Research Paper :

Joint toxicity of organophosphates resistance along with the synthetic pyrethroids in *Helicoverpa armigera*

Y.T. JADHAV, R.V. KANASE AND D.P. BARKADE

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See end of the article for authors' affiliations

Correspondence to :
Y.T. JADHAV
Department of Entomology, Ratnai College of Agriculture, Akluj, SOLAPUR (M.S.) INDIA

SUMMARY

The study was conducted to find out a possible synergistic action by joint toxicity of organophosphate resistance with synthetic pyrethroids in *H.armigera*. The result indicated that profenofos with pyrethroids seemed to be very promising which could be well explored in the management of *H.armigera*, while chlorpyriphos and quninalphos with pyrethroids showed meagre level of resistance. The experimental data showed a very high level of resistance by monocrotophos with pyrethroids throughout the season.

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Key words : *Helicoverpa armigera*, Organophosphate, Resistance, Joint toxicity, Synthetic pyrethroids

H.armigera is polyphagus and cosmopolitan pest found to infest several economically important agricultural crops like cotton, sorghum, tomato, pigeonpea and chickpea, besides infesting other oil seeds, cereals and vegetable crops (Sachan, 1990). Kranthi *et al.* (1997) reported that the annual losses due to *H.armigera* inflicted to cotton and pulses in India alone were estimated to be of the order of US$ 300-500 million per annum.

In India, an intensive country wide resistance monitoring programme has demonstrated that pyrethroid resistance is now wide spread across the country showing significant levels of organophosphate resistance present in most of the population. (Kranthi *et al.*, 1996)

In the light of the above, the present study was undertaken to investigate the resistance effect of joint toxicity by using organophosphate compounds alongwith synthetic pyrethroids in *H.armigera* larvae.

MATERIALS AND METHODS

The laboratory study was carried out in the Department of Entomology during the academic year 2005-06 in Randomized Block Design. The eggs and larvae of *H.armigera* were collected weekly from various host plants from nearby farmer's field and the College farm. The collected eggs were disinfected with 0.02% sodium hypochlorite solution and then transferred into multicellular tray having chickpea based semi synthetic diet (Armes *et al.*, 1992). Later, the third instar larvae gaining weight of 30-40mg were individually placed in multicellular trays to avoid cannibalism. Such larvae at 1ul dose were treated on the dorsal prothorax region with Hamilton micro-applicator under a non-replicated trial using synthetic pyrethriods such as Cypermethrin 0.1ug were applied 15-20 minutes prior to different organophosphate insecticides as Quinalphos 0.75ug, Profenofos 0.1ug, Monocrotophos 1.0ug and Chlorpyriphos 1.0ug to obtain joint toxicity effect. Control treatment was carried out by applying larvae with acetone only. Relative humidity of 78$\pm$2 per cent, temperature of 27 $\pm$ 2^{0}C and photo period of approximately 13:11 Light : Dark hours regime was maintained throughout the rearing procedure. Mortality of larvae was observed after every 24 hrs upto 7 days. Corrected mortality was calculated by using Abbots (1925) formula. Later on using the per cent resistance formula, the joint toxicity effect of organophosphate resistance alongwith

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Table 1 : Frequencies of organophosphate resistance suppression with synthetic pyrethroids in *H.armigera*

Month	Per cent resistance of cypermethrin 0.1ug/larvae with			
	Quinalphos 0.75ug/larvae	Profenofos 0.1ug/larvae	Monocrotophos 1.0ug/larvae	Chlopyriphos 1.0ug/larvae
Aug.2005	12.92 (21.00)	0.0 (0.0)	19.43 (26.13)	1.87 (7.92)
Sep. 2005	1.92 (7.92)	0.0 (0.0)	22.71 (28.50)	2.85 (9.81)
Oct. 2005	11.31 (9.64)	0.0 (0.0)	6.19 (14.42)	9.09 (17.56)
Nov. 2005	0.24 (0.81)	0.0 (0.0)	8.96 (17.46)	1.02 (5.74)
Dec. 2005	12.54 (20.70)	0.0 (0.0)	10.38 (18.81)	7.26 (15.68)
Jan. 2006	14.77 (22.63)	0.0 (0.0)	9.39 (17.90)	1.67 (7.49)
Feb. 2006	7.29 (15.68)	0.0 (0.0)	8.71 (17.16)	7.44 (15.79)
Mar.2006	4.56 (12.39)	0.0 (0.0)	19.13 (25.92)	3.25 (10.47)

Figures in parenthesis are arc sin values

synthetic pyrethroids in *H.armigera* was calculated.

RESULTS AND DISCUSSION

Studies were undertaken to examine the organophosphate resistance alongwith synthetic pyrethroids in *H.armigera* occurring in the vicinity of Akola. The results indicated in Table 1 clearly imply that the synergism of Profenofos 0.1ug with synthetic pyrethroids such as Cypermethrin 0.1ug were promising showing cent per cent mortality, exhibiting no resistance throughout the season. However, fluctuating result were obtained by Quinalphos 0.75ug +Cypermethrin 0.1ug showing low resistance in between 0.24 to 4.56 per cent in the months of September, November and March while moderate resistance was obtained ranging in between 7.29 to 12.92 per cent in the remaining months on *H.armigera* larvae. Saxena *et al.* (1989) in similar study determined of the toxicity of insecticide and showed LC_{50} of cypermethrin (0.0167) and those of quinalphos (0.0122).

The per cent resistance suppression was the highest in monocrotophos 1.0ug + cypermethrin 0.1ug in the months of September (22.71%), August (19.43%) and March (19.13%) whereas, it was moderate in the remaining months ranging from 6.19 to 13.05 per cent. Somewhat low resistance suppression was obtained by Chlorpyriphos 1.0ug + cypermethrin 0.1ug in between 1.67 to 9.09 per cent throughout the season. These results are in conformity with the findings of Peter *et al.* (1997). Similar results were also obtained by Pawar and Mali (1997). They reported that combination of chlorpyriphos 0.08 + Cypermethrin 0.008 was more effective in controlling *H.armigera*.

In view of the above, it is summarized that *H.armigera* has developed substantial level of resistance in monocrotophos 1.0ug + cypermethrin 0.1ug which needs further investigation. Nevertheless the joint toxicity effect of profenofos 0.1ug + cypermethrin 0.1ug showed very good resistance suppression results which could be exploited for the management of *H.armigera*.

Authors' affiliations:
R.V. KANASE , Department of Plant Pathology, Ratnai College of Agriculture, Akluj, SOLAPUR (M.S.) INDIA
D.P. BARKADE, Department of Entomology, Ratnai College of Agriculture, Akluj, SOLAPUR (M.S.) INDIA

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