

EFFECT OF REPEATED EXPOSURES OF TOLFENPYRAD 15% EC AT SUBLETHAL DOSES ON THE EGG PARASITOID, *Trichogramma chilonis* ISHII

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Insecticides act as the most limiting factor in the establishment of introduced natural enemies, conservation of natural enemies and efficacy of augmentative releases. In most of the toxicity studies against natural enemies, insecticides are screened for mortality due to acute toxicity only, while effects of sublethal doses on development, behavior and reproduction are overlooked. Hence, effect of sublethal doses of insecticides need to be quantified in addition to acute toxicity in order to accurately predict the total impact of a pesticide on a natural enemy. In this context, a program was undertaken to assess the effect of repeated exposure of sublethal doses (LC₂₅ and half of LC₂₅) of tolfenpyrad 15% EC, which shows broad insecticidal activities against important and difficult to control pests such as Hemiptera, Diptera, Coleoptera, Lepidoptera, Thysanoptera and acarines, on the egg parasitoid, *Trichogramma chilonis* Ishii.

Corcyra cephalonica egg card containing the pupal stage of *T. chilonis* were exposed repeatedly (once in each generation) to the LC₅₀, LC₂₅ and half of LC₂₅ of tolfenpyrad 15% EC (0.000146%, 0.000079% and 0.0000395%). After adult emergence 10 pairs of adults were collected and each pair were placed separately in a small glass tube along with small egg cards, containing about 100 *Corcyra* eggs for parasitisation. The Remaining adults were provided with a large egg card @ 30 eggs / adult for continuation of the bulk culture for the experiment. Similarly, in another set, parasitized egg cards were dipped in water to serve as control treatment. Adult parasitoids were fed with 50% honey solution. After each exposure observations were taken on mortality of pupae, longevity of adults, number of eggs parasitized / female, duration of life cycle, percent adult emergence and sex ratio of the off springs. The process was repeated till the viable adults were available in insecticide treated population. The experiment was conducted at a temperature of 27 ± 1°C and 70 ± 5% R.H. Effect of exposures was compared with control in each generation and also among different generation. Data were subjected to test of significance following General linear model using SPSS and SAS packages.

When *Trichogramma chilonis* pupae were exposed to LC₅₀ of tolfenpyrad 15% EC, the emerged adults died without parasitizing the host eggs successfully. Repeated exposure of *T. chilonis* pupae to LC₂₅ and half of LC₂₅ doses of tolfenpyrad adversely affected the survival and biology of the egg parasitoid and the parasitoid could survive up to 6th and 8th exposure, respectively. After 5th exposure to LC₂₅ of tolfenpyrad adult emergence was very low and the obtained females showed very low rate of parasitization in bulk culture, when this parasitized egg card was further exposed to the insecticide, most of the pupae died and a few adults that emerged from these eggs died soon after their emergence and the experiment was terminated automatically. However, the females emerged from the pupae after the last exposure to half of LC₂₅ of tolfenpyrad failed to parasitize any egg. Both the doses of the insecticide had immense adverse impact on biological parameters like, egg parasitization, adult emergence and sex ratio, which intensified with the number of exposures, whereas, the duration of life cycle was almost unaffected.

Table 1: Chronic toxicity of LC₂₅ of Tolfenpyrad 15% EC to *T.chilonis*

Exposure	Corrected Mortality (%)	Longevity (days)		No. of eggs parasitized/female	Duration of life cycle (days)	Adult Emergence Percentage	Sex ratio	
		Male	Female				Female	Male
1	24.99 E (29.98)•	1.5	2.0	53.3 A(7.3)**	8.0	90.08 A (71.74)*	1.61	1
2	29.16 E (32.60)	1.0	2.0	44.2 B(6.6)	8.0	80.25 B (63.74)	1.59	1
3	37.44 D (37.70)	1.0	1.0	33.3 C(5.8)	8.0	70.13 C (56.88)	1.57	1
4	46.71 C (43.11)	1.0	1.0	33.4 C(5.8)	8.0	60.40 C (51.01)	1.53	1
5	60.92 B (51.31)	0.5	0.5	15.0 D(3.6)	10.0	31.47 D (32.10)	1.30	1
6	73.83 A (59.25)							

• Represents Duncan's Grouping, * Parentheses contain angular transformed values, **Parentheses contain square root transformed values

Table 2: UNTREATED CONTROL

Exposure	Percent Mortality	Longevity (days)		No. of eggs parasitized/female	Duration of life cycle (days)	Adult Emergence Percentage	Sex ratio	
		Male	Female				Female	Male
1	2.22 (8.88)	2.0	3.0	70.6 •A (8.4)**	8.0	97.43 A (80.36)*	1.63	1
2	1.11 (6.47)	2.0	3.0	70.9 A (8.4)	8.0	97.47 A (80.46)	1.62	1
3	2.22 (8.88)	2.5	3.0	71.0 A (8.4)	8.0	96.23 A (78.92)	1.62	1
4	2.22 (8.88)	2.0	2.5	70.8 A (8.4)	8.0	96.51 A (79.42)	1.61	1
5	3.33 (11.29)	2.0	3.0	69.9 A (8.3)	8.0	96.42 A (79.24)	1.63	1
6	2.22 (8.88)	2.5	3.0	70.0 A (8.3)	8.0	96.35 A (79.37)	1.62	1
7	2.22 (8.88)	2.0	2.5	70.1 A (8.3)	8.0	96.58 A (79.55)	1.62	1
8	1.11 (6.47)	2.0	3.0	70.5 A (8.4)	8.0	96.44 A (79.25)	1.62	1
9	2.22 (8.88)	2.0	3.0	69.8 A (8.3)	8.0	96.44 A (79.25)	1.62	1
10	1.11 (6.47)	2.0	3.0	70.2 A (8.4)	8.0	97.27 A (80.44)	1.63	1

• Represents Duncan's Grouping, * Parentheses contain angular transformed values, **Parentheses contain square root transformed values

Table 3: Chronic toxicity of half of LC₂₅ of Tolfenpyrad 15% EC to *T.chilonis*

Exposure	Corrected Mortality (%)	Longevity (days)		No. of eggs parasitized/female	Duration of life cycle (days)	Adult Emergence Percentage	Sex ratio	
		Male	Female				Female	Male
1	14.76 •G (22.57)*	1.5	2.0	58.5 A (7.6)**	8.0	91.35 A (73.18)*	1.62	1
2	19.08 F (25.89)	1.5	2.0	57.2 A (7.5)	8.0	83.69 B (66.22)	1.62	1
3	19.31 F (26.06)	1.5	2.0	42.5 B (6.5)	8.0	76.42 BC (60.99)	1.60	1
4	27.28 E (31.49)	1.5	2.0	40.4 B (6.4)	8.0	75.08 BC (60.08)	1.60	1
5	36.36 D (37.08)	1.5	2.0	32.0 C (5.7)	8.0	70.57 CD(57.16)	1.46	1
6	42.03 C (40.42)	1.0	1.0	31.2 C (5.6)	8.0	62.13 D (52.03)	1.43	1
7	54.52 B (47.59)	0.5	1.0	23.6 D (4.5)	8.0	48.11 E (41.73)	1.37	1
8	76.40 A (60.94)	0.5	0.5	10.0 E (2.9)	8.0	39.29 E (36.01)	1.33	1

• Represents Duncan's Grouping, * Parentheses contain angular transformed values, **Parentheses contain square root transformed values

Table 4: UNTREATED CONTROL

Exposure	Percent Mortality	Longevity (days)		No. of eggs parasitized/female	Duration of life cycle (days)	Adult Emergence Percentage	Sex ratio	
		Male	Female				Female	Male
1	2.22 (8.88)	2.5	2.5	70.8 • A (8.4)**	8.0	96.46 A (79.28)*	1.63	1
2	1.11 (6.47)	2.0	3.0	71.0 A (8.4)	8.0	96.50 A (79.29)	1.63	1
3	2.22 (8.88)	2.0	3.0	71.1 A (8.4)	8.0	96.51 A (79.33)	1.64	1
4	2.22 (8.88)	2.0	3.0	71.2 A (8.4)	8.0	96.36 A (79.14)	1.63	1
5	2.22 (8.88)	2.0	3.0	70.2 A (8.3)	8.0	96.28 A (79.07)	1.62	1
6	2.22 (8.88)	2.5	3.0	70.6 A (8.4)	8.0	96.47 A (79.27)	1.63	1
7	2.22 (8.88)	2.0	2.5	69.8 A (8.3)	8.0	96.33 A (79.22)	1.63	1
8	1.11 (6.47)	2.5	3.0	70.1 A (8.4)	8.0	96.31 A (79.06)	1.63	1
9	1.11 (6.47)	2.0	3.0	70.0 A (8.4)	8.0	96.43 A (79.16)	1.64	1
10	1.11 (6.47)	2.0	3.0	70.7 A (8.4)	8.0	96.33 A (79.07)	1.63	1

• Represents Duncan's Grouping, * Parentheses contain angular transformed values, **Parentheses contain square root transformed values