



RESIDUAL EFFECT OF SOME INSECTICIDES ON ADULTS OF *TRICHOGRAMMA* SPP.

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ABSTRACT

The experiment was conducted to evaluate the residual toxicity of four insecticides (chlorantraniliprole 18.5%SC, flubendiamide 480SC, diafenthiuron 50% WP and azadirachtin 10000 ppm) on three species of *Trichogramma* namely *T. chilonis*, *T. pretiosum* and *T. japonicum*. Residual toxicity evaluation revealed that diafenthiuron 50%WP was slightly harmful to adults of all the three *Trichogramma* spp. Diafenthiuron led to maximum adults mortality i.e. 34.17%, 34.16% and 16.11% and azadirachtin, the least mortality i.e. 20.83%, 15.83% and 9.16% on 1st, 5th and 10th day of treatment, respectively.

Key words: *Trichogramma* spp., chlorantraniliprole, flubendiamide, diafenthiuron, azadirachtin, parasitization, mortality, toxicity,

Insecticides are the most effective means of protecting crop against insects' damage as they provide rapid control. The complex chemistry of pesticides, persistence in the environment, toxicity to animals and human beings and bioaccumulation- risks make pesticidal pollution, a critical problem. Among the various bioagents, *Trichogramma* is a hymenopteran parasitoid and has a high biocontrol potential against lepidopteran pests of corn, rice, sugarcane, cotton, vegetables and pines. It has been successfully used in inundative and inoculative biological control programme. Biological control reduces the chemical use and thereby the environmental pollution.

Detrimental effects of pesticides on *Trichogramma* have been limited to very few studies. Consoli et al. (1998) determined the effects of pesticides on *T. pretiosum* by dipping the parasitized host eggs in the pesticide solutions. This study evaluates the residual toxicity of some insecticides to adults of egg parasitoids belonging to three species of *Trichogramma*.

MATERIALS AND METHODS

The experiments were carried out in the Biocontrol Laboratory, Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola, Maharashtra during 2015-2016. *Trichogramma chilonis*, *T. pretiosum* and *T. japonicum* were obtained from ICAR- National Bureau of Agricultural Insect Resources, Bengaluru. The strains were then raised in the laboratory on *Corcyra cephalonica*. Field Recommended Concentrations (FRCs) of the insecticides viz., chlorantraniliprole 18.5%

SC (3ml/ 10l), flubendiamide 480SC (2.5ml/10l), diafenthiuron 50%WP (6gm/10l) and azadirachtin 10000 ppm (20ml/10l) were used. Residual effect of these insecticides were evaluated against adults of the *Trichogramma* spp.. The experiments were carried out using standard methods developed by Santharam and Kumaraswami (1985).

The effect of insecticide residues on survival of adult *Trichogramma* spp. was studied by glass vial bioassay method. For this, the glass vials measuring about 15x 4 cm size were taken. Sufficient quantity of insecticidal solution at recommended concentration of each insecticide were prepared in acetone. A thin uniform film of each insecticide was applied to each vial by taking 1 ml of spray liquid in it and quickly rotating by hand, so that vials get uniformly coated with the insecticides. The treated vials were shade dried to have insecticide residues as a dry film. A batch of glass vials treated with acetone was kept as control. After drying of insecticides, 20 newly emerged adults of *Trichogramma* were released inside each vial at an interval of 1st, 5th and 10th days after treatment to vials to test the residual toxicity. The adults were exposed to insecticide residues for 4 hrs and observations were recorded on number of dead and live adults.

The data on mortality was transformed before two way ANOVA. Means were separated by FCRD at p=0.05 (Gomez and Gomez, 1984). On the basis of % mortality insecticides were classified in different categories IOBC/WPRS (Sterk et al., 1999). Classification of toxicity level according to IOBC/WPRS was as follows: Toxicity Class- Categorization-

% Mortality; Class 1- Harmless-<30; Class 2- Slightly harmful- 30-79; Class 3- Moderately harmful- 80-99; and Class -Harmful- >99.

RESULTS AND DISCUSSION

The insecticidal treatments had significant effect on mortality of adults of three *Trichogramma* species on 1st day after treatment. Among all the insecticidal treatments the T₃-diafenthiuron 50% WP recorded highest mortality of 34.17% followed by T₂-flubendiamide 480 SC (28.38%). T₁-chlorantraniliprole 18.5%SC recorded 20.91% mortality and was found at par with T₄-azadirachtin 10000 ppm 20.83%. According to the IOBC classification of toxicity level diafenthiuron 50% WP was found slightly harmful (class-2) for *Trichogramma* adults and rest of the insecticides were harmless (class-1).

Preetha et al. (2009) and Kumar et al. (2016) findings are in line with present findings, that chlorantraniliprole 18.5%SC was harmless (class-1) to the adults of *T. chilonis* and Sattar et al. (2011) recorded flubendiamide was also harmless to adults of *T. Chilonis*. Similar to present findings Nasreen et al. (2004) reported diafenthiuron was slightly harmful up to 24 h to *Trichogramma*. Among the three species none of the species registered significant tolerance to the insecticidal residues when parasitoids were released on 1st day of treatment. However, the adult mortality after residual effect ranged between 18.55 - 24.01% in all the three *Trichogramma* species. Non-significant effect of different insecticides on three different *Trichogramma* species recorded. However, diafenthiuron 50% WP on *T. japonicum* recorded highest percent adult mortality (37.50%). Whereas, lowest mortality was observed in azadirachtin 10000 ppm treatment on *T. pretiosum* recording 15.00% adult mortality.

The insecticidal treatments also had significant effect on adult mortality of *Trichogramma* species on 5th day after treatment. Among all the insecticidal treatments the T₃-diafenthiuron 50% WP recorded highest mortality of adult *Trichogramma* (34.16%) followed by T₂-flubendiamide 480 SC (27.51%). T₁-chlorantraniliprole 18.5% SC caused 19.16% mortality. Significantly lowest mortality was observed in T₄-azadirachtin 10000 ppm (15.83%) and registered as safer to *Trichogramma* species over rest of the insecticides. As per the IOBC classification of toxicity level chlorantraniliprole, flubendiamide and azadirachtin were recorded as harmless (Class-1) whereas, diafenthiuron 50% WP recorded as slightly harmful (Class-2).

Among the three species none of the species recorded significant difference in tolerance to the insecticidal residues when parasitoids were released on 5th day of treatment. However, the adult mortality after residual effect observed to be ranged between 16.50-22.50% in all the three *Trichogramma* species. *T. pretiosum* recorded lowest mortality (16.50%) whereas, *T. japonicum* had highest mortality (22.50%). Whereas, acetone treated control had no mortality. Non-significant effect of different insecticides on three different *Trichogramma* species recorded. However, diafenthiuron 50%WP on *T. japonicum* recorded highest % adult mortality (42.50%). Whereas, lowest mortality was observed in azadirachtin 10000 ppm (12.50%) on *T. pretiosum*.

The insecticidal treatments had significant effect on adults of three different *Trichogramma* species. Among all the insecticidal treatments the T₃-diafenthiuron 50% WP recorded highest mortality of the adult (16.11%) followed by T₂-flubendiamide 480 SC (15.00%) both these were at par with each other. T₁-chlorantraniliprole 18.5% SC recorded 12.77% adult mortality. Significantly lowest mortality was observed in T₄-azadirachtin 10000 ppm treatment (9.16%). According to the IOBC classification of toxicity level all the insecticides reported as harmless (class-1).

Preetha et al. (2009) observed chlorantraniliprole as safer to *T. chilonis*. chlorantraniliprole was found harmless (class-1) throughout the exposure period to the *T. chilonis* (Kumar et al., 2016), flubendiamide ranked as short lived (IOBC, persistency class A) by Sattar et al. (2011). Neem product had short persistence and less toxicity to natural enemies as reported by El-wakeil et al. (2006). Thus, these findings are in close proximity with the results of present investigation.

Among the three species none of the species recorded significant difference in tolerance to the insecticidal residues when parasitoids were released on 10th day of treatment. However, the adult mortality after residual effect observed ranged from 7.16 - 12.50% in all the three *Trichogramma* species. *T. pretiosum* recorded lowest mortality (7.16%). Whereas, *T. chilonis* and *T. japonicum* had 12.16% and 12.50% mortality, respectively. In acetone treated control no mortality was recorded.

Giraddi and Gundannavar (2006) reported *T. Pretiosum* relatively more tolerant as compared to the *T. chilonis* and *T. Japonicum* which is in corroboration with present investigation. From the present investigations,

it is concluded that the non-significant effect of different insecticides on three different *Trichogramma* species recorded. However, flubendiamide 480 SC and diafenthiuron 50% WP on *T. japonicum* recorded highest % adult mortality (20.00%). Whereas, lowest mortality was observed in azadirachtin 10000 ppm treatment on *T. pretiosum* (5.00%) and recorded as safer for *Trichogramma* adults.

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