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Management of coriander wilt using biocontrol agents

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Abstract

A replicated field trial on biocontrol of coriander wilt caused by *Fusarium oxysporum* f. sp. *corianderi* was conducted in *kharif* season during 1995–96, 1996–97 and 1997–98 in the Department of Spices and Plantation Crops, Horticultural College and Research Institute, TNAU, Coimbatore. Seed treatment with *Trichoderma viride* at 4 g kg^{-1} of seed was found to be more effective in reducing the wilt incidence to 5.3 per cent as against 28.3 per cent recorded in untreated control plots in all the three years. The mean yield (387.5 kg ha^{-1}) for all the three years was also significantly higher in seed treatment with *T. viride* as against very low yield (162 kg ha^{-1}) obtained in untreated plots. The cost benefit ratio was also enhanced with the same treatment.

Key words: biological control, *Coriandrum sativum*, *Fusarium oxysporum* f. sp. *corianderi.*

Coriander (*Coriandrum sativum* L.) is one of the important seed spices grown in India over an area of 546.50 thousand hectares producing 290 thousand tonnes with an export value of Rs.274.25 million during the year 2000–2001. Tamil Nadu is one of the important spice growing states of India. Pests and diseases are the major constraints in the production of coriander. Among the diseases, coriander wilt caused by *Fusarium oxysporum* f. sp. *corianderi* is an important disease which causes an yield loss of 10%. In the recent years, scientists have realised the need to use the biocontrol agents as effective alternatives for the disease management to conventionally used chemicals. They are environment friendly and do not induce resistance in pathogens as the chemicals do. Therefore, the present study was taken up to find out the effect of biocontrol agents in the management of coriander wilt.

A field trial on biocontrol of wilt disease in coriander variety CO. 3 was conducted for three seasons during 1995–1996, 1996–97 and 1997–98 in the Department of Spices and Plantation Crops, Horticultural College and Research Institute, TNAU, Coimbatore with six treatments including control. The experiment was conducted in a randomized block design with three replications. The treatment details are given in Table 1. The seeds were treated with *Trichoderma* species at the rate of 4 g kg^{-1} seeds whereas in the case of *Bacillus subtilis* and *Pseudomonas fluorescens* 10 g each was used to treat 1 kg of seeds (the biocontrol agents were obtained from Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore). A fungicidal check with carbendazim (2 g kg^{-1} seeds) was also included for comparison. The untreated seeds served as control. The other cultivation

Table 1. Biological control of coriander wilt

Treatment	Mean wilt incidence (%)				Yield (kg ha^{-1})				Cost benefit ratio
	1995-96	1996-97	1997-98	Mean	1995-96	1996-97	1997-98	Mean	
ST with *T. viride* (4 g kg^{-1})	6.0 (14.18)	5.4 (13.44)	4.5 (12.11)	5.3	389.5	387.5	385.5	387.5	1:17
ST with *T. harzianum* (4 g kg^{-1})	8.5 (16.95)	6.8 (15.12)	4.8 (12.11)	6.7	320.0	331.0	342.0	331.0	1:13
ST with *B. subtilis* (10 g kg^{-1})	12.5 (20.70)	10.5 (18.91)	8.5 (16.95)	10.5	310.0	302.5	295.0	302.5	1:11
ST with *P. fluorescens* (10 g kg^{-1})	16.7 (24.12)	8.7 (17.15)	10.2 (18.63)	13.2	295.0	285.0	275.0	285.0	1:10
ST with carbendazim (2 g kg^{-1})	6.5 (14.77)	5.6 (13.69)	5.3 (12.92)	5.8	385.0	360.0	315.0	350.0	1:13
Control (without any treatment)	36.6 (37.23)	28.3 (32.14	20.0 (26.57)	28.3	168.0	162.0	156.0	162.0	
CD (P=0.05)	2.76	2.24	2.18		7.44	8.66	7.47		

Figures in parenthesis are arcsine transformed values; ST: Seed Treatment

practices were followed as per the recommendations of horticultural crop production guide. The percentage of infected plants was worked out after the development of symptoms and the grain yield was recorded separately for the individual treatments. The cost benefit ratio was also worked out.

The treatments showed significant difference in their efficacy in controlling wilt disease of coriander in all the three seasons tested (Table 1). Seed treatment with *T. viride* at 4 g kg^{-1} seed was found to be more effective in reducing the wilt disease. The incidence was reduced to 5.3% as against 28.3% recorded in untreated plots. The efficacy of *T. viride* was on par with carbendazim treatment. The next effective treatment was seed treatment with *T. harzianum* with the wilt incidence of 6.7%.

The biocontrol treatments significantly increased the yield of coriander in all the three seasons (Table 1). The mean yield was significantly higher in seed treatment with *T. viride* with 387.5 kg ha^{-1} as against very low yield of 162 kg ha^{-1} obtained in untreated plots. The cost benefit ratio was high (1:17) in seed treatment with *T. viride*. *Trichoderma* represented the most widely and thoroughly studied fungus exhibiting antagonistic activity against a range of soil borne plant pathogens (Papavizas 1985). Several workers have reported the inhibitory effect of volatile compounds produced by *Trichoderma* spp. on serveral soil borne pathogens (Upadhyay & Mukhopadhyay 1983). *T. harzianum* has shown potential to control diseases caused by *Fusarium* spp. A strain of *T. harzianum*, T-35 controlled *Fursarium* wilt of cotton and melons caused by *F. oxysporum* f. sp. *vasinfectum* and *F. oxysporum* f. sp. *melonis*, respectively (Sivan & Chet 1986). *Fusarium* seedling blight in wheat caused by *F. culmorum* was also controlled by this fungus under natural soil conditions (Kempf & Wolf 1989). Padmodaya & Reddy (1996) reported that *T. viride* (H) was found highly inhibitory to *F. oxysporum* f. sp. *lycopersici* causing wilt in tomato in dual culture followed by *T. harzianum*.

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