

## EFFICACY OF DIFFERENT INSECTICIDES AGAINST BOLLWORMS ON COTTON

Muhammad Aslam, Muhammad Razaq, Saher Rana and Muhammad Faheem

University College of Agriculture, Bahauddin Zakariya University, Multan.

email: aslamuca@yahoo.com

**Abstract:** Ten insecticides were tested under field conditions against *Earias insulana* (Boisd.) (spotted), *E. vitella* (Fab.) (spiny) and *Helicoverpa armigera* (Hub.) (American) bollworms at recommended doses during 2001. All the insecticides were effective against these pests up to 7 days after treatment (DAT). For spotted bollworms, Nighaban 20EC (Fenpropathrin) followed by Talstar 10EC (Bifenthrin) was most effective up to 3 DAT, whereas Nighaban 20EC (Fenpropathrin) followed by Confidor Supra 500EC (Imidacloprid + Betacyfluthrin) was most effective up to 7 DAT. Patriot 360SC (Chlorfenapyr) was least effective. For American bollworm, Patriot 360SC (Chlorfenapyr) followed by Taophos 25EC (Quinalphos) was most effective up to 3 DAT, whereas Larvin 80DF (Thiodicarb), Tracer 240SC (Spinosad) and Lorsban 40EC (Chlorpyrifos) were most effective up to 7 DAT. Vital 1.8EC (Abamectin) was least effective. So, Nighaban 20EC and Lorsban 40EC were the most effective for spotted bollworm and American bollworm, respectively.

**Keywords:** Control, *Earias* spp., *Gossypium hirsutum*, *Helicoverpa armigera*, Insecticides.

### INTRODUCTION

Cotton is the main cash crop in Pakistan, which accounts for 11.7% of value added in agriculture and about 2.9% of GDP [Anonymous 2003]. Pakistan is third largest cotton lint producer in the world after China and U.S.A. [Skorburg 2002]. Bollworms cause about 30 to 40% losses of yield of seed cotton [Haque 1991]. Among bollworms, American bollworm, *Helicoverpa armigera* (Hub.), spotted bollworm, *Earias insulana* (Boisd.) and spiny bollworm, *E. vietella* (Fab.) are important pests of cotton. Bollworms mainly feed on fruiting parts of cotton resulting in considerable losses both in quality and quantity [Ahmad 1980] and 20-60% damage to and a decrease in market value of fiber [Verma 1999]. American bollworm tunnels into small squares, terminal buds [Bohmalk *et al.* 2001] and large bolls from the base by leaving posterior half portion of the body outside the bolls [Munro 1987]. This may cause abnormal non-reproductive growth [Bohmalk *et al.* 2001]. The larvae of *Earias* spp. attack soft and growing tissues especially terminal bud of main stem, flower buds and bolls [Munro 1987], which ultimately shed [Atwal 1994].

To overcome the losses and to increase the yield, pesticides application is utmost important. In Pakistan during 2000-2001, about 16402 tons of pesticides were imported [Malik 2001] and about 70-80% of these were sprayed for controlling the cotton pests [Mohyuddin *et al.* 1997]. Previous investigation about the evaluation of different insecticides for the control of cotton bollworms were conducted by Patil *et al.* [1990], Talpur *et al.*

[1993], Ravi *et al.* [1997], Sherma *et al.* [1997], Akber and Hassan [1999], Naveed *et al.* [1999] and Allen *et al.* [2000].

It is important to compare the efficacy of insecticides against pests for effective pest management and to reduce the indiscriminate use of insecticides. Thus, the present study was conducted to evaluate different products available in the market for their efficacy against bollworms complex.

### **MATERIALS AND METHODS**

The study was conducted at research farm of the Central Cotton Research Institute (CCRI) Multan, during 2001. Eleven treatments including a control (Tables 1 and 2) were tested against *Earias* spp. and American bollworm (*H. armigera*) on cotton. The treatments were replicated three times in a Randomized Complete Block Design and the plot size was 25 x 15 m. The distance between the lines was 75 cm. The recommended doses of insecticides, using 100 liter of water, were sprayed against spotted and American bollworms on 8<sup>th</sup> August and 6<sup>th</sup> September, respectively. Five plants were selected randomly from each plot and larval population was counted by splitting or opening the infested flower buds, flowers and bolls 24 hours before and 3 and 7 days after treatment (DAT) and percent larval mortality was calculated.

Data collected were subjected to analysis of variance using MS Excel and LSD test at 5% level of significance was used for treatment means separation [Chaudhry and Kamal 1997].

### **RESULTS AND DISCUSSION**

#### **SPOTTED BOLLWORMS**

Percent mortality of spotted bollworms (*Earias* spp.) was higher in all treated plots (Table 1) than that in untreated plots at 3 and 7 days after treatment (DAT). On 3 DAT, the percent mortality in Nighaban 20 treated plots was highest, followed by Talstar 10. The percent mortality in Confidor Supra 500, Hostathion 40 and Duracron 40 was non-significantly different and lower than that in Talstar 10, but higher than that in other treatments. The percent mortality in Boxer 2.5, Vran 1.9, Leopard 2.5 and Deltaphos 360 treated plots was non-significantly different. The lowest percent mortality was observed in Patriot 360 treated plots. On 7 DAT, the highest percent mortality was observed in Confidor Supra 500 and Nighaban 20 treated plots having non-significant difference in percent mortality. Percent mortality in Talstar 10 treated plots was higher than that in Boxer 2.5 and Duracron 40 treated plots, having non-significant difference in percent mortality. In Hostathion 40 treated plots, the percent mortality was lower than that in Boxer 2.5 and Duracron 40, but higher than that in Leopard 2.5 treated plots. Percent mortality in Vran 1.9 treated plots was higher than that in Deltaphos 360 treated plots. The lowest percent mortality was observed in Patriot 360 treated plots.

**Table 1:** Percent mortality of *Earias spp.* on cotton 3 and 7 days after application of different insecticides\*.

Treatments		Dose (ml per acre)	Percent mortality	
Common Names	Trade Names		3 Days	7 Days
Lamdacyhaluthrin	Boxer 2.5EC	400	53.56 bc	59.30 bc
Imidacloprid + Betacyfluthrin	Confidor Supra 500EC	500	63.13 abc	75.00 a
Triazophos + Deltamethrin	Deltaphos 360EC	500	54.23 bc	43.13 de
Fenpropathrin	Nighaban 20EC	1000	71.23 a	78.16 a
Triazophos	Hostathion 40EC	1000	60.66 abc	57.10 bcd
Profenophos	Duracron 40EC	300	60.70 abc	58.36 bc
Chlorfenapyr	Patriot 360SC	330	51.50 c	38.83 e
Emamectin-benzoate	Vran 1.9EC	200	58.30 bc	50.00 cde
Bifenthrin	Talstar 10EC	250	64.50 ab	66.33 ab
Deltamethrin	Leopard 2.5EC	250	56.76 bc	53.56 bcde
Control	-	-	0.00 d	0.00 f

\* Means followed by similar letters are non-significantly different at P= 0.05; Pre-treatment population mean = 14 larvae per 25 plants.

The results concluded that percent mortality of spotted bollworms was higher in all treated plots as compared to untreated plots. Nighaban 20 was the most effective against spotted bollworms up to 7 DAT. This finding is in conformity with Talpur *et al.* [1993], who reported that Danitol gave 85.52% reduction of spotted bollworms at 3 DAT. Confidor Supra 500 was also effective against spotted bollworms at 7 DAT and had no quick knockdown effect. Hostathion 40 was moderately effective against spotted bollworms at 3 and 7 DAT. This finding is partially in conformity with Karimullah *et al.* [1986], who reported that Triazophos, Deltamethrin and Decamethrin gave effective control of *E. insulana* and *Pectinophora gossypiella*. Patriot 360 was the least effective against spotted bollworms. This result is similar to that of Akber and Hasan [1999], who concluded that Pirate was not effective against spotted bollworms at 3 and 7 DAT.

**Table 2:** Percent mortality of *Helicoverpa armigera* (Hub.) on cotton 3 and 7 days after application of different insecticides\*.

Treatment		Dose (ml or g per acre)	Percent mortality	
Common Names	Trade Names		3 Days	7 Days
Imidacloprid + Betacyfluthrin	Confidor Supra 500EC	500	55.87 ab	48.50 de
Triazophos + Deltamethrin	Deltaphos 360EC	700	59.40 ab	66.20 abc
Profenophos	Duracron 40EC	1000	45.63 bc	54.40 cd
Thiodicarb	Larvin 80DF	480	59.67 ab	77.33 a
Chlorfenapyr	Patriot 360SC	333	71.40 a	69.50 ab
Quinalphos	Taophos 25EC	1250	62.77 a	58.57 bcd
Spinosad	Tracer 240SC	100	59.50 ab	76.47 a
Abamectin	Vital 1.8EC	250	33.80 c	36.77 e
Emamectin-benzoate	Vran 1.9EC	200	55.87 ab	59.13 bcd
Chlorpyrifos	Lorsban 40EC	1000	63.33 a	76.40 a
Control	-	-	3.20 d	6.90 f

\* Means followed by similar letters are non-significantly different at P= 0.05; Pre-treatment population mean = 9.65 larvae per 25 plants.

## AMERICAN BOLLWORM

Percent mortality in all treated plots was higher than that in untreated plots at 3 and 7 DAT (Table 2). On 3 DAT, the highest percent mortality was observed in Lorsban 40, Patriot 360 and Taophos 25 treated plots which were non-significantly different. In Confidor Supra 500, Deltaphos

360, Larvin 80, Tracer 240 and Vran 1.9 treated plots, the percent mortality was non-significantly different, but higher than that in Duracron 40 treated plots. The lowest percent mortality was observed in Vital 1.8 treated plots. On 7 DAT, the highest percent mortality was observed in Larvin 80, Tracer 240 and Lorsban 40 treated plots, having non-significant difference in percent mortality. The percent mortality in Patriot 360 treated plots was higher than that in Deltaphos 360 treated plots. Percent mortality was non-significantly different in Taophos 25 and Vran 1.9 treated plots, but higher than that in Duracron 40 treated plots. The percent mortality in Confidor Supra 500 treated plots was lower than that in Duracron 40 treated plots. The lowest percent mortality was observed in Vital 1.8 treated plots.

These results concluded that all the insecticides were effective against American bollworm as compared to control up to 7 DAT. Lorsban 40 was the most effective treatment. This result is in conformity with Ravi *et al.* [1997], who concluded that Chlorpyrifos was effective against 1<sup>st</sup>, 3<sup>rd</sup> and 5<sup>th</sup> instars larvae of *H. armigera* when applied orally. Taophos 25 and Patriot 360 gave good control at 3 DAT and had knockdown effect against American bollworm. These findings agree with those of Sharma *et al.* [1997] and Naveed *et al.* [1999], who concluded that Quinalphos gave good control of American bollworm. Tracer 240 and Larvin 80 were effective at 7 DAT but had no quick knockdown effect. These findings are in conformity with Brickle *et al.* [1999], Allen *et al.* [2000] and Johnson *et al.* [2000], who concluded that Tracer, Larvin and Steward provided good control of American bollworm. Vran 1.9 and Deltaphos 360 were moderately effective against American bollworm. Vital 1.8EC was least effective against American bollworm. This finding is in conformity with Christie and Wright [1990], who concluded that Abamectin was not effective against American bollworm, which was due to metabolic resistance and reduced cuticle penetration.

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