ASSESSMENT OF DIFFERENT CHEMICAL INSECTICIDES AGAINST BUDWORM (*Helicoverpa armigera* L.) ON TOBACCO (*Nicotiana tabaccum* L.)

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Abstract

The present research study was carried out at Tobacco Research Station, Khan Ghari, Mardan (34.20°N, 72.05°E) Khyber Pakhtunkhwa-Pakistan during 2004 to assess the efficacy of different chemical insecticides against budworm, *Helicoverpa armigera* L. (Lepidoptera: Noctuidae) on tobacco (*Nicotiana tobaccum* L.). Flue Cured Virginia (FCV) tobacco was sown as test crop and six different chemical insecticides viz, Imidachloprid WG70, Thiamethaxan 25WG, Methamedophos 50 SCW, Deltamethrin+Triazophos 350+10EC, Spinosad 240 SC, Lannate 20 EC and un-treated control plot were tested against *Helicoverpa armigera* associated with tobacco. When the infestation of budworm reached economic threshold level i.e. 10 percent damage on plant leaves, spray material of different treatments were evaluated. Data on mean plants damaged by *Helicoverpa* were recorded 24h before application of spray and then 24h, 48h, 72h, 96h and 168h after application of first and second spray. The infestation of *H. armigera* was significantly controlled by application of tracer and methomyl. Highest damage by *H. armigera* was recorded in confidor and actara treated plots.

Introduction

Tobacco belongs to the Family Solanaceae, an important cash crop of Khyber Pakhtnkhwa, Pakistan. It is widely grown in Peshawar, Mardan, Buner, Charsadda, Swabi, Swat and Hazara districts. Two species of tobacco, *Nicotiana tabacum* L. and *N. rustica* L. are mainly grown in these tobacco-growing regions of Khyber Pakhtunkhwa (Ali, 1986). Tobacco crop is damaged by a number of insect pests, which includes mainly different species of cutworm, *Agrotis ipsilon*, *A. segetum* and *A. flammatra* (Lepidoptera: Noctuidae), budworm, *Helicoverpa armigera* (Lepidoptera: Noctuidae) and aphid, *Myzus persicae* and *Aphis tabaci* (Homoptera: Aphididae). These pests adversely affect the crop growth and yield as well. Attack of these Insect pests starts right from the nursery and continues till maturity of the crop. In Mardan district, tobacco crop is principally damaged by *H. armigera* (Ali, 1976; Kuttalam, 2008). *H. armigera* larvae are tiny, rust-colored to pale green and stripped that eat into the buds or unfolded leaves of tobacco as the plant begins to top. If the holes are made in the tips of the buds, the leaves that expand from the buds are often ragged and distorted. If the tiny larvae penetrate the unfolded leaves, the leaves will have unsightly holes when they are fully expanded. The attack on the buds renders the leaves unfit for cigar wrappers and greatly cuts the price. The larvae of the second generation eat into the seedpod and on the suckers (Hussain *et al.,* 1979). Cutworm (*A. ipsilon*) damaged the tobacco crop up to 9% while budworm (*H. armigera*) inflicted losses up to 11.35% in tobacco fields, (Aslam *et al.,* 1982; Patil, 1977). Lannate 90 WP and Tamaran 50 EC proved to be the most effective insecticides for the control of budworm. A number of insecticides have been used for the control of *H. armigera* (Vasudevan & Baskaran, 1981). However, still huge losses to tobacco crop occur due to heavy infestation of this pest (Brickle *et al.,* 2001).

Keeping in view the economic importance of tobacco by generating major share of revenue in the province of Khyber Pakhtunkhwa, the present research project was therefore, initiated with the objectives to determine relative efficacy of different chemical insecticides against *H. armigera* and to find out the most effective treatment among different chemicals for the efficient control of budworm on tobacco.

Materials and Methods

The present experiments on "Efficacy of different chemical insecticides on budworm *Helicoverpa armigera* L. on tobacco (*Nicotiana tabacum L.*)" were carried out at Tobacco Research Station, Khan Ghari, Mardan. Tobacco (FCV) was grown as a test cop on a well-prepared seedbed. The seedlings were transplanted in the last week of March. Standard agronomic practices were followed in seedbed preparation and during seedling transplantation. The experiment was laid out in Randomized Complete Block (RCB) Design with four

replications. There were seven treatments, including control in each replication with three rows per treatment. Plant-to-plant and row-to-row distance was kept 60 cm and 90 cm, respectively. There were 30 plants per treatment (10 plants/ row). The size of each treatment was 3 x 5.40 m^2. In the control treatment, fresh tap water was sprayed on the crop. First spray of insecticides was applied on first week of May and the second spray was applied on 3rd week of May (After two week of the first spray) whenever the population level of budworm reached to economic threshold level (ETL). Spray materials were applied with the help of knapsack sprayer. The insecticides applied according to the recommended rates were as follow.

- T1 = Imidachloprid WG70 (Confidor)
- T2 = Thiamethaxan 25WG ((Actara)
- T3 = Methamedophos 50 SCW (Sundaphos)
- T4 = Deltamethrin+Triazophos 350+10EC (Deltaphos)
- T5 = Spinosad 240 SC (Tracer)
- T6 = Lannate 20 EC (Methomyl)
- T7 = Un-treated check plot

The data were regularly recorded during the course of experimentation on the following parameters.

(a) Percent plants damaged by *H. armigera*: The number of damaged plants by *H. armigera* in each treatment was counted one by one after 24, 48, 72 and 168 hours of insecticides application and subsequently converted into percent damaged plants by using below-mentioned formula

$$\text{Percent damaged plants} = \frac{Number\ of\ damaged\ plants}{Total\ number\ of\ plants} \times 100$$

(b) Statistical Analysis: The data for mean plants damaged by budworms were analyzed according to appropriate statistical procedure for RCB design using F-test and the means were separated by using LSD test, as outlined by Steel and Torrie (1984).

Results and Discussion

Plants damaged by *Helicoverpa armigera*

First spray: It was revealed that 24 hours before application of spray and then 24h after application of spray materials, there were no significant differences among the different insecticides against *H. armigera*. However, 24h after spray it was found that maximum mean plant damage of 4.16% were recorded with confidor, while minimum damaged plants (2.50%) were observed on test-plots treated by with tracer (Table 1). Control plots were found with average damaged plants of 3.33%.

Table 1. Plants damaged by *H. armigera* after application of first chemical spray in tobacco field during 2011.

Treatments	24 HBS	24 HAS	48 HAS	72 HAS	96 HAS	168 HAS
Actara	0.75 a	3.33 a	4.16 a	5.83 ab	6.66 ab	7.50 bc
Sundaphos	0.75 a	3.33 a	4.16 a	5.00 abc	5.00 bc	5.83 bcd
Methomyl	0.75 a	2.50 a	2.50 a	3.33 bc	3.33 c	3.33 d
Confidor	1.00 a	4.16 a	5.00 a	5.83 ab	7.50 ab	8.33 ab
Tracer	0.75 a	2.50 a	2.50 a	2.50 c	3.33 c	3.33 d
Deltaphos	0.50 a	2.50 a	2.50 a	4.16 bc	5.00 bc	5.00 cd
Control	0.75 a	3.33 a	5.00 a	7.50 a	9.16 a	10.83 a

Key to abbreviations: HBS= Hours before spray, HAS= Hours after sprays
Means followed by the same letters are not significantly different at 5% level of significance.

48h after insecticide application, maximum mean percent damaged plants (5.00%) were recorded in confidor treated plot, while minimum mean percent damaged plants (2.50%) with tracer. In the control treatment it was 5.00%. 72h after chemical spray, significantly higher plant damage of 5.83% was counted in actara and confidor treated plots, which was followed by 5.00% with sundaphos, while minimum damage of 2.50 %plants with tracer. Plant damage was 3.33% in methomyl and 4.16% in deltaphos treated plots. In the control treatment it was 7.50%. Data recorded after 96h of chemical application showed that percent damage plants were significantly higher (7.50%) in confidor treated plots, which was followed by 6.66% in actara and 5% in sundaphos treated plots. Lower damaged plants of 3.33% plants were recorded in tracer, methomyl and in

sundaphos treated plots. In the control treatment damage was 9.16%. 168h after first chemical spray, mean plant damage was significantly higher 2.50 per 30 plants in confidor treated plots, which was followed by 7.50% actara and 5.83% in sundaphos treated plots. Lower mean plant damage of 3.33% was observed in tracer and methomyl treatments. In the control treatment, it was 10.83 damaged plants.

Table 2. Plants damaged by *H. armigera* after application of second chemical spray in tobacco field during 2011.

Treatments	24 HBS	24 HAS	48 HAS	72 HAS	96 HAS	168 HAS
Actara	3.00 b	10.83 bc	11.66 bc	12.5 ab	14.16 b	16.66 b
Sundaphos	2.50 bc	9.16 cd	9.16 cd	10.0 bc	10.83 a	11.66 c
Methomyl	1.25 de	5.00 ef	5.00 ef	5.00 c	5.00 d	5.00 d
Confidor	3.25 ab	12.5 ab	13.33 b	14.16 ab	16.66 b	18.33 b
Tracer	1.00 e	3.33 f	4.16 f	9.16 bc	4.16 d	4.16 d
Deltaphos	2.00 cd	6.66 de	7.5 de	8.33 bc	9.16 c	10.0 c
Control	4.00 a	15.0 a	16.66 a	17.5 a	20.0 a	23.33 a

Key to abbreviations: HBS= Hours before spray, HAS= Hours after sprays
Means followed by the same letters are not significantly different at 5% level of significance.

Second spray: The data recorded 24h after the second application of different insecticides showed maximum mean plant damage of 12.5% in confidor treatment, which was followed by 10.83% in actara and 9.16% in sundaphos treatments. Lower mean plant damage of 3.33% was counted in tracer treatment, 5.0% in methomyl and 6.66% in deltaphos treatments (Table 2). In the control treatment plant damage was 15%. 48h after insecticide application, maximum mean plant damage of 13.33% was recorded in confidor treatment, while in actara treatment it was 11.66% and in sundaphos treatment 9.16%. 4.16% damaged plants were found in tracer, 5% in methomyl, and 7.5% in deltaphos treatments. In the control treatment 16.66% damaged plants were recorded. 72 after second chemical spray higher number of 14.16% plants were found damaged in confidor treatment, which was followed by 12.5% in actara, 10.0% in sundaphos, 5.0% in methomyl, 9.16 in tracer and 8.33% in deltaphos treatments. In the control treatment, it was 17.5%. 96 of second spray the recorded data showed that significantly higher mean number of 16.66% damaged plants were found in confidor, 14.16%in actara, 10.83% in sundaphos, 4.16% in tracer, 5.00% in methomyl and 9.16% in deltaphos treatment. There were recorded 20% plants damaged in the control treatment. After 168h of the second insecticide application, significantly higher percentage of damage plants (18.33%) were found in confidor, 16.66% in actara, 11.66% in sundaphos, while lower mean number of 4.16% damaged plants in tracer, 5% in methomyl and 10% in deltaphos. In the control treatment, it was 23.33%.

In both the chemical sprays, the different insecticides tested for the control of *H. armigera*, methomyl (Lannate) and tracer (spinosad) gave significant control after 1, 2, 3, 4 and 7 days of insecticide application, as compared to other insecticides. Minimum control of *H. armigera* was recorded in confidor and actara treated plots. The results of the present experiments tally with the work of the following scientists. Johnson *et al*., (1997) conducted a field experiment in Arkansas, to evaluate the performance of some insecticides against *H. armigera.* According to their result *H. armigera* was controlled effectively with tracer. Allen *et al.*, (2000) tested different insecticides for the control of *H. armigera* in Arkansas in 2000. They concluded that larval damage was reduced following treatment with tracer. Kharboutti *et al*., (1999) conducted a field experiment on *H. armigera* in Monticello, U.S.A. According to their result tracer was found to be most effective treatment against this pest. Similar observation on *Helicovera* were also recorded by Brickle *et al.* (2001), Dandale *et al*., (2001), Prasad *et al*. (2001), Vikas (2007) and Gosalwad *et al*. (2009) and described that spinosad was the most effective treatments in term of budworm larvae suppression in cotton treated test-plots.

Conclusion and Recommendation: It can be concluded that insecticides, tracer and methomyl produced significant results in term of least infestation by *H. armigera* and significantly higher yield. Both insecticides may be successfully used for effective management of *H. armigera* on tobacco.

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