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Efficacy of *Trichoderma* spp. against pigeonpea wilt caused by *Fusarium udum* Butler

S. K. JAYALAKSHMI, K. SREERAMULU* and V. I. BENIGI**
Agricultural College
Bheemarayanagudi 585 287, Gulbarga, Karnataka, India
Email: ksramu@rediffmail.com

ABSTRACT: ***Trichoderma harzianum*** **isolated from the rhizosphere of healthy pigeonpea plants in wilt -sick plot and other** ***Trichoderma*** **species collected from different places were screened** ***in vitro*** **and** ***in vivo*** **for their antagonistic effect against the pathogen** ***Fusarium udum*****. Among the bioagents tested, local isolate of** ***Trichoderma harzianum*** **(LI) was found to be the most promising showing maximum inhibitory effect on the mycelial growth (88.69%) of the pathogen. All bioagents were further tested as seed dressing agents for the control of wilt of pigeonpea. The lowest incidence of wilt (20.37%) was observed in the plots where seed treatment was given with the local isolate of** ***Trichoderma harzianum*****.**

KEY WORDS: *Fusarium udum*, pigeonpea, *Trichoderma* spp.

Pigeonpea wilt caused by *Fusarium udum* Butler is one of the most economically important diseases in India and other pigeonpea growing countries (Khare *et al.*, 1994). Application of fungicides in the soil to control the disease is not practicable. Prospects of biological control of soil borne plant pathogens using most promising fungal biocontrol agent of the genus *Trichoderma* have been described (Papavizas, 1985). Successful reduction of fusarial wilt in many crops with application of different species of *Trichoderma* has been recorded (Sivan and Chet, 1986). However, it is also reported that all the isolates of *Trichoderma* species are not equally effective in the control of the pathogen *in vitro* (Bell *et al.*, 1982) and *in vivo* (Lewis and Papavizas, 1987). Success of any antagonist depends on the selection of a virulent strain, method of application and its proliferation in soil. Therefore, a specific effective native isolate is to be identified for successful control of a particular pathogen.

An attempt was made to evaluate the efficacy of eight isolates of *Trichoderma* spp. including a native isolate, *Trichoderma harzianum* (L1) against *F. udum in vitro* and as biological seed dressing agents for the control of pigeonpea wilt.

MATERIALS AND METHODS

In vitro assay

The eight isolates of *Trichoderma* used in the study were: 1. *Trichoderma harzianum* (LI) isolated by using standard procedures from

**Agricultural Research Station, Gulag 585 101, Karnataka
*Department of Biochemistry, Gulbarga University, Gulbarga 585 106, Karnataka

rhizosphere of healthy pigeonpea plants in wilt sick plot at Agricultural Research Station, Gulbarga, 2. *T. viride*, 3. *T. koningii*, 4. *T. harzianum*, 5. *T. hamatum*, 6. *T. pseudokoningii*, collected from University of Agricultural Sciences, Dharwad (D), 7. *Trichoderma* sp. (R), obtained from Regional Research Station, Raichur, and 8. *T. harzianum* (C), collected from Tamil Nadu Agricultural University, Coimbatore were tested for their efficacy to inhibit growth of *F. udum* in dual culture on Potato Dextrose Agar (PDA). The mycelial disc of one cm diameter from the margin of three days old culture of each *Trichoderma* isolate and of the pathogen were placed opposite to each other on PDA plate. Dual plates were incubated at 28±2°C in BOD incubator and the radial growth of the pathogen and test isolate was recorded in each case. Pathogen alone inoculated on PDA plates served as control. Percentage inhibition of pathogen was calculated based on the growth in control and dual culture plates.

Field Experiment

The experiment was conducted in wilt sick plot at Agricultural Research Station, Gulbarga for two years during *kharif* 1998-1999 and 1999-2000. Ten-year-old wilt sick plot was developed by addition of wilted pigeonpea plants (chopped) to the plot every year. The trial was laid out in a randomized block design with a plot size of 1.2x4 m and 60x30 cm spacing between row-to-row and plant-to-plant, respectively. The pigeonpea cultivar TS3 was used in the study. Before sowing, the cultures, *viz.*, *Trichoderma harzianum* (LI), *Trichoderma* sp. (R), *T. harzianum* (C), *T. viride* (D), *T. koningii* (D), *T. psuedokoningii* (D), *T. hamatum* (D) and *T. harzianum* (D) were applied to the seeds of pigeonpea @ 2 g of 7-10 days old spore cum mycelial mass per kg seed by shaking in a conical flask for uniform distribution on the seed surface. Observations on wilt incidence were recorded after 60 days of sowing and compared with that of control plot.

RESULTS AND DISCUSSION

***In vitro* assay**

All the bioagents tested reduced the mycelial growth of the *F. udum* significantly in dual cultures (Table 1). Highest inhibition (88.69%) of pathogen was observed with the local isolate (LI) of *Trichoderma harzianum*. *T. koningii* (D) inhibited the growth of the pathogen to an extent of 77.42 per cent over control. The other bioagents, *viz.*, *Trichoderma* sp. (R), *T. harzianum* (C) *T. viride* (D), *T. harziaunm* (D), *T. hamatum* (D) and *T. pseudokoningii* (D), reduced the mycelial growth of the pathogen by 76.20, 74.62, 71.79, 66.17, 63.38 and 53.33 per cent, respectively. Except *T. viride* (D), *T. hamatum* (D) and *T. pseudokoningii* (D) all other bioagents showed over-growth on the pathogen. However, the local isolate of *Trichoderma harzianum* completely covered the *F. udum* after 8 days of incubation. Therefore the local isolate of *Trichoderma harzianum* (LI) is considered to be the most effective bioagent for *F. udum*. The antagonists *T. harzianum, T. koningii* and *T. viride* were reported as antagonistic to *F. udum in vitro* (Bhatnagar, 1996). It was also reported that isolates of the *T. harzianum* collected from different soils were not equally effective in inhibiting the growth of *F. udum* (Biswas, 1992).

Field experiments

In the present study, the bioagents evaluated *in vitro* were further tested *in vivo* as biological seed dressing agents against fusarial wilt of pigeonpea. Maximum reduction of fusarial wilt was observed in the plots where the seeds were treated with the local isolate of *Trichoderma harzianum* (LI) compared to control (Table 2). The next promising isolate in reducing the wilt incidence was *T. koningii*, which recorded 21.54 per cent of wilt. The other bioagents tested, *viz.*, *Trichoderma* sp. (R) *T. harzianum* (C), *T. viride* (D) and *T. harzianum* (D) were on par in reducing the incidence of wilt (22.67, 23.75 and 24.88%, respectively). Though the isolates of *T. pseudokoningii* (D) and *T. hamatum* (D) inhibited the mycelial growth of *F.*

Table 1. *In vitro* effect of antagonists on the growth of *F. udum* in dual culture

Antagonist	Percent inhibition of mycelial growth		
Trichoderma harzianum (LI)	56.67 (48.83)	78.73 (62.52)	88.69 (70.35)
T. koningii (D)	39.59 (38.99)	61.71 (51.78)	77.42 (63.62)
Trichoderma sp. (R)	41.38 (40.02)	58.11 (49.67)	76.20 (60.67)
T. harzianum (C)	42.29 (40.51)	59.20 (50.50)	74.62 (59.78)
T. viride (D)	45.93 (43.53)	57.42 (49.23)	71.79 (57.92)
T. harzianum (D)	20.66 (27.00)	42.53 (40.69)	66.17 (54.47)
T. hamatum (D)	14.44 (22.32)	44.68 (39.47)	63.38 (52.78)
T. pseudokoningii (D)	17.10 (24.35)	29.74 (33.02)	3.33 (47.20)
Control	0.00	0.00	0.00
SEM±	1.34	3.22	0.90
CD (P=0.05)	4.07	2.17	2.73
CV (%)	5.65	0.88	2.67

* Figures in parentheses are angular transformed values.

Table 2. Evaluation of antagonists as seed dressing agents against pigeonpea wilt

Isolate	Wilt incidence (%)
Trichoderma harzianum. (LI)	20.37 (26.82)
T . koningii (D)	21.67 (27.34)
Trichoderma sp. (R)	22.67 (28.67)
T. harzianum (C)	23.75 (29.16)
T. viride (D)	24.46 (29.63)
T. harzianum (D)	24.88 (29.82)
T. hamatum (D)	25.0 (29.82)
T. pseudokoningii (D)	25.12 (30.08)
Control	25.84 (30.55)
SEM ±	0.41
CD (P=0.05)	1.22
CV (%)	2.42

Figures in parentheses are angular transformed values.

udum in vitro, they were not effective against fusarial wilt in field. The above results indicated that the local isolate was comparatively more effective in reducing the wilt incidence (20.37%).

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