



***Trichoderma harzianum* controls red rot and influences multiplication of *Epiricania melanoleuca*, an ectoparasitoid of *Pyrilla* in sugarcane crop**

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ABSTRACT: Various formulations of two strains of *Trichoderma harzianum* (Th 37 and Th 38) were tested in sugarcane crop (CoLk 7701) during 2006-07 and 2007-08 for ascertaining its response on *Colletotrichum falcatum*, *Pyrilla perpusilla* and *Epiricania melanoleuca*. The results indicated that metabolites (2.5%) of Th-37 and Th-38 increased the population of *Epiricania* cocoons by 136.05% and 95.24%, respectively and reduced the population of *Pyrilla* nymphs and adults to the tune of 44.92, 29.30 % and 44.92, 36.63 % in Th 37 and Th 38 applied plots, respectively. Regarding red rot, the same treatments increased the control by 36.06 and 36.08%, respectively. Application of *T. harzianum* indirectly supported the build up of high population of the parasitoid *E. melanoleuca* for the management of the *Pyrilla*. Application of *T. harzianum* enhanced the field availability of nitrogen to the crop and consequently *Pyrilla* population increased which ultimately influenced the speedy multiplication of *Epiricania*. It is also inferred that *T. harzianum* does not have any harmful effect on the parasitoid.

KEY WORDS: *Epiricania melanoleuca*, *Pyrilla perpusilla*, ratoon, sugarcane, *Trichoderma harzianum*.

Red rot disease of sugarcane caused by *Colletotrichum falcatum* (Went) is the most dreaded disease of sugarcane reported to cause up to 100% loss of the crop for which no chemical control is available. *Pyrilla* (*Pyrilla perpusilla* Walker) is a key pest of sugarcane plant and ratoon. The pest causes heavy reduction in sugar recovery (0.2-5 units) and cane yield (34%) (Rajak, 2006). Due to congenial conditions, mainly scanty rain fall (Chandra and Tiwari, 1978), the population of *Pyrilla* increased during 2007-08 crop season (Gangwar *et al* 2008). *Trichoderma harzianum* is a potential bioagent known to manage various crop diseases and promote growth of the crops (Yadav *et al.*, 2008). *Epiricania melanoleuca* (Fletcher) is a potential nymphal-adult parasitoid of *Pyrilla* (Rajak, 2007). Factors promoting luxuriant growth like high level of manuring enhance *Pyrilla* buildup (Murthy, 1953). *Trichoderma* sp. promotes availability of nitrogen and induces systemic resistance in crop. Keeping this in view, its influence on development of *Pyrilla*, *Epiricania* and red rot was studied in the present study.

Two strains of *T. harzianum* (Th 37 and Th 38) and three formulations, *i.e.*, spore suspension, powder form TMC (*Trichoderma* multiplied culture) and metabolite along with 3 combinations, *viz.*, T_1 = spore suspension (10^6 spores ml^{-1}); T_2 = TMC (solid *Trichoderma* multiplied culture in press mud @ 20kg ha^{-1}); T_3 = metabolite (spore free culture filtrate 15 days old @ 2.5%); T_4 = $T_1 + T_2$; T_5

= $T_1 + T_3$; T_6 = $T_2 + T_3$ and T_7 = Check (without treatment) were tested. *Trichoderma* grown in PDA broth and filtrate was collected after 15 days. All the treatments were applied in furrows at the time of planting. The experiment was laid out in randomized block design in plot size of 27m² and 3 replications during 2006-07 and 2007-08 crop seasons. The population of *P. perpusilla* and *Epiricania* on 50 leaves per plot were recorded in August-September and infection of red rot in nodal-inoculated 50 canes per plot were noted after 60 days of inoculation by splitting open the cane longitudinally. The data was converted into per cent reduction and per cent increase over control.

Efficacy of *T. harzianum* against red rot

The results obtained from the experiment (Table 1) revealed that T_3 treatment (metabolite) was most effective and enhanced the control of red rot by 36.06 while the range was 10.81 to 25.79% with other treatments using strain Th 37. T_3 treatment of Th 38 could control red rot by up to 36.04% as against 18.22 to 28.04% with other treatments. The yield was also higher with these treatments (71.10 and 71.24t ha^{-1}).

Effect of *T. harzianum* on *P. perpusilla* and *E. melanoleuca*

The increase in the population of *Epiricania* cocoons was noticed to the tune of 3.47 and 2.87 leaf⁻¹ with T_3 by

Table 1. Effect of *Trichoderma harzianum* (Th 37 and Th 38) on red rot, *Pyrilla* and *Epiricania* in sugarcane crop

Treatment	Strains	Mean <i>Pyrilla</i> adults		Mean <i>Pyrilla</i> nymphs		Mean <i>Epiricania</i> cocoons		Mean red rot control		Mean yield	
		Population-leaf ⁻¹	Reduction (%)	Population-leaf ⁻¹	Reduction (%)	Population leaf ⁻¹	Increase (%)	Increase (%)	Increase (%)	T ha ⁻¹	Increase (%)
T ₁ = spore suspension (10 ⁶ spores ml ⁻¹)	Th 37	2.60	4.76	11.60	12.12	2.13	44.90	35.34	16.04	55.42	5.16
	Th 38	2.53	7.33	11.93	9.62	1.87	27.21	23.43	21.32	55.52	5.35
T ₂ = TMC (in press mud @ 20kg ha ⁻¹)	Th 37	2.33	14.65	10.07	23.71	2.22	51.02	30.12	10.81	58.03	10.11
	Th 38	2.23	18.31	10.90	17.42	1.77	20.41	37.53	18.22	58.48	10.97
T ₃ = Metabolite (culture @ 2.5%)	Th 37	1.93	29.30	7.27	44.92	3.47	136.05	55.37	36.06	71.10	34.91
	Th 38	1.73	36.63	7.27	44.92	2.87	95.24	55.35	36.04	71.24	35.18
T ₄ = T ₁ + T ₂	Th 37	2.20	19.41	8.73	33.86	2.27	54.42	42.54	23.23	58.25	10.53
	Th 38	2.13	21.98	8.80	33.33	2.27	54.42	47.35	28.04	58.61	11.21
T ₅ = T ₁ + T ₂	Th 37	2.07	24.18	8.20	37.88	2.87	95.24	45.10	25.79	61.37	16.45
	Th 38	2.00	26.74	8.73	33.86	2.33	58.50	40.88	21.57	61.05	15.84
T ₄ + T ₂ + T ₃	Th 37	2.13	21.98	8.73	33.86	2.53	72.11	43.23	23.92	62.66	18.90
	Th 38	2.27	16.85	9.80	25.76	1.93	31.29	46.14	26.83	62.60	18.79
T ₇ = Check (no treatment)	-	2.73	-	13.20	-	1.47	-	19.31	-	52.70	-
CD (P = 0.05)		0.58	2.60	3.41	4.11	0.64	18.73	9.59	4.89	9.50	2.74

Th 37 and Th 38, respectively, as compared to 1.47 in check. T₃ treatment was highly effective in reducing the population of nymphs and adults of *P. perpusilla*. Highest reduction in the population of *Pyrilla* adults was 29.30% in Th 38 treated plots. Similarly the reduction in nymphs of *Pyrilla* was 44.92% with both the strains in the treatment T₃. *T. harzianum* not show any harmful effect on *Epiricania* (Table 1).

Pyrilla and red rot are key pests of sugarcane and economically very important for plant and ratoon. Red rot infection can be protected up to 75% cane by these strains (Singh *et al.*, 2008). The uptake of nutrients is increased in the presence of *Trichoderma* resulting in luxuriant plant growth and enhanced yield (Shukla *et al.*, 2008; Srivastava *et al.*, 2006). Prasad and Anes (2008) reported that *T. harzianum* was effective against second stage juveniles of *Meloidogyne incognita*. Application of *Trichoderma* formulations has facilitated the build up of sufficient number of cocoons of *E. melanoleuca* to minimize the population of *P. perpusilla*. In case of organic farming system where biopesticide is supplemented, the natural mechanism of biological control of pest is enhanced. *Trichoderma* spp. promote availability of nitrogen and induce systemic resistance in the crop making it more vigorous and less prone to red rot.

The findings of the experiments advocate the use of metabolite (2.5%) of *T. harzianum* strain Th 37 or Th 38 for the management of red rot as well as *P. perpusilla*. In order to manage *Pyrilla*, release of cocoons of *Epiricania* in new areas may be coupled with *Trichoderma* metabolite.

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