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## Chemical Control of Cotton Bollworms

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### Abstract

Azodrin, Deltanete, Methaphos, Ripcord and Thiodan were sprayed with an interval of fifteen days. The results revealed that all the insecticides significantly reduced the bollworms infestation. Ripcord was found significantly more effective in reducing the infestation of bollworms followed by Methaphos, Deltanete, Azodrin and Thiodan. High doses of all insecticides gave better control of the pests than medium and low doses. However, all the tested insecticides at all the three doses were found significantly better than control.

### Introduction

Cotton (*Gossypium hirsutum* L.) is one of the important cash crop of Pakistan and is known as "silver fibre". It provides livelihood to millions of people at farms, ginning factories, textile and edible oil industries etc. It is a major source of foreign exchange earning. Cotton is, therefore, rightly called as the backbone of Pakistan's economy.

Rice *et al* (1973), Belli *et al* (1974), and Kavut (1974) obtained good control of *Pectinophora gossypiella* with the application of Monocrotophos (Azodrin).

Thiammial (1976) stated that the shedding of squares and bolls of cotton due to *Earias vitella* (F) in Indian State of Karnataka during 1971-73 was reduced by the application of Monocrotophos and Endosulfan.

Tajammal *et al.* (1979) found four synthetic Pyrethroid insecticides viz. Permethrin (Ambush), Decamethrin (Decis), Cypermethrin (Ripcord) and Fenvalerate (Sumicidin) effective against the major cotton insects in Pakistan. Endosulfan (Thiodan) was kept as standard insecticide. The insecticides were sprayed at 10 days intervals being the first application 38 days after sowing. These treatments also increased the yield of cotton. Pawar *et al* (1984, 1984a) and Shelks *et al.* (1986) found Cypermethrin as the most effective insecticide for the control of *Heliothis armigera*, *Earias insulana* and *Pectinophora gossypiella* on cotton in India.

Since the bollworms are adversely affecting cotton production due to their notorious nature, the present study was initiated to find out the most effective insecticide and its appropriate dose for the control of these pests.

### Materials and Methods

Chemical control trial against bollworms was conducted at the Agricultural Farm, Faculty of Agriculture, Gomal University, D.I.Khan.

For this purpose, an early variety of cotton NIAB-78 was sown in the first week of June, 1991. There were five treatments each having three different doses in comparison with control. All the treatments were replicated three times. Sub-plot size was kept 3.0 X 2.25 m. the experiment was conducted in two factors, factorial arrangement with randomized complete block design. Row to row and plant

to plant distance was kept 75 and 30 cm respectively. Three seeds/hill were sown. After germination thinning was done to leave one seedling/hill. Recommended doses of fertilizers were applied with first irrigation to the crop. The following insecticides having three different doses in comparison with control were sprayed on two different dates i.e. September 15, 1991 and October 1, 1991.

Name of Insecticide		Dose/Acre (mm)
Azodrin 40 EC (Monocrotophos)	Low	600
	Medium	800
	High	1000
Deltanete 400 EC (Furathiocarb)	Low	200
	Medium	250
	High	300
Methaphos (Mathamidophos)	Low	300
	Medium	400
	High	500
Ripcord 10 EC (Cypermethrin)	Low	200
	Medium	250
	High	300
Thiodan 35 EC (Endosulfan)	Low	750
	Medium	1000
	High	1250

The insecticides were sprayed with knapsack sprayer. Effectiveness of the insecticides was based on the percentage infestation of bollworms, which was recorded after 48 hours, and one week after insecticides application. Yield data of all the treatments were also recorded. The data obtained was analyzed by using the above mentioned statistical design and the significance difference between the means was determined by using DMR tests.

### Results and Discussion

The results of chemical control trial conducted against cotton bollworms are presented in Table 1.

#### First spray

**After 48 hours:** Data recorded after 48 hours of insecticide application reveal that all of the insecticides applied at three concentration gave highest per cent mortality of bollworms and differed significantly from control at

cent level of probability.

Ripcord was on the top by giving 100 per cent mortality in both the medium and high doses. Similarly Deltanete and Methaphos gave 100 per cent mortality only at high dose. Thiodan did not perform a good job in the control of bollworms, particularly when applied at lower doses, though found significantly better than the control (untreated). The results clearly indicate that all the insecticides when applied at high doses gave maximum percent mortality. The insecticides when used at medium doses gave satisfactory control of the test insects as compared to low dose. However, maximum infestation of bollworms was observed at low doses compared to higher doses, though found significantly better than the untreated ones. No phytotoxicity was observed at high doses of the insecticides.

**After 72 hours:** The data reveals that the insecticides varied differently with various doses in terms of bollworms control. Ripcord out-classed the rest of treatments when applied at all the three doses, with lowest per cent infestation of bollworms, followed by Methaphos. Thiodan was found less effective against the bollworms followed by Azodrin and Deltanete. The performance of all the insecticides at low doses was poor, though differed significantly from the control at 1 per cent level of probability. Maximum infestation was recorded in the untreated (control) plot.

**After one week:** Perusal of the data recorded after one week of insecticides application shows that effect of insecticides and their doses against the bollworms infestation of cotton differed significantly from one another and also from the untreated (control) plot at 1 per cent level of probability. Methaphos gave excellent performance when applied at high dose as compared to the rest of treatments. It was followed by Ripcord and Deltanete at high doses which were also found significantly different from one another at 1 per cent level of probability. Keeping in view the over all performance of Ripcord when applied at all the three doses was found satisfactory in decreasing the infestation of bollworms. The maximum infestation was recorded in the untreated (control) plots. The data clearly indicates that all the insecticides in all the three doses had lost their residual effect, as high percent infestation of bollworms was recorded after one week of their application.

#### Second Spray

**After 48 hours:** Data recorded after 48 hours of insecticides application reveals that all the insecticides at low, medium and high doses reduced the pest infestation. Ripcord at both medium and high doses gave 100 per cent mortality. Similarly no infestation was recorded in plots sprayed with Methaphos and Deltanete at high doses. In second application like first one, Thiodan did not give good performance in the control of test insects. Ripcord

performance was found most satisfactory followed by Methaphos, Deltanete and Azodrin. Statistically all of these insecticides were found significantly different from each other and also from the control at 1 per cent level of probability.

**After 72 hours:** The effect of different insecticides i.e. Azodrin, Deltanete, Methaphos and Thiodan after 72 hours in low, medium and high doses on cotton bollworms infestation reveals that all the insecticides when applied at low, medium and high doses significantly reduced the pest population.

The results clearly indicate that highest per cent infestation was observed in the plots sprayed with low dose of insecticides and lowest per cent infestation was recorded in the plots treated with high dose of insecticides. Ripcord was on the top by giving 0.00, 4.99 per cent infestation of bollworms at its high and medium dose, followed by Methaphos giving 1.97, 8.91 per cent infestation at high and medium doses respectively.

Ripcord performed a good job in the control of bollworms followed by Methaphos, Deltanete, Azodrin and Thiodan. All of these insecticides were found significantly different from each others in their effectiveness against bollworms at 1 per cent level of probability. Over all performance of all the insecticides at all the three doses was significantly better than the control.

**After one week:** Data about the effectiveness of Ripcord, Deltanete, Methaphos, Azodrin and Thiodan sprayed in low, medium and high doses after one week for the control of bollworms indicates that highest percent infestation of bollworms 29.71 was observed in the plots sprayed with Thiodan at its low doses. Ripcord on the other hand gave lowest per cent infestation of the pests 6.76 per cent, particularly when it was applied at its high dose.

At low dose the percent infestation in all the treatments was high as compared to medium and high doses of insecticides but were found significantly better than untreated control plots. Lowest per cent infestation was observed in plots treated with Ripcord. All of the insecticides were found significantly different from each other at 1 % level of probability in the control of bollworms infestation at all the three doses. The data also reveals that the over all infestation of bollworms was high after one week of insecticides application.

**Effect of insecticides on the yield of cotton:** The effect of insecticides on crop yield was evaluated and are given in the Table 2. The results reveal that all of the insecticides at all three doses gave significantly different yield from each others at 1 per cent level of probability. The data shows that all the insecticides in all doses gave significantly higher yield compared to the check (untreated plots). Ripcord gave significantly highest yield of cotton, followed by Methaphos, Deltanete, Azodrin and Thiodan. Plots treated

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Table 1: Comparison of mean values of percent infestation of bollworms on cotton treated with different doses insecticides.

Insecticides	Dose	First Spray			Second spray		
		48 hours	72 hours	One week	48 hours	72 hours	One week
Azodrin 40 EC	D1	11.30 D	18.46 G	29.14 G	13.59 F	18.05 G	24.80
	D2	08.69 DE	15.35 H	23.87 I	08.70 HI	15.71 I	22.46
	D3	01.76 GH	09.65 L	19.57 N	04.07 K	13.36 M	14.83
	D0	36.06 A	42.75 D	57.91 E	32.00 D	56.95 A	62.03
Mean		14.45 AB	21.55 B	32.62 B	14.59 B	26.02 B	31.03
Deltanete 400 EC	D1	09.01 DE	12.56 J	21.00 J	11.71 G	15.14 J	21.00
	D2	08.24 FG	12.54 J	20.55 K	06.26 J	12.53 N	18.80
	D3	00.00 H	04.74 P	11.75 R	00.00 M	06.98 Q	11.58
	D0	31.86 B	41.20 E	72.42 D	36.21 B	54.83 C	75.03
Mean		12.28 BC	17.76 C	31.43 C	13.55 C	22.37 C	31.68
Methaphos	D1	04.32 FG	08.15 M	20.15 M	07.95 I	13.62 L	19.56
	D2	01.97 GH	06.01 N	17.79 O	04.31 K	08.91 P	13.42
	D3	00.00 H	02.09 R	09.33 T	00.00 M	01.97 S	08.92
	D0	36.11 A	51.85 A	77.29 A	38.65 A	54.95 B	74.46
Mean		10.60 C	17.20 D	31.15 D	12.48 D	19.86 D	29.09
Ripcord 10 EC	D1	01.76 GH	05.59 O	17.19 P	01.76 L	09.08 O	14.46
	D2	00.00 H	04.23 Q	15.07 Q	00.00 M	04.99 R	09.76
	D3	00.00 H	01.86 S	11.09 S	00.00 M	00.00 T	06.76
	D0	34.72 AB	44.44 B	75.00 C	34.72 C	53.83 D	78.38
Mean		09.12 C	14.03 E	29.59 E	09.12 E	16.98 E	27.34
Thiodan 35 EC	D1	16.43 C	22.54 F	33.41 F	17.41 E	22.20 F	29.71
	D2	10.03 DE	14.31 I	24.51 H	12.41 G	13.95 K	23.77
	D3	07.26 EF	11.01 K	20.26 L	09.43 H	16.30 H	22.69
	D0	36.05 A	43.87 C	75.13 B	35.04 C	52.72 E	75.13
Mean		17.44 A	22.93 A	38.33 A	18.57 A	26.29 A	37.83

Table 2. Effect of insecticides on the yield (kg/ha) of cotton.

Insecticides	D1	D2	D3	D4	Mean
Azodrin 40 EC	1237 g	1277 fg	1296 fg	804.9 i	1153.3
Deltanete 400EC	1356 ef	1385 e	1405 e	805.4 i	1237.7
Methaphos	1662 d	1689 cd	1765 abc	787.7 i	1475.7
Ripcord 10 EC	1733 bcd	1798 ab	1832 a	790.1 i	1538.2
Thiodan 35 EC	1121 h	1143 h	1279 fg	775.3 i	1079.4
Mean	1515.33 a	1458.27b	1421.72c	792.69	

Means followed by different letter are significantly differ from each other at 1% level of probability.

D1 = Low dose; D2 = Medium dose; D3 = High dose; D0 = Control

with high doses of insecticides gave highest yield as compared to medium and low doses. Ripcord at high dose gave significantly higher yield followed by medium dose of the same insecticide and high dose of Methaphos.

It can be concluded that Ripcord out classed the rest of the treatments followed by Methaphos, Deltanete, Azodrin and Thiodan in their effectiveness on the basis of seed cotton yield. These results are in agreement to the findings of Tajammal *et al.* (1979) in respect of increase in the yield due to insecticides effect.

**Over all effectiveness of insecticides:** The data of over all

effectiveness of insecticides upto one week of the applications indicates that Ripcord, Methaphos gave best results in decreasing the infestation of bollworms, followed by Deltanete, Azodrin and Thiodan as compared to control plots in both applications.

However, the over all effectiveness of different doses of insecticides reveal that high doses were more effective than medium and low doses in decreasing the pest infestation. While the medium doses of insecticides were found to be significantly better than low doses. These results are in agreement to the finding of Pawar *et al.* (1984, 1986) and Shelks *et al.* (1986).

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