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Research Article

Comparative Analysis of Different Insecticides Against Thrip (*Thrips Tabaci*) on Cotton Crop

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ABSTRACT

Cotton (*Gossypium hirsutum* L.) is the significant cash crop and produces the fiber-based yield throughout the world. As several as types of insect pests have been attacked on cotton crop among them cotton thrip (*Thrips tabaci*) cause huge losses by suck the cell sap of leaves and reduce the yield every year. Selective insecticide chemicals are the dire need nowadays to manage cotton thrip, because of their target oriented and immediate knockdown effect. Farmers still depend on old chemistry-based insecticides for controlling the thrip pest which is not work properly, thus the present research was initiated to determine the effectiveness of novel insecticides against cotton thrip. Results showed the after first spray overall average of various time intervals that maximum mortality % was recorded from the plots which treated with Ulala insecticide such as such as (70.02±10.05%) followed by Acephate insecticide (59.79±07.00%) and Mospilan insecticide (53.04±08.19%), and Polo (48.82±08.06%) respectively. However, after the application of second spray highest mortality % was recorded from the plots which treated with Ulala insecticide such as (64.09±09.09%) by Acephate insecticide (61.17±07.10%) and Mospilan insecticide (47.62±08.05), and Polo (38.59±08.96%) respectively. Further, yield of cotton after the applications of different insecticides was recorded and maximum yield was obtained from the plots which traded with Ulala chemical such as (769.30 kg/acre) followed by Acephate chemical (739.66 kg/acre), Mospilan chemical (712.00 kg/acre), Polo chemical (673.0 kg/acre) and Control untreated (625.0), respectively. In addition, yield over control was also computed and maximum (178.00 kg/acre) was obtained from the plots which treated with Ulala insecticide followed by Acephate (114.25 kg/ acre), Mospilan insecticide (86.65 kg/acre), Polo (673.00 kg/acre) as compared to control. Based on the results, it is recommended that Ulala and Acephate insecticide product should be sprayed on cotton crop under field for the management cotton thrip for the less crop infestation and better cotton production.

Keywords: Cotton thrip, Insecticides, Yield, Insect Pest, Crop protection.

INTRODUCTION

The cotton plant (*Gossypium hirsutum* L.) is a well-known natural fiber crop that supports one of the largest textile businesses in the world, with an annual economic effect of at least \$600 billion globally (Ashraf et al., 2018) and cotton is one of the most significant crops in agriculture (Abbas et al., 2018). The fifth-largest cotton grower in the world is Pakistan. It is distributed in almost 100 nations, the main nations being China (24% of worldwide cotton produced), the USA (19%), India (16%) and Pakistan (10%) (Kooistra & Termorhuizen, 2006). It is also one of the economic sources of Pakistan, and cotton plays a significant part in the country's growth. Around 60% of the nation's total exports are made up of cotton and textile



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items. Around 0.6 percent of the GDP and 2.4 percent of agricultural value added are contributed by it. Cotton farming has decreased during the past ten years as compared to the previous last year by up to 6.8%. According to the Economic Survey of Pakistan 2021-22, cotton output grew to 8.329 million bales from 7.064 million bales the previous year. Because it generates so much money, it is referred to as "white gold" in some nations (Ali et al., 2014). Every type of textile we can conceive of uses it the most. Each year, over 25 million tons of cotton is produced globally with an estimated value of \$12 billion.

Low cotton productivity is mostly caused by several factors, including weeds, insect pest complexes, and disease (Aslam et al., 2004). Of them, an important factor for cotton, particularly in Pakistan is insects. According to reports, insect pests in Pakistan cause up to 2.5 million bales of cotton crop losses annually (Arshad et al., 2018). The key sucking insect pests of cotton are thrips, *Thrips tabaci*; jassid, *Amrasca biguttula biguttula*; whitefly, *Bemisia tabaci*; and aphid, *Aphis gossypii* (Dhaka et al., 2017). In cotton, the insect pest infestation caused deterioration in lint quality and 10-40% losses in crop production (Gahukar, 2016). Annual commercial pests of cotton include a few species of thrips (Thysanoptera: Thripidae), particularly seedling cotton during the first 7 to 10 days following plant emergence (Layton et al., 2002). The combination of thrips feeding and other plant stressors has the greatest detrimental effects on crop growth and timely fruit formation (Luttrell et al., 2015). Thrip species have been a serious nuisance to cotton, causing immense yield loss during the vegetative period. Both the adult and nymph phases of the crop (vegetative and reproductive) suck the cell sap from the underside of leaves (Singh et al., 2018). Similarly, nymphs and adults remove significant amounts of cell sap from the leaves, reducing the plant's vigor, and in severe damage, this species causes up to 54.00% yield misfortune (Anitha & Nandihalli, 2018). Cotton thrip *T. tabaci* Lind. (Thysanoptera: Thripidae) is considered as the most economically important pests of onion worldwide (Gachu et al., 2012; Tadele & Mulugeta, 2023). The only cotton thrips cause 17.46% damage in yield and if failing to manage them in early stages were reported to cause 54.04% yield loss (Aslam et al., 2014; Anitha & Nandihalli, 2018). The most significant and significant cause of cotton yield losses in every season and year is the insect pests. Combining integrated pest management techniques has led to the development of various control strategies for cotton thrip. Mechanical control, cultural control, physical control, biological control, and chemical control are some of the management strategies like in other places; the most popular method of controlling cotton thrip infestations is the application of pesticides (Gill et al., 2020; Reitz, 2021). However, careless insecticide usage has been linked to secondary pest outbreaks, resurgences, and insecticide resistance in insect pests. The rate at which pesticide residues are building up in food is concerning. Therefore, there is every reason why these harmful toxicants could pose a health risk to humans (Banchiamlak et al., 2022). Since the 1960s, the most widely used method of managing pests has been the widespread application of synthetic pesticides. The first of these pesticides was dichloro-diphenyl-trichloroethane (DDT), which was employed in the 1940s along with other organophosphate and carbamate insecticides (Nicholson, 2007). Chemical pesticides are the primary tool used in insect pest management to handle these pests of cotton. Globally, cotton accounts for around 23% of all insecticide applications; yet, the majority of these pesticides are hazardous and carcinogenic. Target insect pests may acquire resistance to these pesticides if they are used carelessly and frequently (Ishtiaq & Saleem, 2017). Due to the detrimental consequences that frequent use of pesticides has had on non-target insects, human health, and the environment as a whole, alternative approaches are now being investigated. Due to higher reproduction potential, polyphagous feeding environment, powerful fighting capacity, lack of diapause, probable displacement of rival this species and developed resistance to a variety of pesticide classes are the primary reasons why managing thrip is difficult. Considered the consequences the proper selection of insecticide chemicals is the dire need nowadays to manage cotton thrip *T. tabaci*, because of their target oriented and immediate knockdown effect. Farmers still depend on old chemistry-based insecticides for controlling the insect pests, which is not work properly and in addition lead to insect resistant, environmental pollution and cost effective (Banchiamlak et al., 2012; Reitz, 2021). Keeping in view the importance of the crop, the devastating capacity of the pest and the ever-dynamic pesticide market, the present research work was initiated to investigate the few novels chemical insecticides against cotton thrip *T. tabaci* at farmer field taluka Khangarh, District Ghotki.

MATERIALS AND METHODS

Experiment Design and Procedure

The SS-32 cotton variety was planted in the area of experimental plots total size half acre for the determination of population of sucking complex with three Plots size 25x25 meters with three replications and trial was laid out on the Randomized Complete Block Design (RCBD). Crop was sown second week of April 2024 and all the agronomical

practices such as land preparation, timely sowing, properly weeding, and irrigation and fertilizer application were carried out accordingly to the need of crop. Further plant sequence practices were done such as space row to row space about 75 cm and plant to plant space about 25 cm. However, there is no any control measure was applied to control or monitoring cotton thrip *T. tabaci* which was influence the seasonal population tendency.

Chemical Control for Cotton Thrips

Further different insecticidal chemicals were applied to evaluate the most effective chemical against cotton thrip *T. tabaci*.

Table 1. The treatment details of insecticide chemicals for spray.

Treatment	Chemical and local name	Compound	Dose/acre
T1	Flonicamid 50% WG (Ulala)	Pyridinecarboxamide	120g
T2	Acetamaprid 20% SP (Mospilan)	Neonicotinoid	250g
T3	Acephate 75% SP (Acephate)	Organophosphate	300g
T4	Diafenthiuron500g/L SC (Polo)	Thiourea	200 ml/L
T5	Control plot (without use of pesticides).		

Insecticide Application procedure

Above mentioned insecticides were applied on cotton crop to evaluate the competency of each treatment against cotton thrip *T. tabaci*. Total two sprays were applied on cotton crop subjected to appearances thrips population reached at ETL. Spray was done with knapsack sprayer and after spray of each insecticide the sprayer was washed carefully with water to avoid the error for experiment. Total five observations were taken during the research i.e., pre-treatment (one day before spray) and 3 DAS, 7 DAS, 10 DAS and 15 days after spray. However other inputs were remained same in the control as well as treated plots. In this regard total 25 plants were examined: and six leaves from each plant two from bottom, two from middle and two leaves from top were randomly selected and observed for population and crop infestation. Further to evaluate the reduction percentage of each insecticide was calculated according by Henderson and Tilton, (1955).

$$\text{Efficacy \%} = [1 - (\text{Ta} \cdot \text{Cb} / \text{Tb} \cdot \text{Ca})] \cdot 100$$

Where: Ta = Infestation in treatment plots after spray

Cb = Infestation in control plots before spray

Tb = Infestation in treatment plots before spray

Ca = Infestation in control plots after spray

Yield of cotton

In addition, the production of cotton lint was assessed and quantified from each plot including control plot, and data was subjected to appropriate statistical analysis for interpretation and find out the difference among the treatments.

Statistical analysis

The collected data will be analyzed using Statistix-8.1 and the significance of the differences will be intended by using ANOVA and LSD-test.

RESULTS

Mean Population of *Thrips tabaci* After First Spray of Insecticides

The data in table 1 showed the average pre and post-population of cotton thrip *T. tabaci* per leaf after the first spray of different insecticides in cotton crop under field condition. The average population of cotton thrip (05.15/leaf) was recorded before the application of Ulala insecticide and post average population was recorded (01.85/leaf), (01.52/leaf), (01.01/leaf) and (01.72/leaf) were recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively. Further the average population of cotton thrip (04.28/leaf) was recorded before the application of Acephate insecticide and post average population was recorded (02.02/leaf), (01.69/leaf), (01.46/leaf) and (01.50/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively. However, average population of cotton thrip (05.45/leaf) was recorded before the application of Mospilan insecticide and post average population was recorded (03.10/leaf), (02.48/leaf), (02.15/leaf) and (02.50/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively. However, average population of cotton thrip (04.94/leaf) was recorded before the application of Polo insecticide and post average population was recorded (02.60/leaf), (02.75/leaf), (02.23/leaf) and (02.42/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively, Whereas, population of cotton

thrip (05.70/leaf) was recorded before the application of Polo insecticide and post average population was recorded (06.15/leaf), (06.25/leaf), (05.76/leaf) and (05.12/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively. Furthermore, the results showed that table 1 revealed the overall reduction population of cotton thrip after first spray and data exhibited that overall mean population of different time interval was recorded from the plots treated by Ulala insecticide (01.52±0.38/leaf) followed by Acephate insecticide (01.66±0.41/leaf), Mospilan (02.54±0.63/leaf), Polo insecticide (01.49±0.68/leaf) and untreated control plot (05.80±0.42/leaf), respectively. Further statistically analysis revealed the remarkable difference at (Df= 4, F-value 146.00 and P<0.000) within the treatments overall average reduction population of cotton thrip including control plot as shown on table 1.

Table 2. Pre and post mean population of cotton thrip (*Thrip tabaci*) per leaf after different insecticide applications of first spray on cotton crop.

Treatments	Pre treatment population	Post treatment population				Mean±SD
		3 DAS	7 DAS	10 DAS	15 DAS	
Ulala	5.15	1.85	1.52	1.01	1.72	1.52±0.38 c
Acephate	4.28	2.02	1.69	1.46	1.50	1.66±0.41 c
Mospilan	5.45	3.10	2.48	2.15	2.50	2.54±0.63 b
Polo	4.94	2.60	2.75	2.23	2.42	2.49±0.68 b
Control	5.70	6.15	6.25	5.76	5.12	5.80±1.42 a

* Means and groups (A, B and C) are significantly different from one another by showing different alphabetically letters at (P<0.05).

Reduction % of Cotton Thrips After First Spray of Different Insecticides

Results revealed in the figure 1 showed the reduction % of different insecticide against cotton thrip *Thrip tabaci* in infested cotton crop under field condition after first spray. The pre-observation and post-observation data was taken and reduction percentage was obtained from the data of different time intervals after first spray. The results show that different synthetic insecticide is effectively in reduced the cotton thrip population at varying levels of efficacy at different time intervals. Results revealed in figure 4.1 as reduction percentage of cotton *T. tabaci* after the application of Ulala insecticide 66.71%, 73.08%, 80.39% and 59.88% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively. While data showed the reduction percentage of cotton *T. tabaci* after the application of Acephate insecticide 54.89%, 62.86%, 64.82% and 56.58% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively, although, data showed the reduction percentage of cotton *T. tabaci* after the application of Mospilan insecticide 47.28%, 58.50%, 61.47% and 44.90% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively. Furthermore, data showed the reduction percentage of cotton *T. tabaci* after the application of Polo insecticide 50.82%, 48.82%, 54.49% and 41.17% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively as depicted in figure 1.

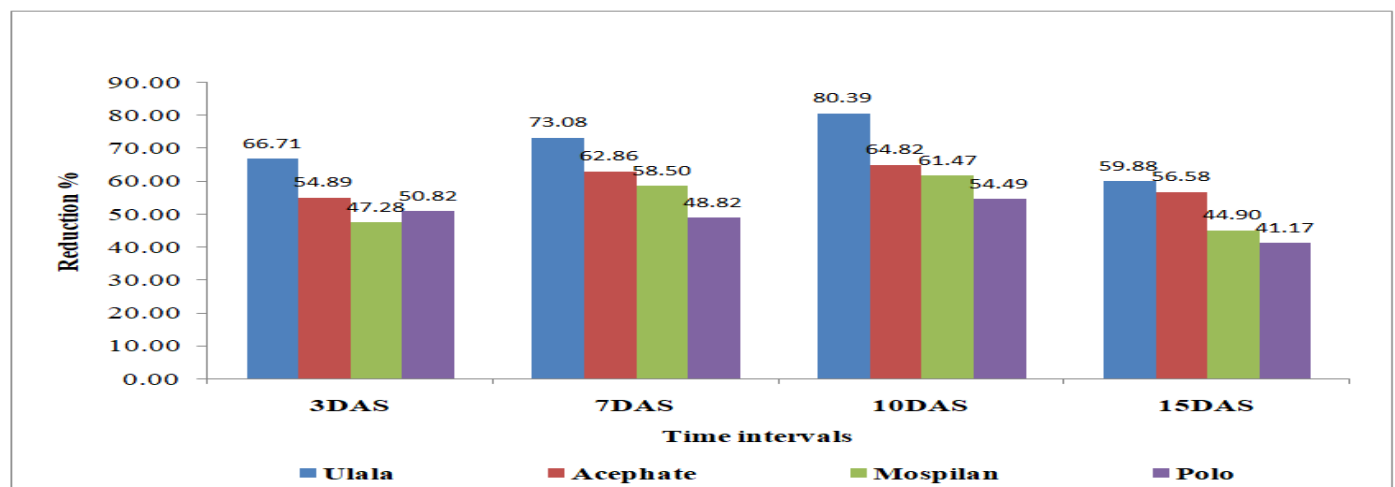


Figure 1. Reduction (%) over control for the population of cotton thrip (*Thrip tabaci*) infesting cotton crop after different time intervals of first spray with different insecticides.

Mean Population of *Thrips tabaci* After Second Spray of Insecticides

The data in table 2 showed that average pre and post population of cotton thrip *T. tabaci* per leaf after the second spray of different insecticides in cotton crop under field condition. The average population of cotton thrip (04.18/leaf) was recorded before the application of Ulala insecticide and post average population was recorded (02.35/leaf), (01.82/leaf), (01.22/leaf) and (01.28/leaf) were recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively. Further the average population of cotton thrip (04.56/leaf) was recorded before the application of Acephate insecticide and post average population was recorded (03.04/leaf), (01.68/leaf), (01.66/leaf) and (01.62/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively. However, average population of cotton thrip (05.15/leaf) was recorded before the application of Mospilan insecticide and post average population was recorded (03.08/leaf), (02.88/leaf), (02.86/leaf) and (02.48/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively.

However, average population of cotton thrip (04.78/leaf) was recorded before the application of Polo insecticide and post average population was recorded (03.46/leaf), (03.15/leaf), (03.23/leaf) and (03.10/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively, Whereas, population of cotton thrip (05.78/leaf) was recorded from the control at the time of before the application and post time interval average population was recorded (07.54/leaf), (07.25/leaf), (06.65/leaf) and (06.20/leaf) was recorded after 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray, respectively from untreated control plots. Furthermore, the results showed that table 2 revealed the overall reduction population of cotton thrip after second spray and data exhibited that overall mean population of different time interval was recorded from the plots treated by Ulala insecticide (01.66 ± 0.41 /leaf) followed by Acephate insecticide (02.00 ± 0.50 /leaf), Mosplian (03.03 ± 0.75 /leaf), Polo insecticide (03.23 ± 0.80 /leaf) and untreated control plot (06.91 ± 0.32 /leaf), respectively. Further statistically analysis revealed the remarkable difference at (Df= 4, F-value 99.00 and $P < 0.000$) within the treatments overall average reduction population of cotton thrip including control plot as shown on table 2.

Table 3. Pre and post mean population of cotton thrip (*Thrip tabaci*) per leaf after different insecticide applications of second spray on cotton crop.

Treatments	Pre treatment population	Post treatment population				Mean+SD
		3 DAS	7 DAS	10 DAS	15 DAS	
Ulala	4.18	2.35	1.82	1.22	1.28	1.66+0.41 c
Acephate	4.56	3.04	1.68	1.66	1.62	2.00+0.50 c
Mospilan	5.15	3.08	2.98	2.86	2.48	3.03+0.75 b
Polo	4.78	3.46	3.15	3.23	3.10	3.23+0.80 b
Control	5.78	7.54	7.25	6.65	6.20	6.91+1.23 a

* Means and groups (A, B and C) are significantly different from one another by showing different alphabetically letters at ($P < 0.05$).

Reduction % of Cotton Thrips After Second Spray of Different Insecticides

Results revealed in the figure 2 showed the reduction % of different insecticide against cotton thrip *Thrip tabaci* in infested cotton crop under field conditions after second spray. The pre-observation and post-observation data was taken and reduction percentage was obtained from the data of different time intervals after second spray. The results show that different synthetic insecticide is effectively in reduced the cotton thrip population at varying levels of efficacy at different time intervals. Results revealed in figure 4.2 as reduction percentage of cotton *T. tabaci* after the application of Ulala insecticide 56.90%, 65.29%, 74.63% and 62.76% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively. While data showed the reduction percentage of cotton *T. tabaci* after the application of Acephate insecticide 48.89%, 70.63%, 68.36% and 56.80% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively, although, data showed the reduction percentage of cotton *T. tabaci* after the application of Mospilan insecticide 43.44%, 53.87%, 51.73% and 41.44% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively. Furthermore, data showed the reduction percentage of cotton *T. tabaci* after the application of Polo insecticide 44.51%, 47.46%, 41.27% and 21.13% was recorded at 3 DAS, 7 DAS, 10 DAS and 15 DAS days after spray DAS, respectively as depicted in figure 2.

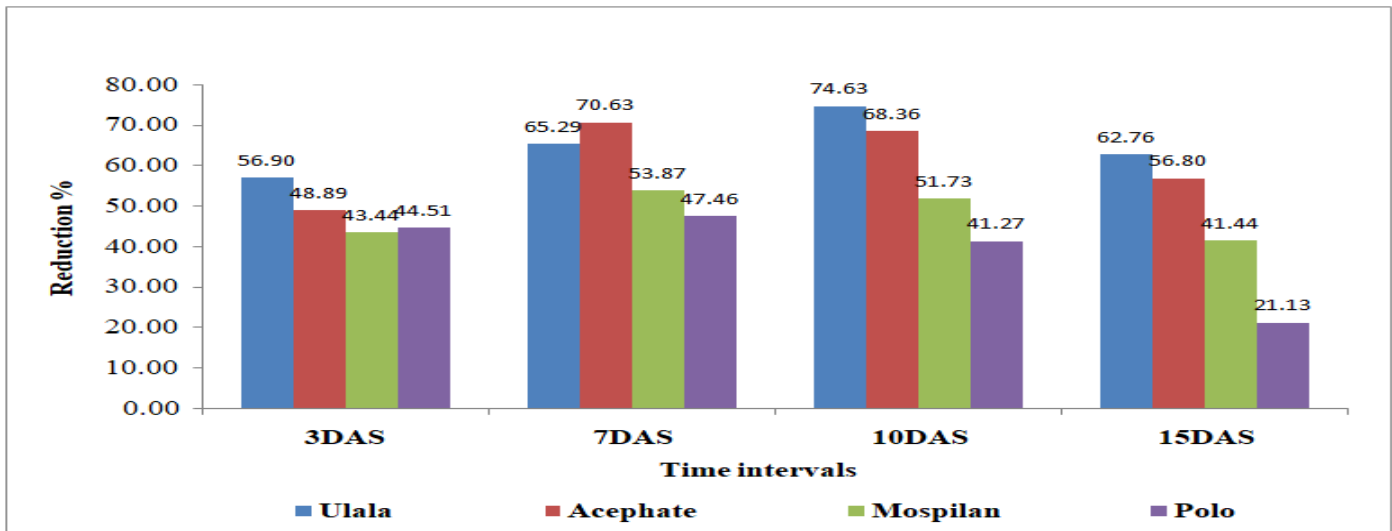


Figure 2. Reduction (%) over control for the population of cotton thrip (*Thrip tabaci*) infesting cotton crop after different time intervals of second spray with different insecticides.

Overall Pooled Reduction % of Both Sprays on *Thrip tabaci*

Data in figure 3 revealed that overall pooled reduction % of different time intervals after first and second spray against cotton *thrip tabaci* under field condition. Data exhibited that after the first spray of different insecticides overall maximum reduction percentage (70.02±10.05%) was recorded from the plots which treated with synthetic chemical Ulala followed by Acephate insecticide (59.79±07.00%) and Mospilan insecticide (53.04±08.19), and Polo (48.82±08.06%) respectively as shown in figure 4.3. in addition, data exhibited that after the second spray of different insecticides overall maximum reduction percentage (64.09±09.09%) was recorded from the plots which treated with synthetic chemical Ulala followed by Acephate insecticide (61.17±07.10%) and Mospilan insecticide (47.62±08.05), and Polo (38.59±08.96%) respectively as shown in figure 4.3. Further statistically analysis revealed the remarkable difference at (Df= 7, F-value 25.40 and P<0.000) within the treatments overall average reduction population of cotton thrip including control plot as shown on table 2.

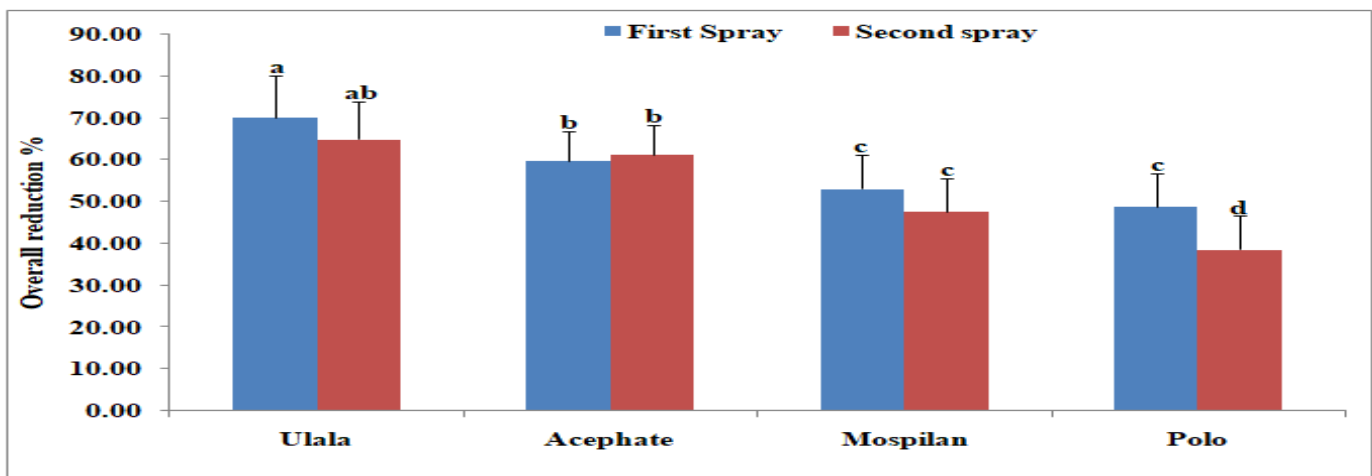


Figure 3. Overall pooled reductions (%) over control the population of cotton thrip (*Thrip tabaci*) infesting cotton crop after first and second sprays with different insecticides.

Potential Yield Difference After the Application of Insecticides

Data revealed in table 3 total production of cotton after the application of different insecticides on cotton crop against cotton thrip *T. tabbaci*. Data showed that maximum yield was obtained from the plots which traded with Ulala chemical such as (769.30 kg/acre) followed by Acephate chemical (739.66 kg/acre), Mospilan chemical (712.00 kg/acre), Polo chemical (673.0 kg/acre) and Control untreated (625.0), respectively. Further statistically analysis revealed the

remarkable difference at (Df= 4, F-value 10.01 and P<0.001) yield over control within the different insecticides including control plot as shown on table 4.3. Further findings in table 4.3 exhibited that yield over control was also computed and maximum (143.95. kg/acre) was noted from the plots which treated with Ulala insecticide as compared to Acephate (114.25 kg/ acre), Mospilan insecticide (86.65 kg/acre), Polo (673.00 kg/acre) as compared to control, respectively.

Table 3. Yield of cotton lint after the application of different insecticides against thrip control during 2024.

Treatments	Yield (kg/acre)	Yield over control (kg/acre)
Ulala	769.30 a	143.95
Acephate	739.66 ab	114.25
Mospilan	712.00 bc	86.65
Polo	673.00 cd	47.65
Control (Untreated)	625.35 d	----

* For overall yield (kg/acre) all five means and groups (A, B, C, and D) are significantly different from one another by showing different alphabetically letters at (P<0.05).

DISCUSSION

Cotton is an important fiber crop of the world and considered as cash crops of Pakistan (Memon et al., 2011). It has been well established that insect pests are major factors constraining the achievement of yield and cause 20-40% damages to cotton yield (Guptae t al., 2017). Furthermore, severe thrip infestations have been shown to inflict 17.46% damage to production; if these infestations are not managed in their early stages, yield loss has been estimated to be 54.04% (Anitha & Nandihalli, 2018). Recently, studies reported that the use of botanicals may be an effective tactic in IPM programs, since they induce plant defenses resulting in decreased herbivore fitness (Reglinski et al., 2014). Sucking insect pests, which occurred on cotton crop among them cotton thrip is associated from sowing to harvesting all treatments including control, such findings are agreed with Khaliq et al. (2104) mentioned that the thrip damage cotton directly by feeding. Cotton thrip is the most economically significant pests in the world (Gachu et al., 2022; Tadele & Mulugeta, 2023) and affects cotton yield by 17.46% and if it is not controlled in the early stage yield loss can reach 54.04% (Aslam et al., 2014; Anitha & Nandihalli, 2018). Because of its target-oriented and immediate knockdown action, selective insecticide based chemicals are urgently needed to control cotton thrip. In order to control this noxious pest farmers, continue to rely on old chemical-based chemistry products which not only worked well but also cause insect resistance, environmental pollution, and cost effectiveness (Banchiamlak et al., 2012; Reitz, 2021). Given the significance of the crop and the pest destructive potential and the constantly shifting market for pesticides, the current study was started to determine how the new insecticides function against cotton thrip in cotton eco system. In the present study, four different insecticides were applied and data showed that all insecticides showed varied reduction % at various time intervals and usually highest reduction % was observed up to 10 days after spray in each treatments in both sprays.

These results are quite similar with Lopez et al. (2018) reported that among eight insecticides five showed the significant reduction of cotton thrip up to 10 days after spray and slightly decreed the effects up to 15 days after spray. Further, it was confirmed from the analysis of variance that there was a substantial variation in the ways that pesticides reduced the number of the insect after each spray, which is agreed with Nazemi et al. (2016) who characterizes the resistance level of different group of insecticides against *Thrips tabaci*. However, six insecticides were evaluated by Stankovac et al. (2021) for their proportionate effectiveness in reducing *T. tabaci* in cotton. Ulala and Acephate provided the best control, killing all of the nymphs and adults within 10 days of the application and the effects persisted for up to fifteen days. A few insecticides for reducing *T. tabaci* infestation on cotton were evaluated by Rathore et al. (2019) he disclosed that pyridinecarboxamide and organophosphate were the insecticides that produced the best results up to ten days after spraying, this is strongly agreed with the present findings because in Ulala and Acephate chemicals also pertaining to these groups and stated that up to two weeks these insecticides had persist their effectiveness. Further, the overall reduction % results of both sprays of the current study showed that Ulala and Acephate insecticides were found more effective and Mospilan and Polo insecticides with least effective. The findings are even more contentious when compared to those of (Aslam et al., 2004) who found that Mospilan was extremely effective against thrips, while (Wahla et al., 2019) agreed with the results that were similar to Khaliq et al. (2014) who reported that acephate chemical was also very successful against the thrips. Present data showed maximum overall pooled reduction % reduction percentage bu Ulala (70.02%) followed by Acephate (59.79%), Mospilan (53.04%) and Polo (48.82%) after first spray

and maximum reduction % Ulala (64.09%), followed by Acephate (61.17%) and Mospilan (47.62), and Polo (38.59) after second spray respectively and statistically analysis revealed the remarkable difference at ($P < 0.00$). The results show that polo Ulala and Acephate were the most effective insecticides against cotton thrip, whereas Mosplian and Polo was the least effective and these findings are already confirmed by Ahmad et al. (2017) he assessed the relative effectiveness of several insecticides for cotton against the cotton thrip that pesticides were belongs to Pyridinecarboxamide (Ulala) and Organophosphate (Acephate) chemical groups, might be the chemical composition of the both insecticides are same due to showed the potential efficacy in this study. The findings of Zafar et al. (2016) are consistent with our investigation that examined the effects of these insecticides against cotton thrip. Based on the results, it was shown that Mosplian and Polo were also showed effectiveness at controlling thrip specis in cotton crop. In addition, these findings are consistent with the experiment carried out by Kernal et al. (2018) to evaluate the moderately efficacy of Neonicotinoid group (Mosplian) and Thiourea (Polo) compound based products against cotton sucking insect pests including thrip.

Taken together, potential insecticides are a strong and efficient tool for controlling cotton thrip, according to the results previously stated and findings of the study could be suggesting for further scientific research because our work is partially designed. According to these findings, farmers should avoid reapplying pesticides too soon because they have a maximal impact and remain extremely effective for up to fifteen days following application. All four synthetic insecticide used in the current study could be great options to reduce the population of cotton thrip and increase the lint production. Further investigations are important to assess the possibility of these insecticides on large scale before they can be suggested as part of IPM in cotton agro ecosystem.

CONCLUSIONS

A field trial was conducted at farmer field taluka Khangarh, District Ghotki during 2024, to evaluate the efficacy of different insecticides against cotton thrip *Thrips tabaci* under field condition. All four insecticides were found to be most effective against the cotton thrip *Thrips tabaci* according to post treatment time intervals up to 15 days after each spray. Data showed that Ulala and Acephate insecticide exhibited the highest mortality % under field condition. Highest yield was also obtained from the plots which treated with Ulala and Acephate as compared to Mosplian and Polo products. Based on the potential effects and overall mortality % cotton thrip in both sprays and yield parameter treatments were ranked categories as Ulala>Acephate>Mosiplian>Polo for the control of cotton thrip in field crops. It is concluded that somehow all four insecticides can be effectively use as part of Integrated Pest Management (IPM) strategy for control and manage the thrip infestation in cotton crop. Based on the results, it is recommended that Ulala insecticide product should be sprayed on cotton crop under field for the management cotton thrip for the less crop infestation and better yield production. Therefore, above insecticides are might be used as tool of integrated pest management IPM program for the sustainable management of cotton thrip.

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AUTHOR CONTRIBUTIONS

All the authors contributed equally to this research.

COMPETING OF INTEREST

No conflicts of interest have been disclosed by the authors.

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