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Research Note

Biological control of dry root-rot of acid lime (*Citrus aurantifolia* Swingle) caused by *Fusarium solani* (Mart.) Sacc.

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ABSTRACT: **Dry root-rot of acid lime caused by *Fusarium solani* was effectively reduced (>70%) in pot culture studies by application of *Trichoderma viride* isolates (T_2 and T_4) @ 100 g/ kg soil.**

KEY WORDS: Acid lime, Bio-control, dry root-rot, *Fusarium solani*, *Trichoderma*

Acid lime is an important citrus species widely grown in India. Nearly 20 per cent of the total citrus production comes from this crop. This is affected by number of fungal, bacterial and viral diseases (Gopal *et al.*, 2000). Among fungal diseases dry root-rot is economically important disease caused by *Fusarium solani* (Mart) Sacc. (Gopal *et al.*, 2001). The fungus is soil borne and possesses great problems in managing the disease with fungicides. Among all bio-agents a lot of research has been carried out on the *Trichoderma* spp. It is well known that all the isolates of *Trichoderma* are not equally antagonistic towards a species of pathogen (Elad *et al.*, 1982). Present study was undertaken to evaluate the efficacy of T_2 and T_4 *Trichoderma viride* isolates (Acc No. 5738, 5743) isolated from rhizosphere soil of diseased Acid lime trees to suppress the dry root-rot disease (Kavitha *et al.*, 2004). Pot culture studies were conducted for effectiveness of two antagonists before taking up field evaluation.

Rhizosphere soil samples were collected along with feeder roots from different acid lime gardens of Andhra Pradesh (AP). These samples were used for isolation of *Trichoderma* by using *Trichoderma* specific medium, (TSM) (Elad and Chet, 1983). Based on initial laboratory studies the two *T. viride* isolates (T_2 and T_4) were selected as these two isolates were more effective in *in-vivo* conditions (Kavitha *et al.*, 2004). Eight ml of sterilized distilled water was poured into a six day old culture of *Trichoderma* grown on PDA slant and shaken vigorously to prepare homogenous spore suspension of T_2 and T_4 isolates. The 250ml flasks containing 100g of sterilized wheat bran sand

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medium were inoculated with the spore suspension of T_2 and T_4, separately. These flasks were incubated up to three weeks. This was applied to the sterilized pot soil @ 100g/kg. *Pseudomonas fluorescens*, talc based formulation was used for comparison @ 20g/kg of pot soil. Twenty cm pots were used for conducting this experiment. The pots were filled with 2mm sieved sterilized soil and farmyard manure at the ratio of 2:1. The pathogen grown on sand sorghum medium was incorporated at the rte of 75g/kg pot soil and allowed for 3 days for its multiplication. The experimental consisted of four treatments each replication five times. In each pot 20 seedlings of one-month-old acid lime var. Kasipentla were planted and such two pots were maintained for each replication.

The observation on per cent mortality and per cent disease reduction were calculated as mentioned below and analysed (Upadhyay and Mukhopadhyay, 1986).

$$\text{Per cent disease incidence} = \frac{\text{Seedling stand in un-inoculated control} - \text{Seedling stand in treatment}}{\text{Seedling stand in un-inoculated control}} \times 100$$

Both the T_2 and T_4 isolates delivered to soil as wheat bran sand formulation reduced the dry root-rot incidence equally and significantly. The per cent reduction was 71.3 and 70.1 with T_4 and T_2 isolates of *T. viride*, respectively. Where as only 51.1 per cent disease reduction was recorded with *Pseudomonas fluorescens*. So these two *T. viride* isolates were significantly superior to the *Pseudomonas fluorescens*. Costache *et al.* (1977) reported that *T. viride* and *T. koningii* when added to soil retarded the symptom development of *Fusarium* wilt of linseed. Wheat bran inoculum preparation when incorporated into soil controlled *Sclerotium rolfsii* more effectively than the simple conidial suspension of same antagonist incorporated into soil (Elad *et al.*, 1982). Kousalya and Jeyarajan (1988) also reported that *F. solani* was significantly inhibited by *T. viride* and *Trichoderma* spp.

In the present study, two isolates of *T. viride* (T_2 and T_4) were evaluated for their efficacy in controlling dry root-rot of acid lime *in-vivo* conditions showed more than 70 per cent reduction of the disease. Therefore, the two isolates could be used as a component in IPM for the management of dry root-rot in acid lime.

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Table 1. Effect of *T. viride* isolates (T2 and T4) in controlling dry root-rot of acid lime seedlings caused by *F. solani* in pot culture experiment

Sl. no.	Treatment	Per cent disease incidence	Per cent decrease over control
1	*Fusarium solani* + *Trichoderma* –2	26.4 (30.92)*	70.1
2	*Fusarium solani* + *Trichoderma* – 4	25.4 (30.26)	71.3
3	*Fusarium solani* + *Pseudomonas fluorescens*	42.7 (40.80)	51.1
4	*Fusarium solani* alone (Control)	88.7 (70.36)	-
	SEM (±)	2.33	
	CD (P = 0.05)	7.04	

* Figures in parentheses are angular transformed values.

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