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RESEARCH ARTICLE

SENSITIVITY OF *TRICHOGRAMMA JAPONICUM (ASHMEAD)* TO DIFFERENT INSECTICIDES

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ABSTRACT

The present investigations were undertaken on laboratory studies of *Trichogramma japonicum* (Ashmead) during the year 2013-2014 in the Bio-control laboratory, Department of Agricultural Entomology, College of Agriculture, Dapoli (Maharashtra).The results of effect of different insecticides on parasitisation potential of *T. japonicum* revealed that insecticides *viz.,* oxydemeton methyl and cypermethrin could be used safely before *T. japonicum* release in the field. Further, insecticides *viz.,* dimethoate, indoxacarb and emamectin benzoate could be used before *T. japonicum* release in the field with some safe period, while insecticides *viz.,* malathi on and dichlorvos should not be used in the field, as they can disturb the parasitisation.

INTRODUCTION

Biological control is the regulation of pest population using natural enemies, including predators, parasitoids, nematodes and microbial agents (Rosenheim and Jay, 1998; Bale *et al.* 2008). As opposed to chemical control, biological control is advantageous because it poses no threat to human health, it is environment friendly, host specific, and probability of the host developing resistance is low. The economic damage caused by lepidopteran pests on field crops and on stored grain exacerbates the problem of food security and malnutrition in many developing countries (Gressel *et al.* 2004). Just to quote an example, among the various polyphagous pests of economic importance, the well known is, the tobacco caterpillar, *Spodopteralitura* (Fab.), it is next to *Helicoverpa armigera* (Hub.) in economic importance at national level. It is one of the important polyphagous crop pests distributed throughout south and eastern world infesting 112 species of plants belonging to 44 families, of which 40 species are known from India. It is important polyphagous pest that has about 150 hosts including major crops like soybean, cabbage, beetroot, cotton, sorghum, tomato, etc., (Rao *et al.* 1993). In India, *S. litura* has been reported as an increasingly important pest during the rainy season causing heavy yield loss (Rathi and Gopalakrishan, 2005). Dhir *et al.*(1992) reported *S. litura* as a serious but sporadic insect pest causing economic losses of crops from 25.8-100 per cent.

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Several insecticides that are widely used to suppress various pests can disrupt the effectiveness of these beneficial agents. Thus, assessment on the safety of insecticides to natural enemies was essential. Detailed knowledge of the effects of different pesticides on the natural enemies will help to determine the type of spray and the timing of sprays, thus avoiding contact with their most susceptible stages.

MATERIALS AND METHODS

To study the sensitivity of *T. japonicum* to insecticides

Freshly laid, U.V irradiated 100 eggs of *Corcyra* were pasted separately and randomly on a small white paper card strip (4 x 3.5 cm)with the help of diluted gum which were then air dried and were served to 3 pre-mated freshly emerged females of and *T. japonicum* from mass culture in a small glass vial (7.5 × 7 cm) separately. After 24 h *i.e*, after parasitisation, the paper strips were removed and kept in a separate same size vial for further development of the parasitoid and following biological parameters of *T. japonicum* from respective host's trichocards were recorded separately.

Design	:	C.R.D
Treatments	**:**	**8**
Repetitions	**:**	**3**

The treatment details and the treatment concentrations are as below:

Sr. No.	Treatments	Concentration (%)
1.	Cypermethrin 25EC	0.0075
2.	Dimethoate 30 EC	0.05
3.	Oxydemeton methyl 25 EC	0.02
4.	Indoxacarb 15.8 SC	0.01
5.	Emamectin benzoate 5 SG	0.002
6.	Malathion 50 EC	0.05
7.	DDVP 50 EC	0.05
8.	Control	_

Effect on egg parasitisation

White card paper strip (4 x 3.5 cm) with fresh, U.V sterilized 100 *Corcyra* eggs; glued with the help of diluted gum was prepared. It was air-dried thoroughly and sprayed with respective insecticide solution with the help of hand sprayer. In control, the card paper strip was sprayed with distilled water. Strips were again thoroughly air dried and then exposed separately to 5 freshly emerged, mated females of *T. japonicum* for 24 h. After 24 h, stripes were removed and kept in another same size vials, individually. Number of eggs parasitised per treatment were judged as mentioned earlier. Based on reduction in parasitisation compared to control, the insecticides were categorized into four categories as below.

Sr. No.	Particulars	Reduction in parasitisation over control (%)	Score
1.	Harmless	<30	1
2.	Slightly harmful	30 to 79	2
3.	Moderately harmful	80 to 99	3
4.	Harmful	>99	4

(Baladandi *et al.,* 2005)

1	=	Harmless (< 30 % reduction)	:	Cypermethrin and Oxydemeton methyl
2	=	Slightly harmful (30 to 79% reduction)	:	dimethoate, indoxacarb, emmamectin benzoate
3	=	Moderately harmful (80to99% reduction)	:	DDVP
4	=	Harmful (> 99% reduction)	:	Malathion

From these results it was clear that cypermethrin and oxydemeton methyl could equally favour greater per cent of egg parasitisation followed by dimethoate, indoxacarb, emamectin benzoate. However, malathion and DDVP greatly affected the paratisation by *T. japonicum.* Earlier different workers conducted experiments with varying insecticides to observe their effects on egg parasitisation. Among them, Prem *et al.* (2001) reported highest parasitisation of 48.14 per cent in acephate 0.05 per cent while lowest in endosulfan 0.05 per cent (2.90%), deltamethrin 0.0028 per cent (4.54%) and malathion 0.05 per cent (5.13%) as compared to 69.80 per cent in control. Baladandi *et al.* (2005) observed the side effects of maximum recommended doses (for field use in sugarcane) of six insecticides *viz.,* endosulfan 35 EC, dimethoate 30 EC, chlorpyriphos 20 EC, monocrotophos 36 WSC, profenophos 50 EC, oxy-demeton methyl 25 EC on *T. chilonis, T. japonicum* and *Ooencyrtus papilionis* Ashmead. Based on reduction in parasitisation, the insecticides were categorized into four categories, 1: harmless (< 30%), 2: slightly harmless (30 to 79%), 3: moderately harmful (80 to 99%) and 4: harmful (> 99%). The results revealed that the insecticides differed in their initial toxicity. Dimethoate (0.03%), oxy-demeton methyl (0.03%) and monocrotophos (0.05%) were slightly harmful to *T. chilonis* but moderately harmful to

Table: Effect of different insecticidal treatments on parasitisation by T. *japonicum*

Sr. No.	Treatment	Concentration (%)	Per cent egg parasitisation	Per cent reduction in egg parasitisation over control	Score
1.	Cypermethrin 25 EC	0.0075	82.67 (66.78)	10.46	1
2.	Dimethoate 30 EC	0.05	35.67 (36.47)	61.36	2
3.	Oxydemeton methyl 25EC	0.02	81.33 (64.86)	11.90	1
4.	Indoxacarb 15.8 SC	0.01	41.33 (39.91)	55.23	2
5.	Emamectin benzoate 5 SG	0.002	61.67 (51.93)	33.20	2
6.	Malathion 50 EC	0.05	0.67 (2.71)	99.27	4
7.	DDVP 50 EC	0.05	1.00 (2.71)	98.91	3
8.	Water	-	92.33 (74.77)	0.00	1
	S.Em ±		4.39	-	-
	CD @ 5 %		13.16	-	-

Note: Figures in the parentheses are arcsine values

RESULTS AND DISCUSSION

Sensitivity of *T. japonicum* to insecticides for egg parasitisation

The results revealed that significantly highest egg parasitisation of 92.33 per cent was recorded in control (water spray) followed by cypermethrin and oxydemeton methyl recorded 82.67 and 81.33 per cent parasitisation, respectively and were at par. Further reduction in adult emergence was recorded in emamectin benzoate with 61.67 per cent followed by indoxacarb and dimethoate with 41.33 and 35.67 per cent parasitisaton, respectively and were at par. Further, insecticides *viz.,* DDVP and malathion supported minimum parasitisation of 1.00 and 0.67 per cent, respectively. Based on the data, ranking of the insecticides with respect to the parasitisation of the pre-treated *Corcyra* eggs by *T. japonicum* was allotted on the basis of per cent reduction in egg parasitisation over control which was as below.

T. japonicum and *O. papilionis*. However, endosulfan (0.07%) was also moderately harmful to both *Trichogramma* species and *O. papilionis*, While chlorpyriphos (0.01%) and profenophos (0.006%) were harmful in initial toxicity tests on all the three adult parasitoids. Samantha *et al.* (2006) evaluated the residues of different insecticides in/on brinjal and their effect on *T. chilonis* and *T. japonicum*. They noticed that alpha cypermethrin was safest towards both the species. Considering the retention period of the toxicant, they recommended to release both the parasitoids in the cropping ecosystem after 3 to 5 days of alpha cypermethrin, 4 to 6 days of methomyl and 6 to 7 days of quinalphos spray, respectively depending upon the treatment doses. Snehmar (2011) evaluated five insecticides *viz,* malathion, endosulfan, imidachlopride, triazophos, chlorpyriphos for their impact on some biological parameters of egg parasitoid *Trichogramma japonicum.* He found that endosulfan @ 394 g a.i./ha was comparatively safe to the parasitoid with least effect on the emergence and parasitisation of parents as well as their progeny, while malathion @ 1250 g a.i./ha and chlorpyriphos @ 175 g a.i./ha were highly deleterious. The toxic effects of immidachloprid @ 20 g a.i./ha and triazophos @ 600 g a.i./ha were in between endosulfan and malathion. Present results are strongly supported by all above findings.

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