International J. Seed Spices 5(2), July 2015:89-91

Sensitivity of cumin rhizosphere *Trichoderma* isolates to fungicides

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Abstract

The potential isolates of *Trichoderma* found antagonistic to *Fusarium oxysporum* f. sp. *cumini* and *Alternaria burnsii* the causal agents of wilt and blight diseases of cumin respectively were exposed to different commonly used commercial fungicides for growth inhibition under *in vitro* conditions. The results revealed that *Trichoderma* isolates (CuTa 03-01, CuTk 07-01, CuTa 07-02, CuTh 09-02 and TIF-1) were germinated and survived in the presence of mancozeb added upto1500 µg ml^{-1} concentration. Whereas, the isolates were sensitive to different concentrations of carbendazim and thiram. The results indicated that mancozeb fungicide can be used in combination with the biocontrol agents evaluated.

Keywords: *Alternaria*, *Cuminum cyminum*, fungicide compatibility, *Fusarium*, *Trichoderma* isolates

Cumin (*Cuminum cyminum* L.) is an important export oriented seed spice crop mainly grown in Rajasthan and Gujarat states of India. The crop is affected by fungal diseases including *Fusarium* wilt, *Alternaria* blight and powdery mildew. The diseases can be managed by using chemical, cultural and biological means. Biological control of disease management involves the utilization of antagonists and beneficial micro organisms to suppress the population of plant pathogens and to control plant diseases. *Trichoderma* has been reported as a potential biological agent for the management of various diseases in crop plants including *Fusarium* sp., *Pythium* sp., *Rhizoctonia solani*, *Sclerotium rofsii*, *Macrophomina phaseolina* (Elad *et al*., 5, Howell 6, Shivan *et al*., 11 & 12, Abdollahzadeh *et al*., 2, Shalini *et al*., 9 and Osman *et al*., 8). The *Trichoderma* isolates isolated from cumin rhizosphere has been found antagonistic to *Fusarium oxysporum* f. sp. *cumini* and *Alternaria burnsii* the causal agents of wilt and blight diseases of cumin (Sharma *et al*., 10). Under field conditions, the efficacy of the biological agents can be enhanced by their application along with compatible chemicals or other bio-pesticides. Keeping this in view, the potential isolates of *Trichoderma* were evaluated for their compatibility with commonly used fungicides to know the effect of fungicides on growth of these isolates.

Four *Trichoderma* isolates isolated from the rhizosphere of cumin (CuTa 3-01, CuTk 7-01, CuTa 7-02, CuTh 9-02) along with a mutant (TIF1) and a commercial formulation of *T. viride* showed antagonistic activity against *Fusarium oxysporum* f. sp. *cumini* and *Alternaria burnsii* causing wilt and blight disease of cumin respectively were used for the studies. The isolates are being maintained in Plant Pathology laboratory, ICAR-NRC on Seed Spices, Ajmer and sub cultured onto potato dextrose agar plates for the studies. Three commonly used fungicides viz. mancozeb, carbendazim and thiram each at 500 µg ml^{-1}, 1000 µg ml^{-1} and 1500 µg ml^{-1} were used for evaluation under *in vitro* conditions using poison food technique (Dhingra and Sinclare 4).The required quantities of fungicides were added to the basal medium (PDA) before pouring in the petri plates to obtain desired concentrations and were mixed thoroughly by gentle shaking. The fungicide amended petri plates after solidification of the medium were inoculated with 5 mm disc of four days old cultures of different *Trichoderma* isolates. The PDA plates without added fungicide served as control. Three replicates of each treatment were maintained. The plates were incubated at 25±1° C. The mycelial growth was measured after four days of inoculation and percent growth inhibition was calculated (Sunder *et al*., 13). The data obtained were subjected for statistical analysis.

The effect of fungicides on the growth of *Trichoderma* isolates are presented in Table 1. Among the different fungicides tested, a systemic fungicide carbendazim was the most toxic to the growth of *Trichoderma* isolates, where complete growth inhibition was observed at all three concentrations. Thiram was found highly toxic at 1500 µg ml^{-1}. Among tested fungicides, mancozeb was found compatible with the test antagonists up to 1500 µg ml^{-1}, as this fungicide did not adversely affect the growth of test antagonists. The growth inhibition by mancozeb was observed from 0.0 to 26.7 per cent at 500 µg ml^{-1}, 0.0-41.9 per cent at 1000 µg ml^{-1} and 0.0-47.1 per cent at 1500 µg ml^{-1} (Fig. 1). Comparatively, TIF-1 and CuTa3-01 were least sensitive to the fungicide. The fungicides carbendazim and thiram was found incompatible even at

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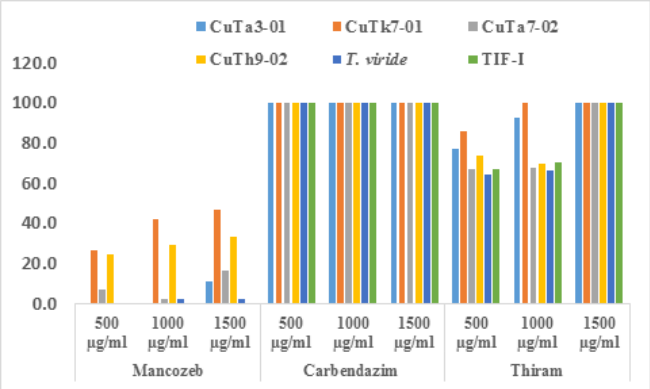

Fig 1. Growth inhibition of *Trichoderma* isolates in culture by different fungicides

500 µg ml^{-1}, as they adversely inhibited the growth of the test antagonists to a greater extent (64.5-100 per cent). In earlier reports it has been suggested that biological control agents that can tolerate a certain level of fungicides can be mixed with agrochemicals for disease management (Bhagwan 3; Ashwani *et al.*,1; Sushir and Pandey 14 and Johnson *et al.*, 7). In the present investigation, the compatability of *Trichoderma* isolates with mancozeb indicated that mancozeb fungicide can be used in combination with the *Trichoderma* isolates evaluated. However, the current results will provide only base level data in this context. Further research is needed to evaluate the practical application of this fungicide with *Trichoderma* isolates in the field.

Table 1: Effect of Fungicides on growth of *Trichoderma* isolates in culture media

Treatments	Colony growth (cm)									
	Mancozeb			Carbendazim			Thiram			Without fungicide
	500 µg/ml	1000 µg/ml	1500 µg/ml	500 µg/ml	1000 µg/ml	1500 µg/ml	500 µg/ml	1000 µg/ml	1500 µg/ml	
CuTa3-01	9.1	9.0	8.1	0.0	0.0	0.0	2.1	0.7	0.0	9.1
CuTk7-01	6.7	5.3	4.8	0.0	0.0	0.0	1.3	0.0	0.0	9.1
CuTa7-02	8.5	8.9	7.6	0.0	0.0	0.0	3.0	2.9	0.0	9.1
CuTh9-02	5.9	5.5	5.2	0.0	0.0	0.0	2.0	2.4	0.0	7.8
T. viride	9.1	8.9	8.9	0.0	0.0	0.0	3.2	3.1	0.0	9.1
TIF-I	9.1	9.1	9.1	0.0	0.0	0.0	3.0	2.7	0.0	9.1
CD (P=0.05)	0.92	0.23	0.58	NS	NS	NS	0.10	0.46	NS	0.26

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Received : April 2015; Revised : May 2015;
Accepted : June 2015.