Effect of different insecticides on population rate of whitefly in Gossypium hirsutum L.

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Abstract: Cotton is one of the most valued crop of Pakistan. In Pakistan different insect pests are associated with this crop triggering 30-50% decline in yield of cotton. Whitefly is one of the most disastrous insect, which is responsible for devastation by secreting a sugary material on which sooty mold develop and photosynthetic area of leaves is shortened and become the source of viral disease transfer. To reduce the damage and deleterious effects caused by whitefly use of chemicals is very effective in controlling the population as compared to other control methods. An experiment was performed at Research area, University of Agriculture, Faisalabad, one cotton variety (Lalazar) were sown on 30th May 2018 using Randomized Complete Block Design. The research was initiated to determine the effect of three different insecticides imidacloprid (Confidor 20%SL), thiamethoxam (Actara 25%WG) and acetamiprid (Diamond 20%SP) at their recommended doses. Four treatments and also an untreated area (control) where no chemical was sprayed. The data was taken one day before spray and then after 1,3,5,7 and 15 days after spraying. Data was collected by means of Zig zag method. At the end of research data collected from field was analyzed and results showed that all treatments were efficient in dropping of the whitefly population. Highest mortality rates were observed on plots treated with Imidacloprid and other two insecticides Acetamiprid and thiamethoxam also showed significant results and almost same mortality rates.
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Key words: whitefly, cotton, insecticides

Introduction

Cotton (Gossypium spp.) is recognized as 'white gold' and it is also called the king of natural fibers.

Pakistan ranks 5th in world in terms of production. Environmental conditions have a great influence on different aspects of insects like population, development, survival, reproduction capacity and activity of pest. (Rasheed *et al*., 2007).

Among numerous aspects responsible for less output of cotton, insect pests are thought to be the devastating factor, which cause 30-40% losses in yield (Waheed et al., 2019). Whitefly sucks the cell sap from surface below the leaves. Through an idea or estimate there are more than 200 species including various insect pests which attack on cotton during its multiple stages (Asif et al.,2017).

Different types of sucking insect pests like Whitefly, jassid and thrips are enthusiastic in Pakistan and are the basic reason of extensive deterioration in yield. Whitefly a renowned vector of countless viral diseases transmission in vast variety of economic crops (Waheed et al., 2019).

In such condition application of the fresh chemistry molecules such as Neonicotinoids and Pyridincarboximide is suggested. These both molecules are used just in minute quantity and the main advantage is that these molecules are less harmful for environment and also economical and cheap. Neonicotnoids are thought to be much efficacious against sucking pests, it is reported that neonicotinoids are used repeatedly in cotton (Waheed et al., 2019).

After insecticide application whitefly population comes back soon because eggs and nymph expand at foliage's basement and on the lower surface of leaves (Zafar et al., 2018).). Whitefly secrets a sugary material known as honey dew, it suck the sap of cell and the area for photosynthesis is reduced due to which a black sooty mould occurs on the leaves which further lessens the yield, quality and also the worth of crop (Teshome et al., 2016).

Three insecticides are used in this research namely Acetamiprid, thiomethoxam and Imidacloprid. Imidacloprid is known as the first neonicotinoid used for the treatment of seed and also to protect the seedlings against numerous injuries experienced by the attack of initial seasonal insects (Harvey et al., 2017). Thiamethoxam is one of the chief 2nd generation neonicotinoid. It belongs to thianicotinyl which is the subclass of (nicotinoid) chemishtry (Zafar et al., 2017). Through the proper spraying method and techniques and by using at recommended rates, it can

be helpful in controlling vast variety of important insect pests on number of different crops including barley, wheat, cotton, sorghum, corn and canola. Chemical control of the pests is the only way to control the pests as compared to other methods. But there is a drawback that if these are used excessively not only causes the resistance in pests but also pollute ecosystem having hazardous effects (Abbas et al., 2016). The present investigations was undertaken to compare the ability of new molecules against whitefly infesting cotton. In Pakistan, the estimated worth of pesticides which is imported is almost 10 billion rupees and about 60-80% are used against cotton pests (Waheed et al., 2019) Such insecticides are of much importance in agriculture field because they shows a good action contrary to sucking insects (Imran et al., 2017). So there was necessity of using such insecticides which promotes populance reduction of whitefly but also safer for advantageous insects and other eco-friendly species and human beings.

Objectives:

The present study was carried out to justify the following objectives;

• Determines the usefulness of pesticides Acetamiprid, Imidacloprid and Thiamethoxam in contrast to extracting white flies.

• To equate the value of various currently used insecticides for control of whitefly, under field conditions on two cotton varities.

Materials and Methods

Experiment was conducted at Experimental Farm Square No.2, Block No.14 at University of Agriculture, Faisalabad. It was conducted to control the population of whitefly and mainly to evaluate the efficacy of different insecticides against cotton whitefly. **For experiment** the land was prepared well and by the proper instructions and guidance crop was sown on beds during the last week of May 2018. Cotton varieties FH-114 and Lalazar were used for the research purpose. In this experiment, there were three different insecticides which were used and applied at their recommended doses. The dose rates and name of insecticides are mentioned below. There was also a control treatment and on that area no insecticide was sprayed just to compare the efficiency of these insecticides. For spraying purpose, hand knap sack sprayer was used.

Insecticides

Common name	Trade name	Dose
Acetamiprid	Diamond 20%SP	125gm
Imidacloprid	Confidor 20%SL	250ml
Thiamethoxam	Actara 25%WG	24gm

Experimental Design

In this experiment Randomized Complete Block design was used followed with three replications.

Data collection

From each plot data was recorded in the morning, 24 hours before spray and then 1, 3, 7 & 15 days interval after the application of spray. After 15 days, test insecticides were repeated and application of the 2nd spray was done. For this purpose Zig zag method was used for pest scouting. In order to collect the data, Population was taken from top most leaf from the upper part of the first plant, second leaf from the middle part of the second plant, lower leaf of third plant and so on, from 6 plants.

Statistical Analysis

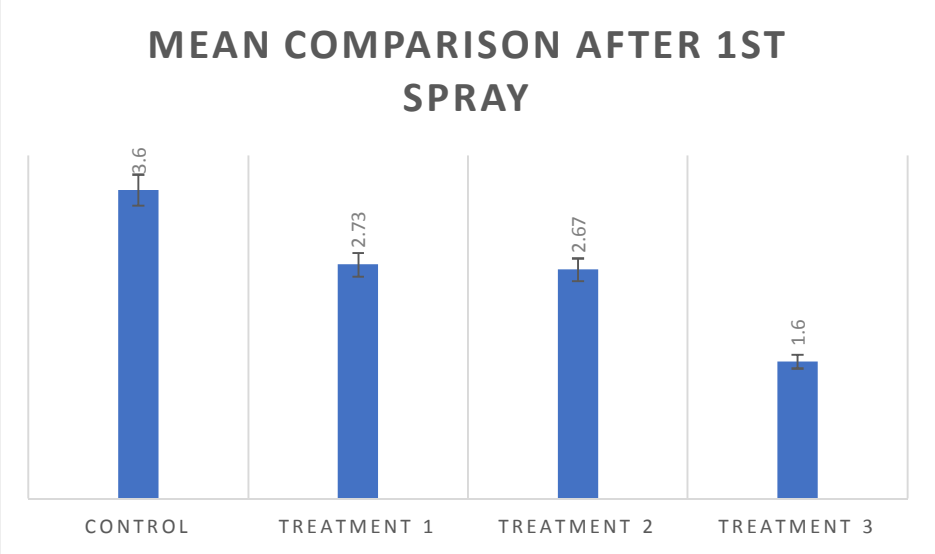
Data of population reduction was analyzed with ANOVA to know hypothesis testing and means were compared by post hoc comparison.

S-O-V	*Sum of squares*	*Degree of freedom*	*Mean S*	*F. cal*	*P-value*
Replicatio	79.19876	3	26.39959	1.873766	0.0234
Treatment	28.70135	2	14.35068	1.018569	0.0416
Error	84.53432	6	14.08905		
Total	192.4344	11			

Results and discussion

We contrast our outcome and the p-esteem if the p-esteem is under 0.05 it implies there is a noteworthy outcome. If the value is less than 0.01, at that point its mean the outcomes are exceptionally noteworthy. from the above anova table the p-esteem for the replication is 0.004 and for the treatment is 0.030 that are under 0.05 it implies our outcomes are critical. After doing comparison of 1st spray of 3 treatments, results showed that plots treated with Treatment 1 had 2.73 mean population of whitefly similarly Treatment 2 gave 2.67 and least population was observed on plots treated with Treatment 3 i.e Imidacloprid where population was 1.60.

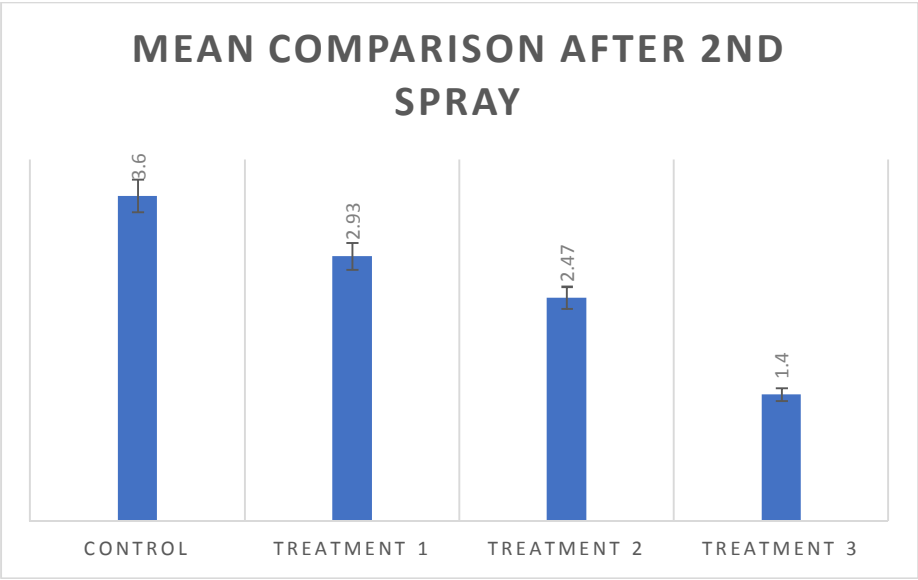
Groups	*Mean comparison*
Control	3.60a
Treatment 1	2.73c
Treatment 2	2.67ac
Treatment 3	1.60b



After doing comparison of 2nd spray of 3 treatments, results showed that plots treated with Treatment 1 had 2.97 mean population of whitefly similarly Treatment 2 gave 2.47 and least population was observed on plots treated with Treatment 3 i.e Imidacloprid where population was 1.40.

ANOVA					
S-O-V	*Sum of squares*	*Degree of freedom*	*Mean.S*	*F.cal*	*P-value*
Replication	71.51483	3	23.83828	2.401156	0.0166
Treatment	192.2905	2	96.14523	9.684413	0.0132
Error	59.567	6	9.927833		
Total	323.3723	11			

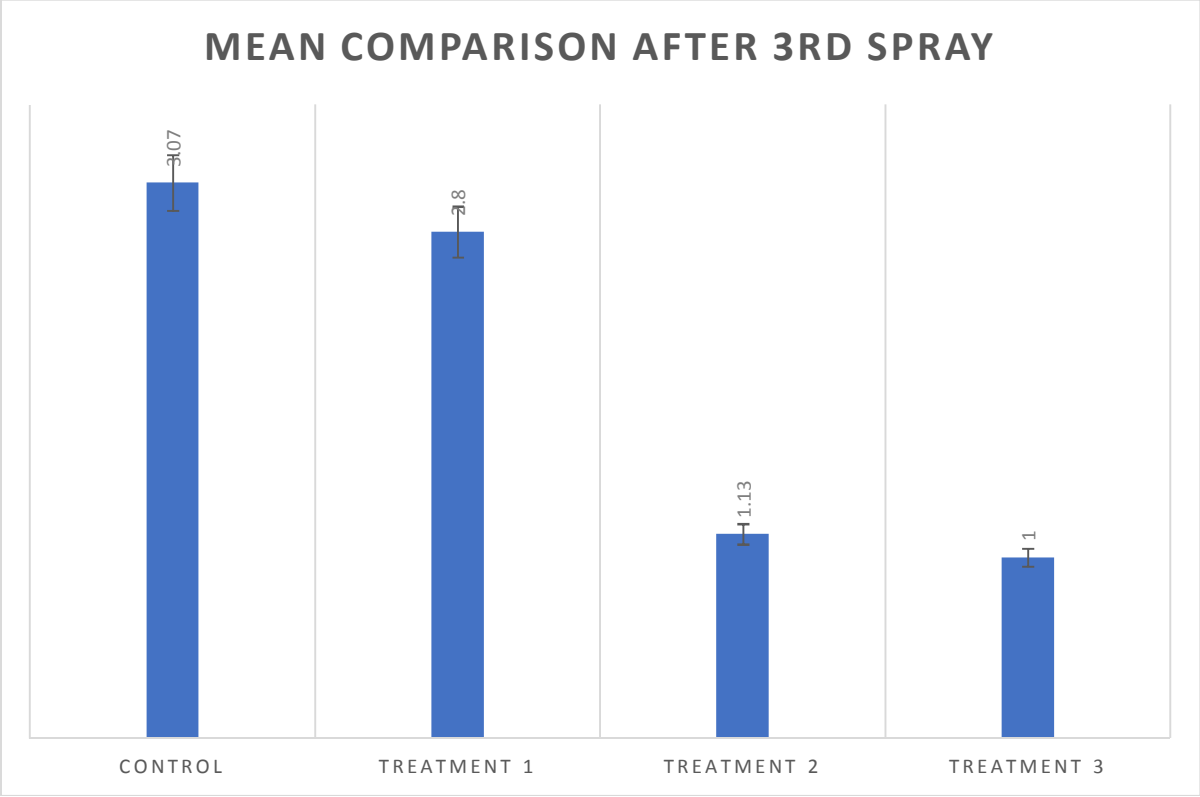
Groups	*Mean comparison*
Control	3.60b
Treatment 1	2.93c
Treatment 2	2.47bc
Treatment 3	1.40a



ANOVA					
S-O-V	*Sum of squares*	*Degree of freedom*	*Mean.S*	*F.cal*	*P-value*
Replication	611.0425	3	203.6808	10.16442	0.009
Treatment	170.5349	2	85.26743	4.255159	0.070
Error	120.2316	6	20.0386		
Total	901.809	11			

After doing comparison of 3rd spray of 3 treatments, results showed that plots treated with Treatment 1 had 2.80 mean population of whitefly similarly Treatment 2 gave 1.13 and least population was observed on plots treated with Treatment 3 i.e Imidacloprid where population was 1.00.

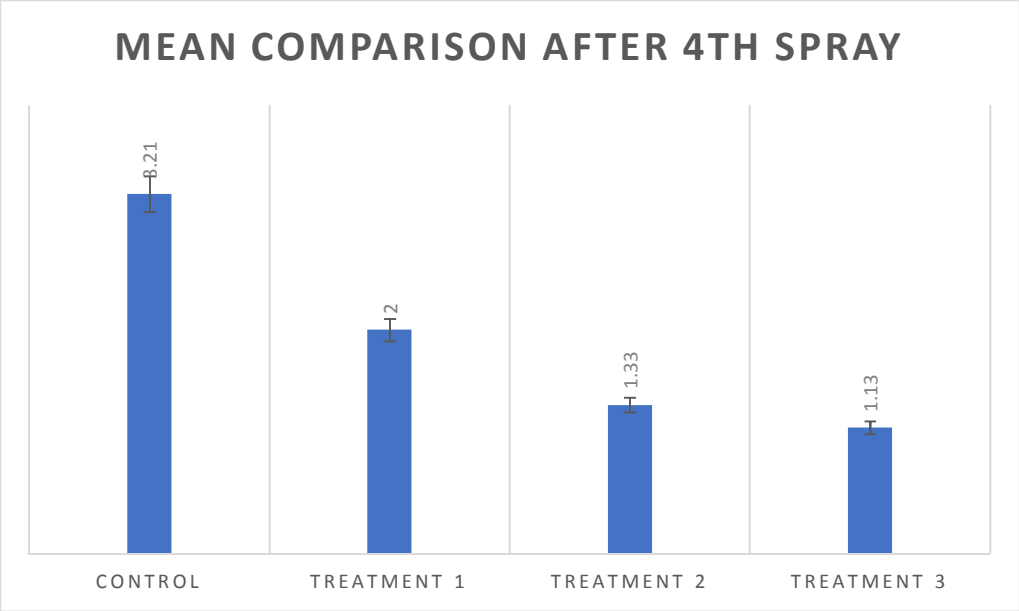
Groups	*Mean comparison*
Control	3.07a
Treatment 1	2.80ac
Treatment 2	1.13b
Treatment 3	1.00bc



ANOVA					
S-O-V	*Sum of squares*	*Degree of freedom*	*Mean.S*	*F.cal*	*P-value*
Replication	99.58333	3	33.19444	0.805799	0.004912
Treatment	46.16667	2	23.08333	0.560351	0.008254
Error	247.1667	6	41.19444		
Total	392.9167	11			

After doing comparison of 4th spray of 3 treatments, results showed that plots treated with Treatment 1 had 2.00 mean population of whitefly similarly Treatment 2 gave 1.33 and least population was observed on plots treated with Treatment 3 i.e Imidacloprid where population was 1.13.

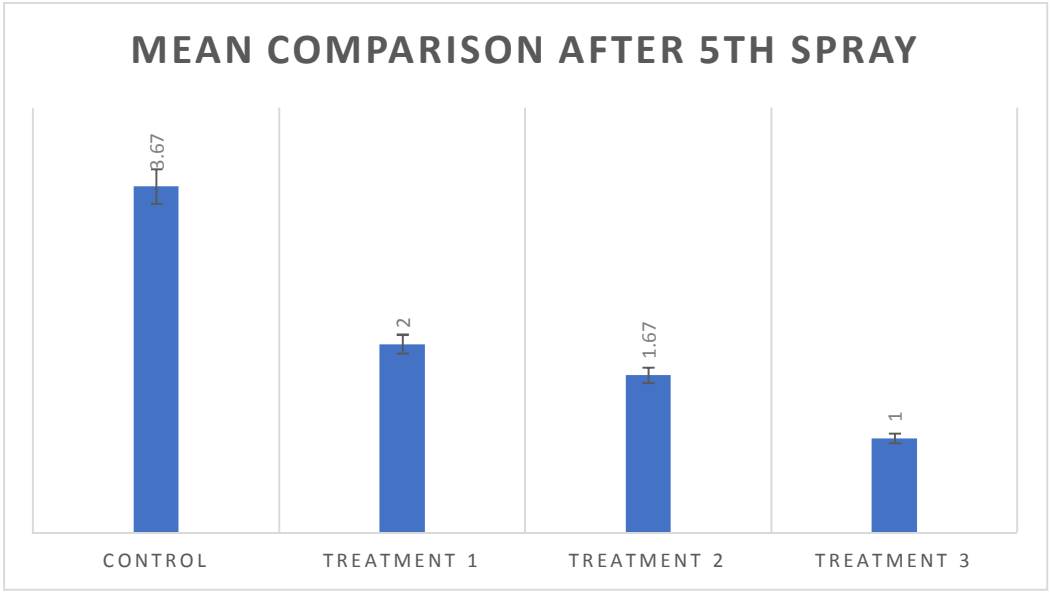
Groups	*Average*
Control	3.210a
Treatment 1	2.00a
Treatment 2	1.33b
Treatment 3	1.13b



ANOVA					
S-O-V	*Sum of squares*	*Degree of freedom*	*Mean.S*	*F.cal*	*P-value*
Replication	34	3	11.33333	0.095038	0.009993
Treatment	37.16667	2	18.58333	0.155835	0.009055
Error	715.5	6	119.25		
Total	786.6667	11			

After doing comparison of 5th spray of 3 treatments, results showed that plots treated with Treatment 1 had 2.00 mean population of whitefly similarly Treatment 2 gave 1.67 and least population was observed on plots treated with Treatment 3 i.e Imidacloprid where population was 1.00.

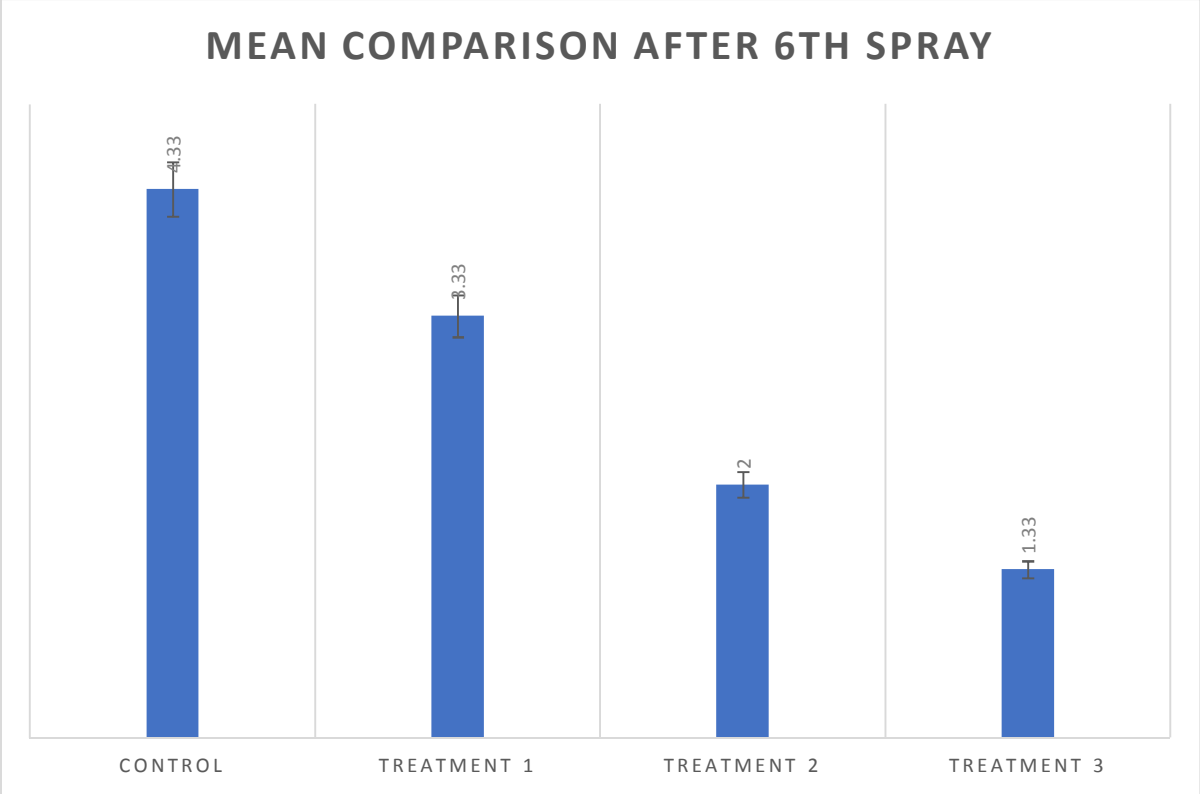
Groups	*Mean comparison*
Control	3.67a
Treatment 1	2.00b
Treatment 2	1.67c
Treatment 3	1.00c



S-O-V	*Sum of squares*	*Degree of freedom*	*Mean.S*	*F.cal*	*P-value*
Replication	155.5833	3	51.86111	3.269702	0.101015
Treatment	50.16667	2	25.08333	1.581436	0.280775
Error	95.16667	6	15.86111		
Total	300.9167	11			

After doing comparison of 6th spray of 3 treatments, results showed that plots treated with Treatment 1 had 3.33 mean population of whitefly similarly Treatment 2 gave 2.00 and least population was observed on plots treated with Treatment 3 i.e Imidacloprid where population was 1.33.

Groups	*Mean comparison*
Control	4.33a
Treatment 1	3.33a
Treatment 2	2.00b
Treatment 3	1.33b



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