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CONTACT TOXICITY OF INSECTICIDES TO ECOTYPES OF EGG PARASITOID *Trichogramma chilonis*. ISHII

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ABSTRACT

Studies were conducted on the contact toxicity of insecticides on six ecotypes of *T. chilonis* collected from Gudimangalam, Palladam, Udumalpet, Pongalur, Chingleput and Mettupalayam and the laboratory strain of *T. chilonis* from Coimbatore in Tamil Nadu revealed that phosalone was the most toxic to the ecotypes while quinalphos and monocrotophos were safe. All the ecotypes were superior to the laboratory strain indicating its deterioration due to constant mass culturing in the laboratory. Palladam ecotype was found to be more tolerant to the insecticides.

The parasites belonging to the family Trichogrammatidae are mass multiplied and released to combat pest complex on crops. It is imperative to conserve the natural enemies in the agro-ecosystem by applying safer insecticides, and studying their susceptibility / resistance to the insecticides.

The present study was undertaken to evaluate whether the laboratory reared strain of *T. chilonis* with that of other ecotypes to determine any deterioration in its qualities.

MATERIALS AND METHODS

Six ecotypes of *T. chilonis* were collected from farmer's fields on cotton and sugarcane by exposing egg cards of *Corcyra cephalonica* at Gudimangalam (ET1), Pongalur (ET2), Udumalpet (ET3), Palladam (ET4), Mettupalayam (ET5) and Chingleput (ET6). These were mass reared on *C. cephalonica* for three successive generations and then tested for their relative susceptibility / resistance to five insecticides and compared with water untreated control (Table 1). These ecotypes were compared with the laboratory strain (ET7) (Table 1).

To study the effect of spraying before parasitism, one hundred and twenty fresh, sterilized eggs of *C. cephalonica* were glued using diluted gum arabic over a cardboard strip of 2.0 x 6.5 cm, sprayed with the above mentioned insecticides to the level of wetting them using a chromatography sprayer, air dried and kept in specimen tubes. A pair of female parasitoids from each ecotype was allowed to oviposit and percentage of parasitism (based on blackening of eggs four days later) and

Table 1. Contact toxicity of insecticides to the ecotypes of the egg parasitoid *Trichogramma chilonis*.

Treatment	Per cent parasitism (Mean of three replications) Ecotypes						
	1	2	3	4	5	6	7
T1 (Phosalone 0.07%)	0.00 C (0.26) d	8.06 A (16.39) e	3.61 B (10.70) e	0.00 C (0.26) d	0.00 C (0.26) d	0.00 C (0.26) d	0.00 C (0.26) e
T2 (Quinalphos 0.05%)	56.94 C (48.98) c	56.94 C (48.97) c	78.61 A (62.47) a	81.39 A (64.43) a	71.39 B (57.68)	78.89 A (62.67) a	13.89 D (21.79) c
T3 (Monocrotophos 0.05%)	71.94 AB (58.02) b	57.22 C (49.14) c	56.11 C (48.50) c	76.39 A (60.94) a	66.39 B (54.56) b	51.67 C (45.94) b	41.11 D (39.86) b
T4 (Deltamethrin 0.002%)	50.56 A (45.30) c	33.33 B (35.25) d	24.44 C (29.61) d	49.17 A (44.50) c	45.28 A (42.27) c	30.56 B (33.52) c	12.50 D (20.67) cd
T5 (Endosulfan 0.07%)	56.67 C (48.82) c	67.22 AB (55.05) b	70.00 A (56.78) b	62.22 BC (52.07) b	48.33 D (44.03) c	27.5 E (31.58) c	8.89 F (17.23) d
T6 (Water treated control)	81.39 A (64.43) a	82.5 A (65.25) a	79.44 A (63.16) a	81.67 A (64.63) a	80.83 A (64.04) a	78.61 AB (62.53) a	72.50 B (58.78) a

In a column, means followed by same letter (lower case) and in a row, means followed by same letter (upper case) were not significantly different by DMRT (P=0.05). Figures within parentheses are transformed values (angular transformation).

Table 2. Contact toxicity of insecticides to the ecotypes of *T. chilonis*.

Treatment	Per cent emergence of parasitoid (Mean of three replications) Ecotypes						
	1	2	3	4	5	6	7
T1	0.00 C (0.26) e	6.94 A (15.19) f	2.50 B (7.42) e	0.00 C (0.26) d	0.00 C (0.26) d	0.00 C (0.26) d	0.00 C (0.26) e
T2	41.28 C (42.27) d	43.61 C (41.31) d	73.61 A (59.10) a	78.06 A (62.70) a	64.72 B (53.56)	76.39 A (60.92) a	4.72 D (10.37) d
T3	69.17 AB (56.26) b	54.17 C (47.37) c	53.89 C (47.22) c	73.89 A (59.32) a	63.33 B (52.72) b	47.22 C (43.39) b	36.11 D (36.92) b
T4	43.61 A (41.31) d	29.72 B (33.01) e	20.00 C (26.50) d	45.56 A (42.43) c	41.11 A (39.86) c	26.39 BC (30.86) c	8.06 D (16.48) c
T5	53.89 C (47.21) c	64.72 AB (53.55) b	66.11 A (54.40) b	56.94 BC (48.98) b	43.61 D (41.30) c	23.06 E (28.65) c	6.67 F (14.72) cd
T6	79.17 A (62.84) a	80.83 A (64.01) a	78.33 A (62.39) a	80.83 A (64.01) a	79.72 A (63.24) a	78.06 A (62.13) a	70.56 B (57.41) a

In a column, means followed by same letter (lower case) and in a row, means followed by same letter (upper case) were not significantly different by DMRT (P=0.05). Figures within parentheses are transformed values (angular transformation).

emergence were worked out. The treatments were replicated thrice.

To study the effect of spraying after parasitism, one hundred and twenty, four-day-old eggs parasitized by T. chilonis were glued over a cardboard strip similarly and sprayed with insecticides to the level of wetting them using a chromatography sprayer and percentage emergence of parasitoid was worked out. The treatmenrs were replicated thrice.

To study the contact toxicity by dry film method, the spray solutions of insecticides were prepared at the required concentrations and teepol (1ml/1) was mixed as wetting agent and used for the experiment. Five ml screw cap vials were taken and filled with the insecticidal solutions which were immediately discarded so that the tubes got uniformly coated with insecticides and air dried (Meera Gupta *et al.*, 1984).

Thirty freshly emerged parasitoids of the individual ecotypes were introduced and their moratality was observed at an interval of one hour until all the parasitoids died. The treatments were replicated three times and the median lethal time (LT 50) was worked out (Finney, 1967).

Table 3. Contact toxicity of insecticides to ecotypes of *T.chilonis* (percentage emergence-spraying blackened eggs).

Treatment	Per cent emergence of parasitoid from blackened eggs (Mean of three replications) Ecotypes						
	1	2	3	4	5	6	7
T1	18.33 C (25.19) e	51.11 A (45.62) c	46.39 A (42.91) c	20.28 B (26.69) d	9.44 C (17.79) d	8.06 C (16.39) e	10.28 C (18.57) d
T2	50.00 A (44.98) d	39.72 BC (39.03) d	46.39 AB (42.91) c	51.67 A (45.94) c	49.17 A (44.50) c	33.06 C (35.07) cd	26.11 D (30.67) c
T3	73.61 AB (59.07) b	64.72 CD (53.55) b	60.83 DE (51.25) b	77.22 A (61.70) a	68.61 BC (55.93) b	54.72 E (47.70) b	53.89 E (47.21) b
T4	58.06 B (49.63) c	69.72 A (56.61) b	65.56 A (54.06) b	63.61 AB (52.91) b	50.28 C (45.14) c	31.11 D (33.88) d	10.00 E (18.36) d
T5	59.39 C (48.66) cd	55.83 C (48.34) c	75.56 AB (60.37) a	80.28 A (63.62) a	69.72 B (56.61)	38.61 D (38.39) c	12.78 E (20.85) d
T6	81.11 A (64.26) a	82.50 A (65.25) a	77.78 A (62.05) a	81.11 A (64.21) a	81.67 A (64.63) a	78.89 A (62.75) a	70.83 B (57.30) a

In a column, means followed by same letter (lower case) and in a row, means followed by same letter (upper case) were not significantly different by DMRT (P=0.05). Figures within parentheses are transformed values (angular transformation).

Table 4. LT_{50} values (in hr.) of some insecticides for the different ecotype of *T.chilonis*.

Eco type	Phosa lone 0.07%	Quina lphos 0.05%	Monoc rotophos 0.05%	Deltam ethrin 0.002%	Endos ulfan 0.07%
1	2.32	3.71	4.24	2.84	2.46
2	3.71	3.87	3.57	2.04	4.11
3	3.77	4.90	2.72	2.07	3.99
4	2.23	5.47	4.94	3.36	2.68
5	1.20	3.31	5.27	2.43	2.43
6	1.46	1.57	2.29	1.62	1.46
7	0.96	1.36	1.90	0.91	0.68

RESULTS AND DISCUSSION

Among the ecotypes tested, ET4 was found to be the most tolerant to all the insecticides tested with 58.47 per cent parasitism and 55.88 per cent emergence when insecticides were sprayed before parasitism (Tables 1 & 2). Ecotypes 1,2,3 and 5 were comparatively inferior to ET4 and were statistically on par with regard to parasitism and emergence. The laboratory strain of Coimbatore proved to be the poorest indicating only 24.81 per cent parasitism and 21.02 per cent emergence, as against 79.56 per cent parasitism in water treatment. Among the insecticides quinalphos (T_2) was the safest recording 62.58 per cent parasitism followed by monocrotophos (T_3) with 60.12 per cent. Phosalone (T_1) was the most toxic recording only 1.65 per cent parasitism and 1.35 per cent emergence. The maximum emergence of parasites was observed from water treatment (T_6) which was significantly superior to the rest of the treatments. The emergence of the adults among insecticides was maximum in monocrotophos (56.83%) indicating the development of the parasitoid was not affected and was safer to the parasitoid. However, Prabhu (1991) reported 89.33 to 93.33 per cent emergence of parasitoid when treated with monocrotophos 0.036 per cent.

ET4, ET3 and ET2 indicated maximum emergence of adults (62.36, 62.08 and 60.60 % respectively) and were statistically on par but significantly superior to the rest when insecticides were sprayed after parasitism (Table 3). Water treatment was the safest recording 79.13 per cent and phosalone was the most toxic with 23.41 per cent. Maximum per cent emergence of 64.80 per cent was observed in monocrotophos.

Contact toxicity studies revealed that ET3 was the most tolerant to phosalone which took 3.77 hr. to kill 50 per cent of the population followed by ET2 with 3.71 hr. ET4 was found to be the most tolerant to quinalphos having an LT 50 of 5.47 hr. followed by ET3 with 4.93 hr. ET5 was the most tolerant to monocrotophos having an LT 50 value of 5.27 hr. followed by ET4 with 4.94 hr. Deltamethrin (T_4) was found to be the most toxic among all the insecticides tested. However ET4 was found to be the most tolerant with a value of 3.36 hr. ET2 was found to be the most tolerant to endosulfan with a value (T_5) of 4.11 hr. followed by ET3 (3.99 hr.). The laboratory strain was found to be comparatively more susceptible to all the insecticides tested. The strain was found to be more tolerant to quinalphos which required 1.36 hr. to kill 50 per cent population. However, phosalone, monocrotophos, deltamethrin and endosulfan required 0.96, 1.90, 0.91 and 0.69 hr. to kill 50 per cent of the population of the laboratory strain (Table 4). Spraying of insecticides on eggs of *C. cephalonica* before parasitisation could be used as a standard method for finding the safety of insecticides to parasitoids, percentage of parasitism and their per cent emergence.

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