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Research Article

Evaluation of Native Isolate of *Trichoderma harzianum* against Fusarial Wilt of Chickpea, *Cicer arietinum* L.

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Abstract

The native isolate of *Trichoderma harzianum* i.e. THCh-1 tested against fusarial wilt disease of chickpea. The results of the research, overall represented that *T. harzianum* with seed cum soil application (10 g/kg + 100 gkg-1) to the chickpea resulted in higher germination per cent with lowest wilt incidence followed by seed cum soil application (5 g/kg + 100 gkg^{-1}). Seed treatment alone found good but soil application alone proved poor in wilt management.

Keywords: *Trichoderma harzianum*; THCh-1; Chickpea; Fusarium

Introduction

Chickpea (*Cicer arietinum* L.) is one of important pulse crop cultivated in India and other countries. It is an excellent source of dietary protein for human being, nutritious feed for livestock and nitrogen fixing plant having profound ameliorative effect on soil. Chickpea suffers heavy losses due to wide varieties of insect pests and diseases. Among the diseases wilt caused by *Fusarium* is one of the most common and widely prevalent in India. In India, it has been reported from all the chickpea growing states and causes an annual loss of 10% [1]. However, it was observed that early wilting causes 77 - 94% loss while late wilting causes 24 - 65% loss [2]. Since wilt pathogen is soil borne in nature and it is difficult to manage them even by conventional chemicals. Biological control of soil borne plant pathogens using antagonistic fungi is ecofriendly, reliable, and efficient approach that can be successfully included in the integrated disease management programmes. The *Trichoderma* spp. have been established as an effective antagonists against *Fusarium* spp. and other pathogens [3,4] *in vitro* and under field condition [5,6]. Trichoderma spp. are known to occur in almost all soils including agricultural, forest, orchard, and fallow soils [7] and to a limited extent in saline soil [8]. The sudden change in external factors leading to stress condition to these fungal bioagents may influence their ecological behaviour and antagonistic potential. This research represented the effectiveness of native isolate of *Trichoderma harzianum* i.e. THCh-1 as well as method of application, in relation to the biological management of wilt of chick pea. Also this was the first attempt to evaluate the native isolate against chickpea fusarial wilt disease at South Gujarat heavy rainfall zone.

Materials and Methods

An attempt was made to evaluate the efficacy of THCh-1 against chickpea wilt in pot condition at glasshouse of the Department of Plant Pathology, N.M. College of Agriculture, Navsari Agricultural University, Navsari during year 2008-09. Twelve seeds of the susceptible chickpea cultivar GG-2 were sown in each sterilized pot (5% formaldehyde solution), which was filled with 5 kg sterilized soil (3 subsequent sterilizations at 1.1 kg.cm for 1 hr. for 3 days). Each pot was then mixed with 20 days old culture of the pathogen, which was multiplied on sand maize meal water medium (90g sand, 10 g maize meal, 20 ml distilled water) at 50 g/kg of soil one week before sowing [5]. The talc based formulation of THCh-1 with three different methods of application viz., seed treatment, soil treatment and seed cum soil treatment was used for this experiment.

Technique of seed treatment with talc based formulation of THCh-1

Materials required

- Talc based formulation of THCh-1
- Seeds of chickpea (var. GG-2)
- Hand gloves
- Plastic tray

Technique

- Little bit of water was taken in to the plastic tray.
- Seeds were dipped in water.
- Talc based formulation of THCh-1 was applied to the seeds and mixed thoroughly to get fine coating on the seeds.
- The treated seeds were spreaded over blotter paper and kept for 15 - 20 minutes for drying.
- Fine coated seeds were sown in each sterilized pots.

Technique of soil treatment with talc based formulation of THCh-1

Materials required

- Talc based formulation of THCh-1
- Hand gloves
- Plastic tubs
- Seeds of chickpea (var. GG-2)

Technique

- Sterilized soil was spread out on the platform of glass house.
- Little bit of water sprinkled over it.
- Talc based formulation of THCh-1 was spread out on the layer of soil and thoroughly mixed with soil.
- Made a heap of these mixture and wail for a half an hour.
- Filled these mixture in sterilized pots.

Technique of seed cum soil treatment with talc based formulation of THCh-1

The technique was done as combination treatment (seed treatment + soil application) as mentioned in section no. A and section no. B.

The experiment was carried out with the following details.

Experimental Details

Following treatments taken to conduct the experiment:

- T_1: Seed treatment (ST) @ 5 g/kg of seeds
- T_2: ST @ 10 g/kg of seeds
- T_3: Soil Application (SA) @ 100 g/ kg soil
- T_4: SA @ 200 g/ kg soil
- T_5: ST @ 5 g/kg of seeds + SA @ 100 g/ kg soil
- T_6: ST @ 5 g/kg of seeds + SA @ 200 g/ kg soil
- T_7: ST @ 10 g/kg of seeds + SA @ 100 g/ kg soil
- T_8: ST @ 10 g/kg of seeds + SA @ 200 g/ kg soil
- T_9: Control (Without treatment)

Observations were recorded on the basis of total number of seeds germinated at 10 days of sowing and total number of wilt infected plants were recorded upto 30 days. Germination percentage and per cent wilt incidence of chickpea was calculated on the basis of following formulae suggested by Nene., *et al*. [9] for chickpea wilt.

$$\% \text{ Wilt incidence} = \frac{\text{No. of infected plants}}{\text{Total no. of plants}} \times 100$$

Results and Discussion

Germination

The effect of different Trichoderma treatment on germination (Table 1) revealed that seed treatment @ 10 g/kg + Soil application @ 100g or 200 g/kg soil of *T. harzianum* proved significantly superior over the rest but was statistically at par with seed treatment @

Sr. No.	Treatments	Total no. of seed sown	No. of germinated seeds (Average)	Germination percentage (Average)
1	ST@5 g/kg of seeds	12	9.00	*60.00 (75.00)
2	ST@10 g/kg of seeds	12	9.33	61.97 (77.78)
3	SA@100 g/ kg of soil	12	6.67	48.24 (55.55)
4	SA@200 g/ kg of soil	12	7.33	51.49 (61.11)
5	ST@5 g/kg + SA@100 g/ kg soil	12	9.67	70.78 (88.88)
6	ST@5 g/kg + SA@200 g/ kg soil	12	10.33	73.21 (91.66)
7	ST@ 10 g/kg + SA@100 g/kg soil	12	11.33	78.81 (94.44)
8	ST@ 10 g/kg + SA@200 g/kg soil	12	11.67	78.81 (94.44)
9	Control	12	05.67	43.40 (47.22)
S.Em.				3.26
C.D.@5%				9.49
C.V.(%)				8.98

Table 1: Effect of T. harzianum (THCh-1) on seed germination. *Figures outside parenthesis are arcsine (angular) transformed value.

5 g/kg + Soil application @ 100 or 200 g/kg soil. The germination in these treatments more ranging from 78.81 to 70.78 per cent. Next best in order of merit was seed treatment @ 5 g/kg (60.00%). Soil application only (5 or 10 g/kg soil) proved inferior showing poor germination.

Wilt incidence

The results of effect of various treatments of Trichoderma on wilt (Table 2) indicated that all the treatments proved significantly superior over control. Among them, significantly lower wilt incidence was recorded in seed treatment @ 10 g/kg + soil application @ 100 (11.18%) or 200 g/kg soil of *T. harzianum* as compared to the rest of but statistically at par with seed treatment @ 5 g/kg + soil application of *T. harzianum* @ 100 or 200 g/kg soil. Next best in order of merit was seed treatment @ 10 g/kg (28.03%) followed by seed treatment @ 5 g/kg seeds. Only soil application @ 100 or 200 g/kg soil proved inferior in managing the wilt. Maximum disease control was recorded in the treatment of seed treatment @ 10 g/kg + soil application @ 100 (75.00%) or 200 g/kg soil. This was followed by seed treatment @ seed treatment @ 5 g/kg + soil application @ 100 or 200 g/kg soil (72.22 to 69.44%). In seed treatment only, the disease control was ranging from 55.55 to 58.33 per cent while in the treatment of soil application only it was from 25.00 to 30.55 per cent. The above results revealed that, the efficacy of *T. harzianum* found to be significant (p = 0.05) with respect to highest germination percentage and lowest wilt incidence by T_7 and T_8 (Seed cum Soil application) followed by T_2 and T_1 (Seed treatment). The least success was observed in soil application alone. This could be due to a less degree of mycoparasitism and production of some antibiotics, secondary metabolites and enzymes involved in this application. The efficiency of *T. harzianum* by these three different methods of application reported here is in conformity with the findings of Singh., *et al.* [1]; Sonawane and Pawar [10] and Dubey., *et al* [5].

Conclusion

Seed treatment @10 g/kg + soil application @ 100 or 200 g/kg soil of *T. harzianum* found significantly superior for germination of chickpea seeds (78.81 to 70.78%) but these were statistically at par with seed treatment @5 g/kg + soil application @ 100 or 200 g/kg soil. Seed treatment alone with *T. harzianum* @5 g/kg (60.00%) was also good. Soil application alone proved poor. Minimum wilt incidence was recorded in seed treatment of *T. harzianum* @ 10 g/kg + soil application @ 100 or 200 g/kg soil (11.18%) followed by seed treatment of *T. harzianum* @ 5 g/kg + soil application @ 100 (19.21%) or 200 (16.78%) g/kg soil. Seed treatments alone (5 or 10 g/kg seeds) also proved good but soil application alone poor in wilt management. Overall results represented the native isolate, THCh-1 found efficient to manage chickpea wilt and seed cum soil application found as feasible method of application.

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