

Mycotonic Effect of Carbofuran on *Trichoderma viride*

R.SRIDAR, A. REGUPATHY and K.RANGANATHAN

Centre for Plant Protection Studies
Tamil Nadu Agricultural University
Coimbatore - 641 003

Pesticides are often applied directly to the soil for pest control. Some of the carbamate pesticides have been shown to be moderately persistent (Harris, 1970) and to have some effect on microbiological activities in the soil (Bartha *et al.*, 1967; Tu, 1970). Little is known about the effect of carbofuran on the biocontrol agent *Trichoderma viride* Pers. ex.Fr. which is used for the management of root diseases of crop plants. This paper reports the effects of carbofuran on the mycelial growth, sporulation and biocontrol efficacy of *T.viride*.

Potato Dextrose Agar medium containing 100,500 and 1000 ppm carbofuran was poured in sterile Petri dishes and allowed to solidify. An 8 mm disc of *T.viride* was placed at the centre in all the plates. Control plates were maintained without carbofuran. Five replications were maintained. The radial growth was measured after 72 hours to study the effect of carbofuran on the growth of *T.viride*.

In order to study the effect on sporulation, yeast molasses medium (yeast - 5g; molasses - 30g; water - 1000ml) containing 100, 500 and 1000 ppm carbofuran was prepared. Medium without carbofuran served as control. An 8 mm disc of *T.viride* was added to each flask and kept for incubation. Five replications were

maintained. Spore numbers in different treatments were counted with a haemocytometer on 5th, 7th and 10th day.

Effect of carbofuran on the biocontrol efficacy of *T.viride* was also studied. Sterile PDA medium supplemented with 100 and 200 ppm carbofuran was poured in sterile Petri dishes and allowed to solidify. At one end of Petri dish, an 8 mm disc of *T.viride* was placed and on the opposite end a disc of the root rot pathogen *Macrophomina phaseolina* (Tassi) Goid was placed and incubated for 72 hours. The radial growth of *T.viride* and *M.phaseolina* was measured at 24,48 and 72 hours.

Carbofuran @ 100 ppm did not inhibit the mycelial growth of *T.viride*, whereas 500 and 1000 ppm inhibited the growth. Carbofuran @ 100 ppm enhanced the sporulation when compared to control (Table 1). Carbofuran @ 500 and 1000 ppm reduced the sporulation when compared to control. In the dual plate culture, the radial growth of *T.viride* was faster than control when 100 ppm carbofuran was supplemented, at all the intervals viz, 24, 48 and 72 hours incubation (Table 2).

Tu (1972) reported that *Trichoderma* became dominant species in carbofuran - treated soil indicating the mycotonic effect of carbofuran which enhanced the growth of

Table 1. Effect of carbofuran on the growth and sporulation of *T. viride*

Carbofuran (ppm)	Radial growth of <i>T.viride</i> (mm)		No. of spores/ml of broth ($\times 10^7$) Days after inoculation		
	48h	72h	5	7	10
Control	34.2	41.5	23.6	28.0	40.1
100	35.4	41.5	30.7	37.4	45.4
500	17.5	25.3	20.4	27.8	36.0
1000	5.0	6.8	20.0	26.2	36.0
CD (P=0.05)	1.9	2.6	1.9	2.6	2.3

Table 2. Effect of carbofuran on the biocontrol efficacy of *T. viride*

Carbofuran (ppm)	Growth of <i>T. viride</i> in dual culture plate (mm)			Growth of <i>M. phaseolina</i> in dual culture plate (mm)		
	24h	48h	72h	24h	48h	72h
0	15.0	31.2	46.0	9.8	14.8	22.6
100	19.4	25.0	49.0	9.4	14.6	20.4
200	14.6	28.6	35.0	9.0	14.2	19.6
CD (P=0.05)	1.2	0.8	0.9	0.9	0.6	0.8

Trichoderma. In the present investigation also carbofuran either increased the radial growth of *T. viride* or kept it at the same level as control. It did not inhibit the growth of *T. viride*. It is known that *Trichoderma* can tolerate pesticides (Martin, 1966). At present, for mass multiplication of *T. viride*, the culture is grown for 15 days in yeast molasses medium to obtain sufficient sporulation (Ramakrishnan *et al.*, 1994). In the present investigation it has been found that carbofuran @ 100 ppm enhanced the rate of sporulation so that incubation period for mass multiplication can be reduced from 15 days. Mycoparasitism of *M. phaseolina* by *T. viride* is one of the mechanisms of biological control by *T. viride* (Papavizas, 1985). In the dual culture studies, we found that 100 ppm carbofuran enhanced the growth of *T. viride* which in turn hastened the mycoparasitism of *M. phaseolina*. The present study has shown that 100 ppm carbofuran has mycotonic effect on *T. viride* which can be exploited for biological control of root diseases. However, further detailed studies on the field efficacy of spores exposed to carbofuran are necessary.

KEY WORDS : *Trichoderma viride*,
carbofuran, mycotonic effect

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