Toxicity of RH-2485 (Methoxy fenocide20F) against *Helicoverpa armigera* (Hub.)

K.Kumar[1*] and G.Santharam[2]

ABSTRACT

RH-2485 is a molt accelerating compound and provides effective control of a wide range of key lepidopteran pests. It acts as an ecdysone agonist. The chemical upon absorption into the haemolymph of the insect, binds to the ecdysone receptor which initiates the moulting process. As the normal process disrupted the insects are prevented from shedding its old cuticle. The larvae die of dehydration and starvation within 2-5 days. Hence the toxicity tests were conducted for *Helicoverpa armigera* (Hub.) to fix the LD_{50}.The LD_{50} of molt accelerating hormone RH-2485 was estimated by Bouquet method. It was found that the LD_{50} was 7.68, 15.95, 92.93 and 142.16 ppm for I, II, III and IV instar larvae of *H. armigera* respectively. It was concluded that the earlier instar was found to be more susceptible with lesser LD_{50} values and as the instars advances the values of LD_{50} was found to be increasing. Hence this formulation was found to be more toxic for the different instars of *H. armigera* and can be included in the Integrated Pest Management systems.

Keywords: *Helicoverpa armigera*, methoxy fenocide, mortality

INTRODUCTION

Chemical insecticides have been the backbone of insect pest control since the early 1950's when organochlorine insecticides were first widely introduced. Indiscriminate use of the chemical insecticides which are active against a broad spectrum of insects led to many ecological problems. Chemicals are to be used judiciously which serve as a major tool in pest management. Currently a new group of chemical compounds are being tested against lepidopteran pests. These are called moult accelerating compound (MAC) (Santharam and Kumar, 1998).RH-2485 (Methoxy fenocide 20F) is a molt accelerating compound and provides effective control of a wide range of key lepidopteran insects. It acts as an ecdysone agonist. The chemical upon absorption into the haemolymph of the insect, binds to the ecdysone receptor which initiates the moulting process. As the normal process disrupted, the insects prevented from shedding its old cuticle. The larvae die of dehydration and starvation within 2-5 days. Hence the toxicity tests were conducted for *Helicoverpa armigera* (Hub) to fix the LD_{50}.

MATERIALS AND METHODS

Bouquet method was followed for the experiment. The chickpea plants were raised in the pots and shoots with five compound leaves were taken and washed thoroughly in running tap water. The terminal leaves of the shoots were removed and these shoots were surface sterilized in 0.05 per cent sodium hypochlorite, rinsed in sterile water and shade dried. These shoots were dipped in insecticides solution with teepol for about 30 secs and the excess fluid was removed by jerking uniformly thrice. The petioles of the shoots were kept immersed in water taken in penicillin vials and shade dried. Starved larvae of first, second, third and four nyaphal instar were allowed to feed on the treated shoots for 24hrs and then transferred to penicillin vials containing semi-synthetic diet and plugged with sterile cotton. Mortality counts were taken after 24hrs for 5 days. Log-Dose probit mortality was worked out.

RESULTS AND DISCUSSION

Impact of RH - 2485 on the LD_{50}, lower and upper fiducial limits on *H. armigera* is presented in Table 1.The LD_{50} of molt accelerating hormone RH-2485 estimated by Bouquet method was 7.68 ppm for I instar larvae while the upper and lower fiducial limits was 9.11 and 6.47 respectively. The LD_{50} for II instar larvae was 15.95 ppm and the upper and lower fiducial limits were 18.97 and 13.42 respectively. Similarly the LD_{50} for III and IV instar larvae of *H. armigera* are 92.93 and 142.16 ppm. while the upper and lower fiducial limits were 128.38, 67.27 and 185.64, 108.87 respectively. It was found that the earlier instar was found to be more susceptible with lesser LD-$_{50}$ values and as the instar advances the values of LD_{50} was found to be more toxic to the various instars of *H. armigera* (Table 1).

Table 1. Impact of RH- 2485 on LD_{50} values of I, II, III, IV instar larvae of *H. armigera.*

Instars	LD_{50}	Fiducial limits		y=a+bx	Chi^2 at P=0.05
		UL	LL		
I	7.68	9.11	6.47	Y= 1.40+4.06x	2.05
II	15.95	18.97	13.42	Y= 7.82+4.09x	1.10
III	92.93	128.38	67.27	Y= 1.09+1.98x	1.98
IV	142.16	185.64	108.87	Y= 0.34+2.16x	0.98

Adamczyk *et.al* (1999) indicated that the recommended and experimental insecticides chlorfenapyr, methoxy fenozide, spinosad, and tebufenozide are effective in controlling early fall armyworm instars on cotton if larvae come in contact with these insecticides. *Carlson et al.* (2000) stated that methoxyfenozide exhibits high insecticidal efficacy against a wide range of important caterpillar pests, including many members of the family Pyralidae, Pieridae, Tortricidae and Noctuidae. It is most effective when ingested by the target caterpillar, but it also has some topical and ovicidal properties. It is modestly root systemic, but not significantly leaf-systemic. The results are in confirmity with the present findings.

Gore and Adamczyk (2004) indicated that beet armyworms, *Spodoptera exigua* (Hubner), were artificially selected in the laboratory for resistance to the insect growth regulator, methoxyfenozide. A field collected beet armyworm colony was separated into three cohorts that were independently selected with three concentrations (0.033 ppm, 0.064 ppm, and 0.125 ppm) of methoxyfenozide incorporated into a meridic diet. These concentrations corresponded closely with the LC_{10} (0.033 ppm), LC_{50} (0.072 ppm), and LC_{90} (0.161 ppm), respectively, for the original colony. They found that after seven generations of continuous exposure to methoxyfenozide, resistance in the colony selected at the low concentration did not increase significantly.

Pineda *et al.* (2007) reported that from the to LC_{50} values it was very clear that no significant differences were observed between the same age leaf residues of different application methods at 96 and 72 h after some ingestion treatment on neonates and fourth instars, respectively. Nevertheless, toxicity of methoxyfenozide decreased significantly after some time. Furthermore, larval weight of fourth instars fed for 48 h with pepper, *Capsicum annum* L., leaves containing methoxyfenozide was significantly suppressed. Spinosad and methoxyfenozide reduced the fecundity of *Spodoptera littoralis* adults in a dose-dependent manner when treated oral and residually. Likewise, when methoxyfenozide was administered orally in three different adult crosses, the fecundity was strongly affected, independently of the treated sex. It was concluded by Pinede *et al.* (2007) that the combination of lethal and sublethal effects of methoxy-fenozide and spinosad might exhibit significant effects on the population dynamics of *S .littoralis*.

REFERENCES

Adamczyk, J.J. Jr., Leonard, B.R. and Graves, J.B. 1999. Toxicity of selected insecticides to fall armyworms (Lepidoptera: Noctuidae) in laboratory bioassay studies. *Florida Entomologist,* **82** (2): 230-236.

Carlson, G.R., Dhadialla, T.S., Ricky Hunter., Jansson, R.H., Jany, C.S., Zev Lidert and Slawecki, R.A. 2000. The chemical and biological properties of methoxyfenozide, a new insecticidal ecdysteroid agonist. In a symposium "New chemists for crop protection" London, 19th June, 2000.

Gore,J. and Adamczyk, J.J. Jr. 2004. Laboratory selection for beet armyworm (Lepidoptera: Noctuidae) resistance to methoxyfenozide. *Florida Entomologist,* **87** (4):450-453.

Pineda, S., Marcela –Ines Schneider, Guy Smagghe, Ana-Mabel Martinez, Pedro Del estal, Lisa Vinuela, Javier Valle and Flor Budia.2007. Lethal and sublethal effects of methoxyfenozide and spinosad on *Spodoptera littoralis (*Lepidoptera: Noctuidae). *Journal of Econmic Entomology***, 100**(3): 773-780.

Santharam,G. and Kumar.K.1998. Moult accelerating compounds for the control of lepidopteran pests. In: National conference on "Biological and Biotechno logical remedies to environmental pollution" at vellore, Tamil Nadu, 5-6 **PP**.

K.Kumar[1*] and G.Santharam[2]

[1]Assistant Professor, Department of Entomology, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal-3, Union Teritary of Puducherry, India; [2] Professor, Department of Entomology, TamilNadu Agricultural University, Coimbatore-641 003,Tamil Nadu, India, * Corresponding author.