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Short Scientific Reports

Effect of Some Antagonists on *Thielaviopsis paradoxa* (de Seynes) Hohnel, the Pathogen of Stem Bleeding Disease of Coconut

Stem bleeding disease, generally prevalent in all coconut growing states of India, is caused by *Thielaviopsis paradoxa* (de Seynes) Hohnel (Nambiar et al, 1986). The growth of the pathogen was found to be inhibited *in vitro* by various antagonistic fungi (Gowda, 1987). The present investigation was undertaken to study the effect of antagonistic fungi like *Trichoderma* spp., on the growth of *T. paradoxa* in coconut tissues.

Fresh coconut leaf petioles were cut into pieces of 30 cm length and 3 cm breadth. The cut ends were smeared with petroleum jelly to check water loss from the cut ends. Inoculation of the cut petiole was done by bore hole method developed by Nambiar et al. (1986). Cellotape was fastened over the inoculated site to avoid contamination and to prevent moisture entry. Each of the inoculated petiole piece was covered with a polythene bag, the open end of which was fastened. Following combinations of inoculations were tested:

(i) *T. paradoxa* alone (ii) *T. paradoxa* inoculation followed by *Trichoderma viride*/*T. harzianum* after 7 days (iii) simultaneous inoculation of pathogen and antagonists (iv) antagonist inoculation followed by the pathogen after 7 days (v) uninoculated control (only bore hole was made). Three isolates of *T. viride* and two of *T. harzianum* were used for the study. Three replications were maintained.

The inoculated petioles were incubated at room temperature (25–30°C) for a period of 20 days after which they were split open longitudinally and the lesion dimensions measured. The results obtained are presented in Table I. All the three isolates of *T. viride* tested were uniformly efficient in inhibiting the pathogen (93.0 to 94.7%) when the antagonist inoculation was followed by the pathogen. However, in simultaneous inoculation, isolate No. 2 was better than other two isolates. In the case of *T. harzianum*, isolate No. 2 caused maximum inhibition (94.5% to 97.4%) when the antagonist was inoculated simultaneously with the pathogen or just prior to the inoculation by the pathogen. When *Trichoderma* spp. were inoculated either prior to the pathogen or simultaneously they effectively controlled the disease development. However when the pathogen was inoculated first followed by the antagonist after 7 days, the disease development was not prevented.

Table I. *In vivo* interaction of *Thielaviopsis paradoxa* with *Trichoderma* spp.

Trichoderma	Lesion area (mm^2)			Percentage of inhibition in lesion over control*		
Isolates No.	*T. paradoxa* followed by antagonist	Antagonist followed *T. paradoxa*	Simultaneous inoculation of both	*T. paradoxa* followed by antagonist	Antagonist followed by *T. paradoxa*	Simultaneous inoculation of both
T.Viride-1	6733.00	470.00	930.00	25.00	94.7	89.6
„ No.2	9000.00	404.00	402.67	0.0	93.0	95.5
„ No.3	9000.00	483.33	2093.33	0.0	94.6	76.7
T. harzianum						
„ No.1	9000.00	1366.67	1246.67	0.0	84.8	86.1
„ No.2	8000.00	491.67	232.00	11.1	94.5	97.4

Analysis of data on lesion area only was done.
SE/plot 660.99, CV% 19.89
C. D. for isolates 636.276, C. D. for treatment 492.858, C. D. for I × T 1102.063
* In the control treatment involving *T.paradoxa* alone, the mean lesion area was 9000 mm^2, while it was 93mm^2 in the absolute control.

Gowda (1987) had observed that the *in vitro* growth of *T. paradoxa* was inhibited to different degrees by different isolates of antagonists like *T. viride* and *T. harzianum*. Whipps (1987) studying the effect of *T. harzianum* on *Sclerotinea sclerotiorum* found that treatment of the plant tissue with *T. harzianum* showed inhibition of sclerotial formation. Webber and Hedger (1986) found that *T. viride* could successfully replace the already established infection of *Ceratocystis ulmi*, the causal agent of Dutch Elm Disease. When *T. viride* pellets were inserted into the trunk of Dutch elm trees infected by *C. ulmi*, the disease could be controlled (Ricard, 1983). The results thus suggest the possibility of utilizing the above antagonists in the bio-control of stem bleeding disease. The ability of these antagonists in controlling the disease under natural conditions needs further study.

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Intercropping in Turmeric with Planting Patterns

Research results so far are in favour of mixed and intercropping in turmeric (Aiyadurai 1966; Sundararaj and Thulasidas, 1976; Rao, 1979; Shankaraiah, Reddy and Rao, 1987 and Balashanmugam, Ahamed Shaw and Chezhiyan 1988) though Singh and Randhawa (1988) reported that intercropping with pigeon pea, maize or green gram reduced the availability of light and the rhizome yield. Net returns were higher under intercropping compared with monoculture without mulch. Studies conducted in Maharashtra on mixed cropping of maize in turmeric have showed that there is drastic reduction in turmeric yield as well as monetary returns. Hence, studies were carried out with the objectives of finding out the suitable intercrop and also the ideal planting pattern for turmeric and different intercrops.

The experiment was conducted during 1985–86 and 1986–87 at Turmeric Research Station, Digraj, Maharashtra on vertisol. There were nine treatment combinations formed due to three planting patterns *viz.*, normal (37.5 cm × 30 cm), alternate row skipped (75 cm × 15 cm) and two rows skipped after every two rows (37.5 × 112.5 cm × 15 cm) and three intercrop treatments *viz.*, groudnut, sunflower and soyabean and without any intercrop as control (Table I). These treatment combinations were replicated four times in randomised block design with gross and net plot size of 6m × 6m and 4.8 m × 4.5m, respectively. F. Y. M. @ 22.5 t/ha and 60kg/ha each of P_2O_5 and K_2O were applied at the time of planting. Nitrogen @ 120 kg/ha was applied in three equal doses at 30, 75 and 105 days after planting of turmeric. Planting of turmeric was