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Relative toxicity of Cyazypyr 10% OD and 20% SC, Anthranilic diamide against *Trichogramma chilonis* (Hymenoptera: Trichogrammatidae) Laboratory Conditions

Phool Chand[1], R. Vishwakarma[2] S,K. Mandal[3] and Umesh Chandra[4]
[1&3]Department of Agricultural Entomology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, India
[2]Department of Agricultural Entomology, Bihar Agricultural University, Sabour , 813210, Bhagalpur, Bihar, India
[4]Narendra Deva University of Agriculture and Technology, Kumarganj, faizabad, UP, India
Email: pcshastri_ent@yahoo.com & entoramanuj@gmail.com

ABSTRACT
This study was conducted in the Department of Entomology, Bio-control laboratory, Faculty of Agriculture, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur, Nadia, Best Bengal during 2014. The experiment was laid out incompletely randomized design with three replications. The control treatment was also maintained where only tap water was sprinkled over the card. Laboratory studies were conducted to evaluate the non-target toxicity of cyazypyr10% OD and 20% SC on the pupal stage of T. chilonis Ishida as against flubendiamide 40% SC, profenofos 50% EC, fipronil 5% SC and rynaxpyr 20% SC each at two doses. Among insecticidal treatments only profenofos 50% EC @ 0.07 and 0.05 a.i. were found to be highly toxic to the natural enemy causing 93.22 and 83.88% mortality of the test pupal of parasitoid. Cyazypyr 10% OD @ 0.01% a.i. resulted in 3.41% mortality of the treated pupae and it was significantly lower than rest of the insecticidal treatments. Mortality recorded in all other insecticidal treatments range from 6.82 – 15.82% and the treatments showed significant difference among them.
Key word: *Relative toxicity, Cyazypyr 10% OD and 20% SC, T. chilonis Ishida*

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INTRODUCTION

Trichogramma chilonis is an egg parasitoid that attacks more than 400 pest species, mostly lepidopteran insects. [18]. *Trichogramma* species can survive into a wide range of temperature and gave successful control of lepidopteran pests in manycrops [8-10]. Its role in the biological controlprograms of pest management is well understood [15, 5]. *T.chilonis* is most widely used in India, Pakistan, China, Korea, Taiwan, Japan, Nepal, and Reunion Island and as exotic species in Kenya, Spain, SouthAfrica and Australia. The important role of the biological control agents in agriculture, chemical control is still indispensable but, the use of nonselective insecticides greatly reduces the beneficial potential of the bio-control agents, particularly parasitic Hymenoptera that are often far more susceptible to insecticides than their hosts. By the establishment of Bio-intensive Pest Management Programs (BIPM). Application of selective insecticides to control pests could be useful in conservation of natural enemies associated with crops. More understanding of pest natural enemy insecticide interaction is needed to formulate more effective integrated pest management strategies [13].

Apart from direct toxic effects, insecticides may interfere with the feeding behavior as repellents, inhibitors [1-2]. These compounds also cause disruption of sex pheromone communication [3] and an increase in the arrestment behavior of treated trichogramma males [3]. In addition to the negative effects of fresh insecticide residues, some persistent compounds can exert their lethal and sub lethal effects on the trichogramma for a longer period of time post application [4]. Some new insecticides are potentially more toxic to the target pest but not to natural enemies, thus playing significant role in conservation of biological control agents in agricultural environments. Thus, the objective of this study was to determine the effect of six insecticides, commonly used for lepidopterous pests' suppression, on the development, survival and parasitic efficiency of *T. chilonis* and determine the persistency of these insecticides.

MATERIALS AND METHODS

This study was conducted in the Department of Entomology, Bio-control laboratory, Faculty of Agriculture, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur, Nadia, Best Bengal during 2014. The experiment was laid out incompletely randomized design with three replications. The control treatment was also maintained whereonly tap water was sprinkled over the card.

MASS CULTURE OF LABORATORY HOST OF THE PARASITOIDS:

Corcyra cephalonica Stainton was reared on crushed maize grain. Crushed maize grains, were first sterilized in oven at 100^0 C for 30 minutes. The sterilized grains, after cooling were sprayed with 0.2% formalin to prevent the growth of mould as well as to increase the grain humidity, which has lost during heat sterilization. Then the grains were poured into rearing boxes @ 2.5 kg /box. Each box was inoculated with 0.5cc *Corcyra* eggs and was closed by placing the lid. The boxes were then kept in racks. After about 40 days, moth emergence started, that continued for 60 days. Moths were collected daily and were transferred to specially designed oviposition cages for eggs lying. The eggs were collected every day, cleaned and the scales and others body plants were removed by blowing electric fan. The collected eggs were either used for further rearing of *Corcyra* or for rearing the egg parasitoid.

MASS CULTURE OF *TRICHOGRAMMACHILONIS* ISHII

Eggs of *Corcyra* of not more than 24 hours old were stored in deep freeze (below 0^0C temperature). The eggs were sprinkled uniformly with the help of a camel hair brush eggs cards measuring 15.5cm × 7.5 cm in size), previously smeared with a uniform thin layer of 50% aqueous solution of pure gum arabica. Egg cards were then offered to the newly emerged parasitoids for parasitization inside a glass tube. Super parasitism was avoided by regulating hostparasitoid density. The adult parasitoids were provided with 50% honey solution as food. The temperature of rearing room was maintained at 27^oC. The egg card was removed from the tube after 24hr and a fresh egg card was offered again for parasitization and the process was continued till 20-25% of the parasitoids were alive. Blackening of eggs in the card indicated parasitization by the parasitoids and the cards were either kept as such for the emergence of adult parasitoids or used for toxicological study.

The required concentrations of insecticides were obtained by adding the commercially available formulation with water. For the experiment, egg cards after parasitization were kept at temperature humidity mentioned earlier for the development of the parasitoids inside the host eggs. On the fifth day, when all the parasitized eggs in the egg card turned black indicating pupation, were made into pieces, containing at least 50 parasitized eggs in each piece. These small cards were dipped in insecticidal solutions, removed immediately and dried under electric fan. In control treatment, egg cards were dipped in water. The egg cards were then kept separately in glass vials to allow the emergence of adult parasitoids from the insecticide treated host eggs the mouth of which were plugged with cotton. The mortality of the parasitoids was recorded after adult emergence and the pupae, from which no adults emerged, were considered as dead. Each treatment was replicated three times and observations were taken on 30 parasitized eggs in each replication.

List of insecticides along with their trade name, formulation and sources

S.L No.	pesticides	Trade name	Formulation	Manufacture with address
1	Cyazypyr	New molecule	10% OD 20% SC	M/S E.I. DuPont India Pvt. Ltd.
2	Flubendiamide	Fem	40% SC	M/S E.I. DuPont India Pvt. Ltd.
3	Fipronil	Regent	5% SC	Bayer Crop Science Ltd.
4	Profenofos	Carina	50% EC	P. I. Industries Ltd.
5	Rynaxypyr	Coragen	20%SC	M/S E.I. DuPont India Pvt. Ltd.

RESULT AND DISCUSSION

EFFECT OF CYAZYPYR ON THE PUPAE OF *TRICHOGRAMMA CHILONIS* ISHIDA

Laboratory studies were conducted to evaluate the non-target toxicity of cyazypyr10% OD and 20% SC on the pupal stage of *T. chilonis* Ishida as against flubendiamide 40% SC, profenofos 50% EC, fipronil 5% SC and rynaxpyr 20% SC each at two doses. Among insecticidal treatments only profenofos 50% EC @ 0.07 and 0.05 a.i. were found to be highly toxic to the natural enemy causing 93.22 and 83.88% mortality of the test pupal of parasitoid (Table 1).

Cyazypyr 10% OD @ 0.01% a.i. resulted in 3.41% mortality of the treated pupae and it was significantly lower than rest of the insecticidal treatments. Mortality recorded in all other insecticidal treatments range from 6.82 – 15.82% and the treatments showed significant difference among them.
The results of the present investigation clearly show that, among the test insecticides Profenofos was most toxic to *T. chilonis* pupae, whereas new generation insecticides were safe to it. Among the new generation insecticides, cyazypyr 10% OD @ 0.01% ai caused significantly low level of mortality. When the mortality of different formulation of cyazypyr was compared, cyazypyr 20% SC showed relatively higher mortality than 10% OD. Profenofos has been reported as highly toxic insecticide against different species of Trichogramma [12, 16, 7].
Controversial reports are available on the toxicity of fipronil to *T. chilonis.* Earlier, Tilman and Mulrooney [17] and Zhoa *et al*. [20] reported fipronil to be less toxic, whereas, Wang *et al*. [19] found in to be most toxic to the parasitoid. During the present investigation, fipronil caused very low mortality of *T. chilonis* pupae. Karam [6] observed low toxicity of rynaxypyr to *T. chilonis* [14].

Table 1: Per cent corrected mortality of *T.chilonis* Ishida (pupal) in different Insecticides

Treatment	Doses (%)	% corrected Pupal mortality
Cyazypyr 20% SC	0.015	15.82 (23.15)*
	0.01	9.08 (17.47)
Cyazypyr 10% OD	0.015	6.82 (14.81)
	0.01	3.41 (5.58)
Flubendiamide 40% SC	0.0065	9.12 (17.33)
	0.005	6.82 (14.81)
Profenofos 50% EC	0.07	93.22 (75.21)
	0.05	83.88 (72.50)
Fipronil 5% SC	0.015	9.08 (16.98)
	0.01	6.82 (14.81)
Rynaxypyr 20% SC	0.0066	10.19 (17.97)
	0.005	6.82 (15.13)
CD		8.54

*Values within parentheses are angular transformed

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