt. The infections can be superficial and cause no clear damage to plants, or they can girdle the stem and stunt plants or kill. It also induces root rot in mature plants and leads to wilting and death of chilli plants. Pathogen can survive for many years in soil as a

resting structure, sclerotia, which play a vital role in disease development (Sharma and Kapoor, 1997). The considerable amount of inoculum is provided by the sclerotia which is necessary to initiate the disease. Keeping view its importance and seriousness of disease, the present investigation was carried out to determine the effect of different inoculum levels on disease development and growth of chilli.

MATERIAL AND METHODS

Procurement and maintenance of culture of the root-rot fungus (*Rhizoctonia solani*):

Rhizoctonia solani was isolated from the infected roots of chilli collected during the experiment (Kannan and Jayaraj, 1998) from the field. The isolated fungus was identified and confirmed on the basis of their cultural and morphological characteristics recorded (Mathur *et al.*, 1995), respectively on solid P.D.A. medium in petriplates and in temporary slides prepared in lactophenol, cotton blue and examined under the light microscope. For mass culture production, 1 kg healthy seeds of sorghum were soaked in 5 per cent sucrose solution for overnight and then transferred to 500 ml

Table 1 : Effect of various initial inoculum levels of *R. solani* on the growth and disease development in the roots of chilli cv. G-4.

Initial inoculum levels (Pi)	Plant length (cm)			Plant fresh weight (g)			Plant dry weight (g)			Root infection (%)
	Shoot	Root	Total	Shoot	Root	Total	Shoot	Root	Total	
0	55.3 (0.0)	23.5 (0.0)	78.8 (0.0)	43.0 (0.0)	14.0 (0.0)	57.0 (0.0)	20.7 (0.0)	5.0 (0.0)	25.7 (0.0)	0 (0.0)
0.5	53.1 (4.0)	21.8 (7.2)	74.9 (4.9)	40.3 (6.3)	12.7 (9.3)	53.0 (7.0)	18.7 (9.7)	4.4 (12.0)	23.1 (10.1)	5.0
1.0	50.4 (8.9)	20.3 (13.6)	70.7 (10.3)	38.0 (11.6)	12.0 (14.3)	50.0 (12.3)	17.5 (15.5)	4.1 (18.0)	21.6 (16.0)	12.5
1.5	46.1 (16.6)	18.2 (23.0)	64.3 (18.4)	32.5 (24.4)	10.0 (26.4)	42.8 (24.9)	15.0 (27.5)	3.5 (30.0)	18.5 (28.0)	27.3
2.0	42.2 (23.7)	17.0 (27.7)	59.2 (24.9)	28.3 (34.2)	8.7 (37.9)	37.0 (35.1)	12.7 (38.6)	2.9 (42.0)	15.6 (39.3)	37.5
2.5	37.6 (32.0)	14.9 (36.6)	52.5 (33.4)	25.7 (40.2)	7.8 (44.3)	33.5 (41.2)	11.5 (44.4)	2.6 (48.0)	14.1 (45.1)	45.0
3.0	33.2 (40.0)	13.1 (44.3)	46.3 (41.2)	21.3 (50.5)	6.5 (53.6)	27.8 (51.2)	9.5 (54.1)	2.1 (58.0)	11.6 (54.9)	53.3
4.0	27.5 (50.3)	10.3 (56.2)	37.8 (52.0)	15.5 (64.0)	4.3 (69.3)	19.8 (65.3)	6.7 (67.6)	1.3 (74.0)	8.0 (68.9)	65.7
LSD 0.05	2.40	1.55	3.48	2.34	0.99	2.68	0.84	0.86	1.25	4.06
LSD 0.01	3.34	2.15	4.83	3.25	1.37	3.72	1.17	1.19	1.73	5.64

flasks. The flasks were autoclaved at 15 lb/inch² pressure for 30 minutes, after being plugged with the non-absorbent cotton and covered with butter paper. Pure culture of the fungus prepared in the culture tubes was transferred into the flasks and the flasks were incubated in a B.O.D. incubator at a temperature of 27 + 1°C for 10 days. During incubation, the flasks were shaken thrice daily, to ensure proper growth of the fungal mycelium on the sorghum seeds. To determine the effect of initial inoculum levels of *R. solani* on the growth of chilli, 20 days old seedlings were transplanted into steam sterilized pots containing 5kg of soil and composted farm yard manure (4:1) mixture. After 3 days of transplanting, fungus inoculum was inoculated @ 0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 g culture/kg soil (including the weight of culture medium) by scrapping out 1cm top soil from all the pots and pouring mass culture into the soil remaining inside the pots and after that roots were covered with the soil and pots were watered as and when necessary. There were three replicates for each treatment. After sixty days of inoculation, the plants were carefully uprooted from the pots and roots were washed under running tap water to remove the adhering soil particles. Excess water was removed with the help of blotting paper. The plant growth was determined by measuring the length, fresh and dry weights. For determining dry weight, the plants were dried in hot air oven at 60°C for sufficient period of time (48 hours).

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Effect of various initial inoculum level of *Rhizoctonia solani* on the disease development and the plant growth of chilli cv. G-4 :

The results shown in Table 1 revealed that increasing inoculum levels of *R. solani*, significantly decrease in growth, fresh and dry weights in chilli plant and increase disease incidence. Significant reduction in the shoot-root length and fresh and dry weights was observed at and above initial inoculum level of 0.5 g

culture/kg soil. The highest reduction in shoot length (27.5%) root length (10.3%), shoot fresh weight (15.5%), root fresh weight (4.3%), shoot dry weight (6.7%) and root dry weight (1.3%) were observed at highest inoculum level of 4 g culture/kg soil while lowest reduction in shoot length (53.1%), root length (21.8%), shoot fresh weight (40.3%), root fresh weight (12.7%), shoot dry weight (18.7%) and root dry weight (4.4%) were observed at lowest inoculum level of 0.5 g culture/kg soil as compared to uninoculated plants.

In this study the root infection in chilli caused by *R. solani* was recorded upto 5-65.7 per cent. The highest root infection (65.7%) was observed at highest inoculum level of 4g culture/kg soil, whereas, lowest root infection (5.0 %) was recorded at lowest inoculum level of 0.5 g culture/kg soil.

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