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Performance of different insecticides against tobacco cutworm, budworm and aphids

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Abstract

A field experiment was conducted to evaluate the effectiveness of different insecticide against tobacco pest complex in the tobacco research station mardan in 2015. Cypermethrine, Lambda cyhalothrin and Bifenthrin were used against tobacco cutworm (*Agrotis Ipsilon*), Emamectin benzoate, Methomyl and Indoxacarb against Budworm (*Helicoverpa armigera*), Imidacloprid, Acetamiprid and Spinocad against Aphids (*Myzus persicae*) using a Randomized completed\ block design. Each treatment was replicated thrice. Plant-to-plant and Row-to-row distance was 60cm and 90cm respectively. All the cultural practices including irrigation, hoeing and fertilization were kept uniform to all experimental units. Pesticides were applied just after the attack of cutworm and data were recorded after 24, 48 and 72 hours of the chemical application. Cypermethrin showed better results on controlling the cutworm population. Emamectin gives best result against budworm. Imidacloprid gives better result against aphids. The highest yield was obtained from Cypermethrin treated polt 3225.20kg/ha while lowest was obtained from Bifenthrin treated plot 2188.70kg/ha.

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Introduction

Tobacco (*Nicotiana tabacum*) belongs to family Solanaceae, which is an important family of many other vegetable. Tobacco has more than 70 species in which *Nicotiana rustica* is widely used for Commercial purpose (Bakht *et al*., 2013).

Main cultivating countries of tobacco are China, India, Brazil, USA, Indonesia, Argentina, Zimbabwe and Pakistan. Tobacco is cultivated in 125 countries, over 4 million hectares of land, a third of which is cultivated in China (Badshah, 2005). The area under tobacco crop in Pakistan in 2014 were 49.1 thousand hectares, while in 2014 the production of tobacco was 129.9 thousand tons (Statistical Survey of Pakistan, 2014). Though tobacco is grown on a vast area of Pakistan, but when it comes to quality, our tobacco is subscript and do not get good price in international market. A lot of factors are responsible for its low quality. Among these damages caused by insect pest and the pesticide used for their control are the severe constraints. Among the insect pest the most crucial are cutworms (*Agrotis ipsilon, A. segetum, A. flammatra*), budworms (*Helocoverpa armigera* (Lepidoptera: Noctuidae) and aphids (*Myzus persicae* and *Aphis tabaci*) (Homoptera: Aphididae).Tobacco budworm is also a crucial pest which adversely ingrains the crop production and yield (Sajjad *et al,* 2011).

The bud worm starts attack from nursery and continues till crop maturity. Budworm may cause 20 to 25 percent damage when present in huge number. Besides, tobacco budworms also cause damage to gram, cotton soybean and many other crop. Budworms attack generally start when the tobacco plant are 3 to 4 feet tall. The larva ruin the top portion of the plant while, the moth appear in the April and lay white or cream color eggs on the leaves after brooding the young larva begin feasting on the leaves. During maturation the larva may go from one plant to another while late in August the larva pupate in the top 4cm of the soil. There is three to four generation per year. Usually a single caterpillar can damage up to 12 leaves the insect attacks all portions and all growth stages of Tobacco (Atwal and Dhaliwal, 2009).

Cutworm is a polyphagus, pest which cause grievous and extensive damage to the tobacco crop from the nursery till harvest. In addition to tobacco the cutworms also damage and attack on wheat, Gram, maize, sugar beet and cabbages There were three species recorded on tobacco crop which cause great damage to the tobacco crop (*Agrotis ipsolon, Agrotis segetam and Agrotis flametra*) (Shakur *et al.,* 2007). Tobacco cutworms has complete metamorphic pest. Cutworms lay round shiny eggs white in color the eggs are piled up in 3-4 layers. Incubation take place in 2-3newly hatched larva have black spot on their body. The color of the larva changes as it goes to maturity casting off their old skin (Shakur *et al.,* 2007). The larval stage of cutworm is the most destructive stage of the insect pest the pest attack starts in March just after the transplantation and the pest feed mainly at night are in cloudy days. The pest damage the young plant by cutting the main stem above the soil surface, sometime, it may also attack individual leaves while during the day time cutworms hide under the soil at the root of attacked plant and vegetative debris they are crepuscular in nature and fend off sunlight. The field should be treated with recommended pesticide when 6 percent of the plants were damaged by the cutworms (Atwal, 2009).

There are two species of Aphids recorded which causes severe damage to tobacco crop both in nursery and in the field. These species are (1) *Aphis tabaci* (2) *Myzus persicae*. *M. persicae* cause damage to tobacco crop from sowing of nursery till crop maturity. Both nymphs and adults suck sap from the green parts of the plant in general, and from the leaves in particular. The growth of the young plants in the nursery is seriously retorted. As a result vigor of the plant is decreased, the leaves become curled up and deformed, chlorosis occurs and thus the leaves become vulnerable to the attack of the pathogen. (Mistrick and Clark, 1983). The life cycle passes through much generation and each generation lasting for about 8-9 days under favorable condition there are about 25 generation each year. (Cement *et al.,* 2000).

Keeping in view the economic importance of tobacco crop and damage caused by the mentioned pests, the

present research study was, therefore , designed to determine the relative efficacy of different chemical pesticide against *Agrotis ipsilon, Helcoverpa armigera, Myzus persicae* and effect of the these chemical on the yield of tobacco crop.

Materials and methods

Expermental Site

A field experiment on the efficacy of nine different insecticides for the control of cutworm, (*Agrotis ipsilon) (Lepidoptera: Noctuidae)* budworms *(Helicverpa armigera) and Aphids (Myzus persicae)* were conducted at the Tobacco Research Station of Pakistan Tobacco Board (Mardan) during the year 2014- 15.

Experimental Design

All the trials were laid out in Randomized Complete Block Design (RCBD). Tobacco cultivar Speight G.28 was sown in November and transplantation was done in the first week of March. Plant-to-plant and row-to-row distance were kept 60cm and 90cm respectively. All the agronomical practices were undertaken uniform to all experimental units.

Treatments

Insecticide i.e. Bifenthrin, Cypermethrin, Lambda cyhalothrin, Emamectin benzoate, Methomyl, Indoxacarb, Acetamiprid, Tracer and Imidacloprid were used for their effectiveness. Among each treatment there is a 1 meter buffer zone to avoid mixing of different pesticides with one another.

Data Collection

Pretreatment observation were collected before 24 hours of the pesticide application while post treatment observation were collected after 24, 48 and 72 after each application of pesticide.

Parameter

- Number of damage plants/total plants per treatment for cutworms.
- Number of damage plants/total plants per treatment for budworms.
- Number of aphids/leaf before and after the application of insecticide.
- Yield per plot were determined.
- Yield per hectare were evaluated.

Statistical Analysis

The recorded data were analyzed by using Statistics Package (Statistix Version 8.1). Mean were separated by using LSD test @ 0.05% Probability.

Results

Cutworm (Agrotis Ipsilon)

The result in table 1 indicates that maximum reduction in damage was given by Cypermethrin after 24 hours of the pesticide application the attack were reduced to 1.06% which was followed by lambda Chyalothrin 1.66% While Bifenthrin gave the least control 2.00% while damages in control plot reached at 5.66%.

After 48 hours of the insecticide application Cypermethrin showed significant result where, plant damage percentage was 0.33% by Lamba Cyhalothrin 2.66% and then Bifenthrin 3.68% plant damage population. The results were significantly different compared with the control plots where the damage increases to 6.00%.

While after 72 hours of the application of insecticides Cypermethrin achieved the best result of 0.66% followed by Lambda Cyhalothrin with 1.33% and Bifenthrin have 3.33% damage plants while the control plot have 6.67% damage plant the data indicates that with the passage of time the damage plant population in the control treatment increases.

Table 1. Effect of different insecticides against cutworm on tobacco plants.

No.	Treatment	Pre treatment observation	24 hour	48 hour	72 hour
T1	Cypermethrin	5.03a	1.06bc	0.33d	0.66c
T2	Lambda Cyhalothrin	5.17a	1.66c	2.66c	1.33c
T3	Bifenthrin	5.00a	2.00b	3.68b	3.33b
T4	Control	4.86a	5.66a	6.00a	6.67a
	Lsd		1.20	0.74	1.33

Mean followed by different letter are significantly different at 5% level of significance in each column

Budworm (Helcoverpa armegera)

In table 2 the result indicated that After 24 hour of the pesticide application, Emamectin benzoate shows best result and plant% damage was 4.66% followed by methomyl 6.66% while indoxacarb were 7.66% plant

damaged, while in control the% plant damage was 10.56%. After 48 hour of application of chemical the treatment indicates significant decrease in plant damage% Emamectin benzoate shows 3.33% plant damage followed by Methomyl treated plot 5.00%and indoxacarb 4.67% while pest population in control plot was 11.66%.

After 72 hour of the pesticides application Emamectin benzoate treated plot shows 1.66% plant damage followed by Methomyl and Indoxacrab with 4.66% and 5.66% plant damage respectively. In the control plot the plant damage% was increased with the passage of time and after 72 hours the plant damage was 11.67%.

Table 2. Effect of different insecticides against *Helicoverpa armigera* on Tobacco plant (percent reduction).

No.	Treatment	Post treatment observation	24 hour	48 hour	72 hour
T1	Emamectin Benzoate	10.00a	4.66c	3.33b	1.66c
T2	Methomyl	10.66a	6.66bc	5.00b	4.66b
T3	Indoxacarb	10.32a	7.66b	4.67b	5.66b
T4	Control	10.47a	10.56a	11.66a	11.67a
	Lsd		2.07	3.34	2.64

Mean followed by different letter are significantly different at 5% level of significance in each column.

Myzus persicae

Table 3 Shows that Pre treatment observation shows no statistical significance among them. However, after 24 hour of the insecticides application Acetamiprid was very efficient where the mean number of aphids population were 412.33 followed by Imidacloprid 501.33 while Spinocad 603.67 compared to the control plots 703.66 mean pest population.

After 48 hours the pest population reduces even further in Acetamiprid treated plot have 250.67 followed by Imidacloprid 368.33. Both of these two pesticides Acetamiprid and Imidacloprid were significant at this stage, There was no significant change in the number of pest population in control plot.

After 72 hours of the pesticide application the number of pest population Imidacloprid treated plot 112.33 whereas in Acetamiprid treated plot was only 67.33 At this stage Acetamiprid was more significant as compare with Imidacloprid, however these two pesticides were significantly different from Spinocad and control where the pest population increase even further.

Table 3. Effect of different chemical against Aphids population on Tobacco plant.

No.	Treatment	Pre treatment observation	24hrs	48 hrs	72 hrs
T1	Imidacloprid	706.76 a	501.33c	368.33c	112.33c
T2	Acetamiprid	706.24 a	412.33d	250.67d	67.33d
T3	Spinocad	698.33 a	603.67b	555.67b	670.33b
T4	Control	703.66 a	698.33a	713.00a	738.33a
	Lsd		5.12	31.16	25.79

Mean followed by different letter are significantly different at 5% level of significance in each column.

The result in the table 4 shows the effect of a different pesticide on the yield of tobacco. The data shows that the plot treated with Cypermethrine the highest yield of 16.20kg/plot and 3225.20kg/ha which was followed by Emamectin benzoate 15.46kg/plot and 3081.70kg/ha while the lowest yield was obtained from Bifenthrin treated plot 10.98kg/plot and 2188.68kg/ha while control gives the 9.78kg/plot and 1949.48kg/ha.

Table 4. Effect of different chemical on the yield of tobacco (Cutworm and Budworm trial).

Treatment	Yield/plot	Yield/ha
Cypermethrine	16.20kg	3225.20kg/ha
Lambda Cyhalothrin	12.59kg	2509.60kg/ha
Bifenthrin	10.98kg	2188.68kg/ha
Emamectin benzoate	15.46kg	3081.70kg/ha
Methomyl	13.23kg	2637.50kg/ha
Indoxacarb	14.34	2858.30kg/ha
Control	9.78kg	1949.48kg/ha

The result in the table 5 shows the effect of different insecticides on the yield of tobacco. The data shows that highest yield were obtained form Acetamiprid treated plot where the yield/plot were 17.78kg and 3139.50kg/ha which was followed by Imidacloprid where the yield was 14.55kg/plot and 2900.30kg/ha while control has lowest yield of 9.59kg/plot and 2093.50kg/ha.

Table 5. Effect of different insecticide on the yield of tobacco (Aphids trial).

Treatment	Yield/plot	Yield/ha
Imidacloprid	14.55kg	2900.30kg/ha
Acetamiprid	15.78kg	3139.50kg/ha
Spinocad	13.48kg	2687.10kg/ha
Control	9.59kg	2093.50kg/ha

Discussion

In the present research work, the effectiveness of different pesticides against three major pest of Tobacco was assessed in district Mardan during the crop season 2015. Also the effect of different insecticide on the yield of Tobacco was determined. Result of the efficacy of different pesticides shows that all the pesticides which were used were more or less effective in reducing the plant damage percentage. In the entire treated plot the pesticides significantly reduce the plant damage percentage as compare with the non-treated plot.

Cutworms

As is discernible from our result shows that Cypermethrin was proved to be more effective in controlling the Tobacco cutworm population which was followed by Lambda Cyhalothrin while Bifenthrin proved to be less effective against cutworm. Cypermethrin applied 625 $mlha^{-1}$ give best results against tobacco cutworm which reduce the plant damage% from 5.03 to 0.66. Our results are in accordance with the findings of Muzaffar *et al.* (2002). Similar Good results were also by Aziz (2004) and Martin *et al.* (1997). Ali and Munsif (2012) proved that Provido gives the best result with applied in recommended dose against tobacco cutwom.

Our result shows similarity with Iqbal *et al.* (1999) and Talpur *et al.* (2002). Martin *et al.* (2000) also proved that cypermethrin shows better result against tobacco cutworm. However the difference noticed may be due to the formulation of pesticides and the doses used while the cutworm species may also be different in some cases.

Budworm

In this trial insecticides Emamectin benzoate showed Statistically good result against budworm followed by Methomy and Indoxacarb. Emamectin benzoate reduces the plant damage% from 10.00% to 1.66% while Methomyl treated plot reduce the plant damage percentage from 10.66% to 4.89% while Indoxacarb applied plot the plant damage % was from 10.32% before the application of chemical and 5.66%. The result are somewhat similar with the findings of Ahmad *et al.* (2004) who shows that Indoxacarb give about 88% of control as compare the methomyl.

Our result are also somewhat similar with Karadjova (2001), Link *et al.* (2000) both shows that emamectin and methomyl gives better result against budworm. In the present study Steward proved to be less effective against tobacco budworm because the plant damage percentage was 5.66% after the 72 hours of the application of pesticide. These findings were dissimilar to those evaluated by Allen *et al.* (2002) and Leonard *et al.* (2003) because of the difference in the doses used and type of the pest.

Aphids

Among the different pesticides tested Acetamaprid and Imidacloprid gave highest pest reduction after 24, 48 and 72 hours as compare with tracer. Acetamaprid applied as a spray in recommended doses gives the best result with the reduction of pest population from 706.24 to 412.33, 250.67 and 67.33 no. of pest after 24,48 and 72 hours. Similar result have been reported by Anwar *et al.* (2008), Ligouri *et al.* (2002) and Syed *et al.* (2003) who declared Imidacloprid the most effective insecticide against *Myzus persicae*. Similarly Khan *et al.* (2015). shows that Imidacloprid and acetamaprid were effective against *Myzus persicae* In the present study Tracer showed to be less effective against aphids' similar result were obtained by Badshah *et al.* (2005) who announced that Tracer is least effective against Aphids. Link *et al.* (2000) and link *et al.* (2001) also proved that Acetamaprid was highly effective in controlling the aphids population by comparing it with acephate and endosulfan.

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