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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 6 (6): 563-565, 2003
ISSN 1028-8880

Relative Efficacy of Different Insecticides Against the Second Instar Larvae of American Bollworm (*Helicoverpa armigera* (Hub.)) of Cotton

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Abstract: Efficacy of five insecticides viz., Polytron-C (440EC), Curacron (500EC), Azofas (20/400EC), Thiodan 35EC and Karate 5EC was compared with their recommended doses against 2nd instar larvae of American bollworm (*H. armigera* Hub.) under controlled laboratory conditions. Polytron-C & Curacron showed hundred percent mortality (100%) after 24 hours of application followed by Thiodan (85.33%), Azofas (74.66%) and Karate (61.33%). Mortality was maximum after 48 hours by Azofas (100%) followed by Thiodan (98.66 %) and Karate (93.33 %).Thiodan and Karate also produced 100% mortality of larvae after 72 hours of application.The results concluded that Polytron-C and Curacron are the most effective insecticides against 2nd instar larvae of, *H. armigera* (Hub.) followed by Azofas, Thiodan and Karate..

Key words: *H. armigera* (Hub.), 2nd instar larvae, insecticides, Polytron-C, Curacron, Azofas, Thiodan & Karate.

Introduction

Cotton *(Gossypium hirsutum L.)* is primarily grown in Pakistan for fibre. Secondly it provides edible oil for human and cake for cattle. As a whole, it is a big source of foreign exchange and accounts for 2.9% of GDP of Pakistan. It is grown on an area of about 2927 thousand hectares with total annual production of 10732 thousand bales. Its average yield is 624 kg/hectare (Anonymous, 2001). This production is less than that in many advanced countries. One of the causes for its low yield per hectare is due to the attack of insect pests and diseases. These factors reduced cotton yield from 20 to 30% every year. Among insects, the American bollworm alone causes considerable losses (Lohar, 1994).

Insecticides had been found very effective for the control of chewing and sucking insect pests in the early 1980s (Herve, 1985). Later (in1990s) extensive and continuous use of pyrethroids developed a resistance in *Helicoverpa armigera* (Hub.) in Pakistan (Ahmad *et al., 1997*; Kranthi *et al*., 1997). At prersent a number of insecticides with their different chemical groups are being used commercially to control this notorious pest. In order to know the efficacy of these chemicals prior to field application, an experiment was conducted in laboratory against 2nd instar larvae of American bollworm, *H. armigera* (Hub.).

Materials and Methods

Second instar larvae of American bollworm were taken from NIAB insect rearing laboratory maintained at 28±2 °C and 65±2% R.H. with a photoperiod of 16:8 (L:D)h. These larvae were treated with Polytrin-C (440EC), Curacron (500EC), Azofas (20/400EC), Thiodan 35EC and Karate 5EC by using a leaf dip method. Formulations of their recommended doses were prepared in distilled water. Cotton leaf disks (5 cm diameter) were cut and dipped into the test solutions for 15 seconds with gentle agitation. They were allowed to surface-dry on a paper towel and then placed into petri-dishes containing moistened filter papers to avoid desiccation of leaves. Larvae were transferred to the leaf disks in petri-dishes by tapping lightly to disperse 5 larvae per petri-dish. Each insecticide concentration was replicated 5 times alongwith an untreated control. Whole experiment was run under controlled laboratory conditions. Mortality was assessed after 24, 48 and 72 hours of insecticides application. Insects were considered dead if they gave no response to stimulation by touch. Results were expressed as percent mortality with correction for untreated (control) mortality using Abbott's formula (Abbott, 1925). The data were subjected to ANOVA and LSD tests.

Results and Discussion

Mean percent mortality of 2nd instar larvae of American bollworm, *Helicoverpa armigera* (Hub.) varied significantly in all the treatments among the different time interval. Hundred percent mortality was observed in Polytrin-C 440EC (Cypermethrin+ Profenofas) and Curacron 500EC (Profenofas) followed by Thiodan 35EC (85.33%), Azofas 20/400EC (74.66%) and Karate 5EC (61.33%) after 24 hours. Azofas 20/400EC showed complete mortality (100%) after 48 hours followed by

Table 1: Relative efficacy of different insecticides against the 2nd instar larvae of American bollworm (*Helicoverpa armigera* (Hub.)) of cotton

Treatments	Recommended Dose (ml/acre)	Used Dose (ml/acre)	% Mortality of 2nd instar larvae of *Helicoverpa armigera* (Hub.) after 24 h	48 h	72 h
Polytrin-C (440EC) (Cypermethrin+ Profenofas)	500-550	500	100.00a	100.00a	100.00a
Curacron (500EC) (Profenofas)	800-1000	800	100.00a	100.00a	100.00a
Azofas (20/400EC) (Alpha Cypermethrin+monocrotophos)	500-600	500	74.66c	100.00a	100.00a
Thiodan (35EC) (Endosulfan)	600-800	600	85.33bcd	98.66a	100.00a
Karate (5EC) (Lambda cyhalothrin)	250-330	250	61.33d	93.33ab	100.00a
(Control)	--------	----	00.00g	00.00g	00.00g

** Means within columns & rows with same letter(s) are not significantly different from each other at 5% level of probability.

Thiodan 35EC (98.66%) Karate 5EC (93.33%). After the exposure of 72 hours, larvae were killed completely (100%) by Thiodan 35EC and Karate 5EC (Table 1). The overall results concluded that insecticides concerning cypermethrin and Profenofas groups in particular proved better after 24 hours followed by cypermethrin + monocrotophos insecticides after 48 hours of their application. Comparatively other groups such as endosulfan and lamda cyhalothrin showed the less efficacy in killing the insect. A number of scientists have documented the efficacy of these groups with some variations under different climatic conditions.

Thiodan (endosulfan) was very effective against first instar larvae of, *H. armigera (*Hub.) under laboratory condition (Gunning, 1993). Resistance to cypermethrin in *H. armigera* (Hub.) reduced from 51% in 1993-94 to 30% during 1994-95 respectively, in India (Karanthi *et al*., 1997). Karate 5EC (cyhalothrin) was effective for the control of 3rd & 4th generations of *H. armigera* (Hub.) in the cotton fields in Shangdong, China (Yiliang *et al.,* 1995). Curacron (profenofos) showed very low resistance against *H. armigera* (Hub.) during 1994-95 (Ahmad *et al.,* 1999). Strong efficacy of cypermethrin on small larvae of *H. armigera* (Hub.) was recorded in West Africa (Martin *et al*., 2000). Thiodan (endosulfan) was found most effective against early instars (2nd and 4th) of the *H. armigera* (Hub.) but was not effective against full grown larvae (Khurana, 1999). A low to moderate resistance was found in some Pakistani strains of *H. armigera (Hub.)* against Karate (Ahmad *et al.,*1997). Insecticidal resistance in *H. armigera* (Hub.) revealed that the mean percent survival of 3rd instar larvae to cypermethrin (0.01%) increased from 46.8 (1991-1992) to 95.7 (1994-95) and resistance to endosulfan was high with 46% survival during 1994-95 in India (Sekhar *et al.,* 1996). The mortality of 4th instar larvae of *H. armigera* (Hub.) was recorded after 72 hours of post treatment with different insecticides i.e., cypermethrin and endosulfan varied from 0.0 to 38.10%, 39.90 to 99.50% as compared to 100% during 1984 with same brands and doses in Punjab (Sidhu *et al.,* 1994). Findings of most of the researchers as well as those reported here that confirm that pyrethroid group of insecticides are very effective as compared to endosulfan.

Acknowledgement

The authors wish to thank Dr. Farhat Fatima Jamil (CSO), Head Plant Protection Division, NIAB, Faisalabad, who inspired us to write this paper.

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