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Research Article

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MANAGEMENT OF *EARIAS VITTELLA* AND *PECTINOPHORA GOSSYPIELLA* THROUGH DIFFERENT INSECTICIDES UNDER COTTON FIELD CONDITIONS

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ABSTRACT

The efficacy of five different insecticides was evaluated against bollworms under cotton cultivated crop during the Kharif season, 2021. The insecticides namely; $T_{1=}$ Triazophos 120ml, $T_{2=}$ Deltamethrin+Triazophos 100ml, $T_{3=}$ Cypermethrin 60ml, $T_{4=}$ Emamectin 50ml, $T_{5=}$ Abamectin 20ml/tank and $T_{6=}$ Control (water-washed) were applied and replicated two times on Hari Dsot cotton cultivar variety. The field experimental plot sizes were kept at 100ft, number of rows 100, row to row space 60cm, plant to plant space 25cm, and sprays were done in the early morning after 15 days interval basis. Through RCBD data of the pest population was gathered as pre-treatment and after 3rd, 7th, and 14th days of post-spray. After 1st spray at 1st replication, the abamectin found with more efficacy caused highest reduction (68.68%), followed by the combination of deltamethrin+triazophos (60.55%), cypermethrin (57.45%), emamectin (52.35%) and triazophos (48.65%), against *Earias vittella*, and after 2nd spray, at 2nd fortnight replication abamectin caused again highest larvae reduction (78.87%), followed by emamectin (60.35%), cypermethrin (54.25%), deltamethrin+triazophos (50.65%) and triazophos (47.55%). In the scheduled of 1st spray at 1st replication the abamectin caused the highest reduction (94.75%), followed by deltamethrin+triazophos (73.25%), cypermethrin (70.45%), triazophos (65.25%), and emamectin (62.45%), against *Pectinophora gossypiella*, hence; after 2nd spray at 2nd fortnight replication, the abamectin proved with high reduction again (97.15%), followed by cypermethrin (71.35%), deltamethrin+triazophos (63.65%) emamectin (60.75%), and triazophos (59.55%), respectively. After completion of two successive replicated sprays, it is concluded that the insecticide abamectin proved highest reduction % against both cotton borer species hence, recommended. Intensive attention to the enhancement of biological controlling agents and wise application of pesticides is the best solution for future endeavours.

Keywords: *Abamectin, Cotton bollworms, Cypermethrin, Deltamethrin, Emamectin.*

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is a main profitable cash crop grown in every corner of the world (Abid *et al.*, 2011). Pakistan ranked 5th in production and 4th in cotton consumption in the world (Azumah *et al.*, 2019), and contributes 10% GDP country-wide compared to the GDP overall agriculture area at 18.9% (Malik and Rasheed, 2022). This golden crop globally provides employment opportunities and good wealth for humanity (Tokela *et al.*, 2022). Cotton is globally known as "King of fiber" "Friendly fiber" primarily key source of edible oil and textile industry (Bhute *et al.*, 2023). This crop grows well at low humidity, and high temperature with long periods of sunshine areas (Aslam *et al.*, 2020). The population growth rate and standard living style increased the demand for this crop and need for cotton is getting higher compared to the production (Rauf *et al.*, 2019), due to this alarming situation the cotton growers are facing aridity, quality of water, energy usage, salinity, low profitability, groundwater interaction, transgenic seed application, greenhouse gas, crop production, and food insecurity like threats (Abbas, 2022). The farmers mostly apply certain pesticides in cotton crop to evade the losses (Zaki and Hegab, 2013), but massive application of toxic chemicals enhance the resistance power of the insect pests also causes health hazards, farmer illness, and environmental pollution (Chandio *et al.*, 2021). The wide use of toxic pesticides relying negative effects on human health, and biodiversity across the globe, only drought factor cause severe crop losses (Zahoor *et al.*, 2022). The agriculture sector in Pakistan is the main important for the livelihoods of inhabitants but it is facing like low farming skills, food insecurity, population density, inefficient agricultural management, and low innovation of technologies (Ali and Erenstein, 2017), also land fragmentation, floods, shortage of water, climate change and urban sprawl (Abid *et al*., 2017). The cotton crop is massively attacked by 1326 species of pests, which cause huge losses in terms of quality and quantity of which spotted bollworm and pink bollworm are more causative (Rangarirai *et al*., 2015). The pests cause specific problems, significant product losses, and negative effects in terms of the economy, due to insect pests, 29% of cotton yield losses occur in Pakistan, and 15% are devastating yield losses in the world annually (Kaur *et al.,* 2019). The pink bollworms and spotted bollworms are extensively destructive causing yield losses every year up to 40% in Pakistan (Bhute *et al.,* 2023). The pink bollworm species is an economically notorious pest cause loss in the normal opening of bolls, loss in oil content, and seed cotton yield of cotton, for control this pest cyhalothrin, imidacloprid, profenofos, and combination of salicylic acid were applied, observed with positive effect (El-Sherbeni *et al*., 2022). Due to the more resistance power, the pink bollworm species are becoming more problematic and aggravated, the specialized pheromone and lure application technology (SPLAT), with the application of 1250g/acre, 750g/acre, and 500g/acre of the lure observed with significant control against this pest (Sreenivas *et al*., 2021). The efficacy of endosulfan, dimethoate, indoxacarb, monocrotophos, profenofos, and chlorpyriphos, was observed against *E. vittella*, but lambda-cyhalothrin reported with highest suppression and multineem with the lowest compared with control (Hasan, 2010). The group of insecticides *viz*., cypermethrin, esfenvalerate, lambda-cyhalothrin, zeta-cypermethrin, bifenthrin, deltamethrin, profenofos, chlorpyrifos, phoxim, triazophos, emamectin benzoate, spinosad, chlorfenapyr, indoxacarb, abamectin, and methoxyfenozide were uses through leaf-dip bioassay method against *E. vittella* found with high to low resistance (Ahmad and Arif 2009). The fenvalerate, methomyl, endosulfan, cypermethrin, chlorpyriphos, and quinalphos were applied against 2nd, 3rd, 4th instars of *H. armigera* (Building, 2015). The ready-mixed insecticides indoxacarb 14.5%+acetamiprid 7.7% SC, novaluron 5.25%+indoxacarb 4.5% SC, profenofos 40%+cypermethrin 4% EC, thiamethoxam 12.6%+lambda cyhalothrin 9.5% ZC observed with more efficacy against cotton spotted and pink bollworm (Borude *et al.,* 2018). The *Bacillus thuringiensis* and entomopathogenic fungi proved with significant control against the population reduction of spiny bollworms (Rehab *et al*., 2020). The chemical is the quickest insect control method which stops large-scale insect pests and their outbreaks, whereas; cultural and biological control takes a long time (Bhute *et al.,* 2023). Hence; the research experiment was conducted to evaluate the efficacy of insecticides against population reduction % of *Earias vittella and Pectinophora gossypiella* to share the scientific information for cotton growers.

MATERIALS AND METHODS

Location of experiment: The field trials were formulated at Arbailo Mangrio cotton farm, Village, Yar Muhammad Mangrio, Taluka Khangarh, District, Ghotki-Sindh located at latitude 27.7635 °N, 69.5738 °E longitude to evaluated the efficacy of different insecticides *viz.,* emamectin benzoate 50ml, deltamethrin+triazophos 100ml, abamectin 20ml, triazophos 120ml, cypermethrin 60ml and control on Hari Dsot variety against the population of *Earias vittella* and *Pectinophora gossypiella*.

Seed collection and sowing time: The seed of the Hari Dost cotton variety was purchased from the local market of Ghotki, Sindh-Pakistan during the *Khairf* season, 2021. The sowing of the cotton crop was started from 5 May to 12 May by the dipping method the soaked seed of the prescribed cotton variety was dipped in ridges. Before the dipping, the cotton seed was kept for 24 hours in the channel irrigation water for their emergent seedlings hence; the seed was separated by the help of dry dust massaging. Due to the frequent emergence of seedlings on 3rd day, the irrigation water was released once again and continued up to harvesting or as per need basis. Sometimes at arisen of maximum temperature, the water becomes a crucial priority at the time of flowering and boll stages in cotton plants. The weeding was controlled through the help of handmade and hand usage spade hence, the cotton plants were kept at their space and width level by applying the thinning method according to the scientific way. Further description is given in under described (Table-1).

Table- 1. Experimental details

Design	RCBD	Size of plot	100 x 15 m
Crop	Cotton	Number of rows/ plots	100
Season	Kharif	Row-to-row spacing	60 cm
Year	2021	Plant-to-plant spacing	25 cm
Variety	Hari Dost	Date of Sowings	05 May to 12 May 2021
Chemical treatments	Five	Plant protection	As per need
Interval	15 days	Number of irrigations	As per need
Replications	Two	Number of wedding	Three-Four

Application of novel insecticides: To meet the objectives of the study five insecticides and one water-washed control were used against the population reduction of bollworms on cotton crop, subjected to the appearances and damage symptoms. The spotted bollworm and pink bollworm damage posed an extra burden like the maximum temperature provided support to enhance the population of these pests, in such crucial stage the use of insecticides are essential. For this purpose, each treatment was repeated two times fortnightly interval basis to avoid errors in data. The synthetic chemicals are listed here in (Table- 2) used on the cotton crop to evaluate the competency of each compound against *E. vittella* and *P. gossypiella*. The 1st spray was done at flowering, 2nd maturation of cotton bolls, and appearance of cotton borers inside the bolls. The scheduled sprays were done by using 16 litre capacity containing hand-operated knapsack sprayer in the early morning time, respectively

Table- 2. Insecticides with chemical names and dose

Treatment Name	Chemical Group	Name of company	Dose/ Tank	Dose/ Acre	Mode of action
Triazophos	Organophosphate	Jaffer Agro Services (Pvt). Ltd.	120 ml	600 ml	Stomach
Deltamethrin + Triazophos	Pyrethroids	Safi Markaz (Pvt). Ltd.	100 ml	500 ml	Stomach
Cypermethrin	Organophosphate	Saver Enterprises (Pvt). Ltd.	60 ml	300 ml	Nervous system
Emamectin benzoate	Avermectin	Jaffer Agro Services (Pvt). Ltd.	50 ml	250 ml	Nervous system
Abamectin	Avermectin	Global Agri Sciences (Pvt). Ltd.	20 ml	100 ml	Nervous system
Control	Kept without pesticide only water washed				

Data collection strategy: For each spray, four observations were made i.e., (1 DBS) first day before spray and (3 DAS) 3rd days after spray, (7 DAS) 7th days after spray, and (14 DAS) 14th days after spray. The efficacy of insecticides and the reduction % of the pest population were calculated by the application of (Handerson and Tilton, 1955), formula; Corrected %= (1-Ta x Cb/Ca x Tb) x 100. ANOVA of the pooled data was statistically analyzed by using the student package SWX software 8.1 USA. The LSD level among the pest population through scheduled sprays was measured at ($P<0.05$).

RESULTS

First spray against spotted bollworm: The 1st spray was done after the appearance of the spotted bollworms and subjected to damage symptoms. Further, pre-treatment counts of spotted bollworm in plots sprayed with triazophos, deltamethrin+triazophos, cypermethrin, emamectin, abamectin, and control was (5.19), (5.75), (5.85), (4.70), (5.62) and (5.08) per plant which decreased to (2.68), (2.32), (2.59), (2.66), (1.76) and (5.02) per plant, giving pest reduction % of (2.51), (3.43), (3.26), (3.04), (3.86) with control mean at (0.42) per plant after 14th of post-spray days. However, statistically, the differences in the population of spotted bollworms on cotton were found in non-significant (DF=17; F=0.15; P=0.96) for pre-treatment, while in 1st spray the population of spotted bollworm significantly decreased after 3rd day (DF=17; F=6.39; P=0.01), 7th day (DF=17; F=10.09; P=0.03), and 14th day (DF=17; F=13.59; P=0.01) of post-spray as depicted in (Fig. 1). The efficacy of insecticides based on insect reduction % indicated that among insecticides and different letters showing the significant difference among the treatments at (P< 0.05) level.

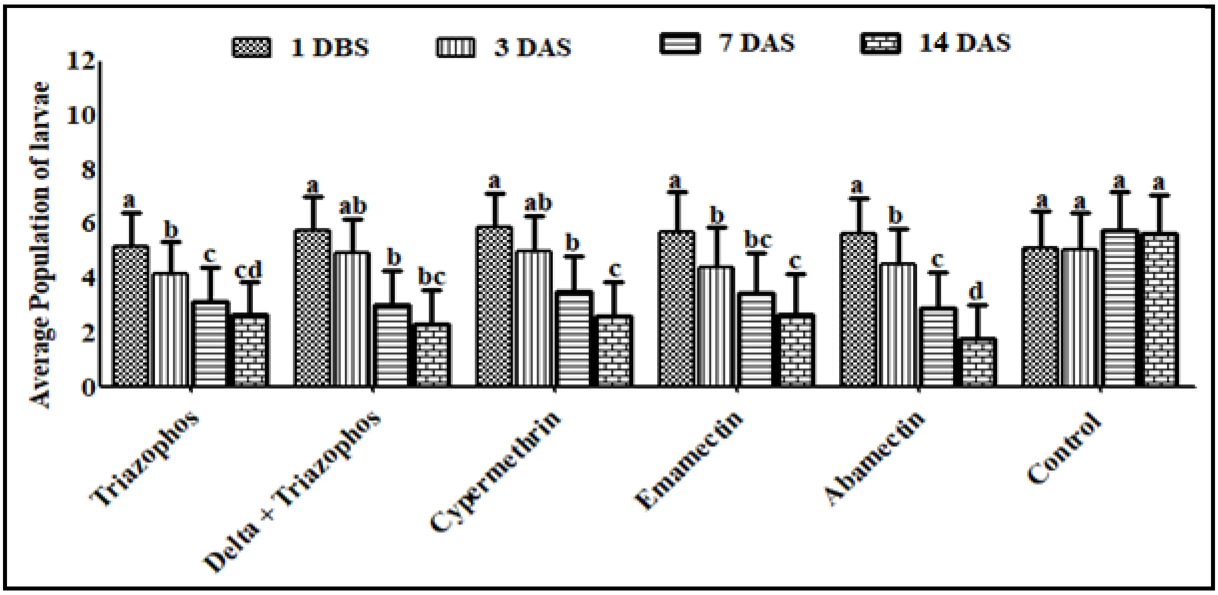

Fig. 1. After 1st spray efficacy of different insecticides against spotted bollworm

Overall reduction % of 1st spray against spotted bollworm: Abamectin provided the highest reduction (68.68%), followed by the combination of deltamethrin+triazophos (60.55%), cypermethrin (57.45%), emamectin (52.35%) and triazophos (48.65%). In control (water-washed) plot, the spotted bollworm population sustained throughout the monitoring period of 14th days after spray. Apart from the highest insect reduction % in chemical control, the treatments ranked as abamectin, deltamethrin+triazophos, cypermethrin, emamectin, triazophos, and cypermethrin showed little difference in their efficacies at different intervals, while deltamethrin+triazophos and emamectin gave closer results to each other. The overall reduction % after 1st spray against spotted bollworm revealed in (Fig. 2). The different letters of the error bar indicated the significant difference between the treatments at (P< 0.05) level.

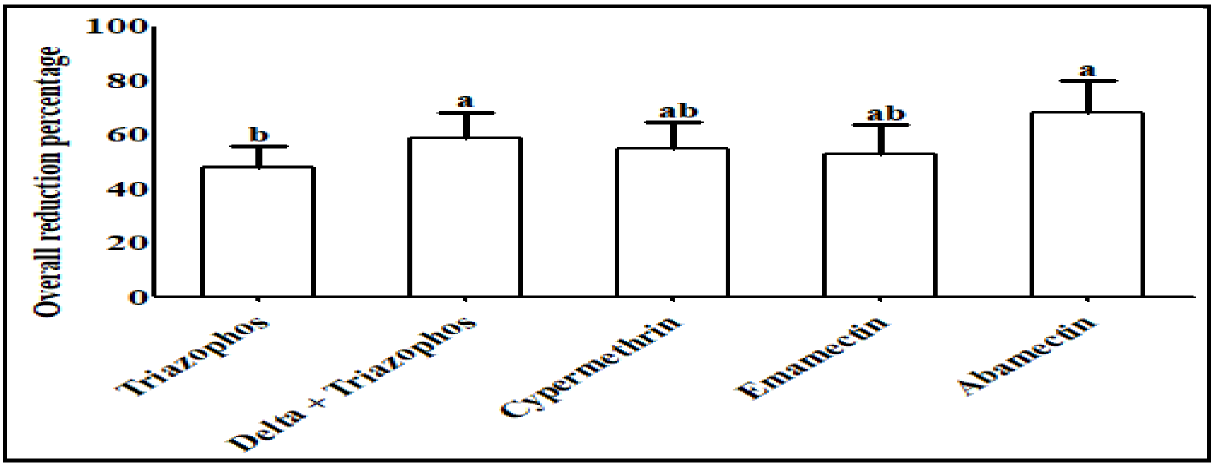

Fig. 2. Overall reduction % of different time intervals of spotted bollworm 1st spray

Second spray against spotted bollworm: The 2nd spray was done at fortnight or up to three-week intervals and the re-appearance of borer complex was subjected to damage symptoms. The pre-treatment counts of spotted bollworm in plots sprayed with triazophos, deltamethrin+triazophos, cypermethrin, emamectin, abamectin, and control (water-washed) was (5.61), (5.54), (5.10), (5.87), (4.28) and (5.50) per plant which declined to (2.93), (2.74), (2.43), (2.34), (0.90) and (5.17) per plant after 14th days of spray, giving pest reduction % of (2.68), (2.80), (2.67), (3.53), (3.38) with control mean at (0.33) per plant, respectively. The population differences for spotted bollworm in different treatment plots were non-significant (DF=17; F=1.20; P=0.36) for pre-treatment, while significant variation was found (DF=17; F=29.92; P=0.01) after 3rd day, (DF=17; F=36.19; P=0.02) after 7th day, and (DF=17; F=42.65; P=0.03) after 14th post-spray days. The different letters show the significant difference among the insecticides found at (P< 0.05) level as their justification given in (Fig. 3).

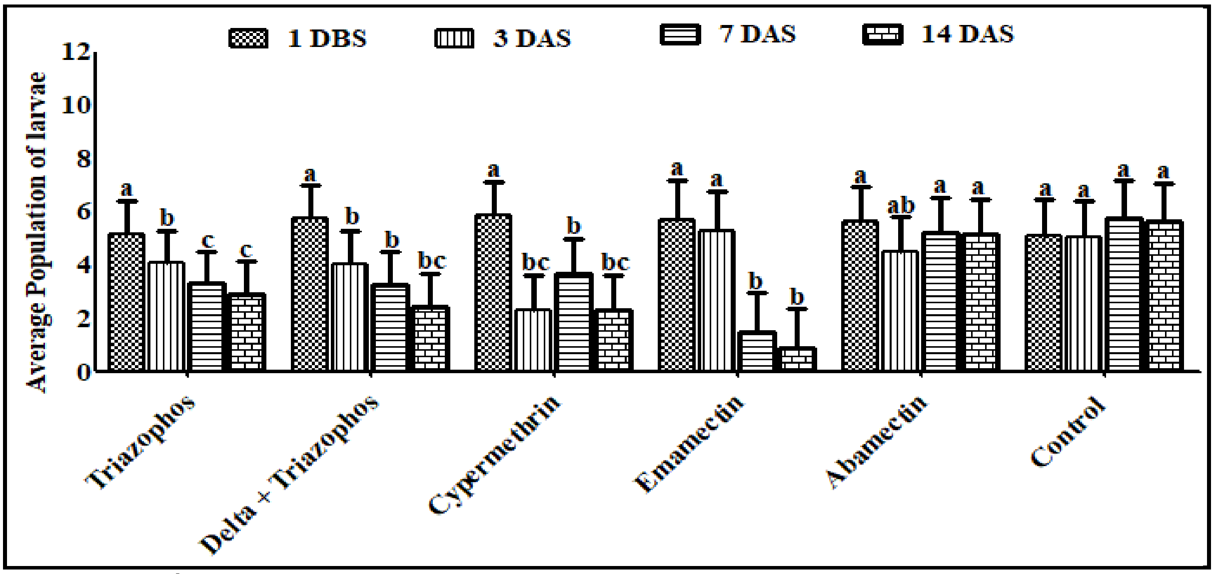

Fig. 3. After 2nd spray efficacy of different insecticides against spotted bollworm

Overall reduction % of 2nd spray against spotted bollworm: The efficacy of 2nd spray on the basis of spotted bollworm reduction % showed among insecticides, abamectin showed the highest efficacy (78.87%), followed by emamectin (60.35%), cypermethrin (54.25%), deltamethrin+triazophos (50.65%) and triazophos (47.55%). In control (water-washed) plot, the spotted bollworm population remained stable during the entire monitoring period of 14 days after the 2nd spray. On the basis of insecticides efficacy, the treatments ranked as abamectin, emamectin, cypermethrin, deltamethrin+triazophos, and triazophos. Hence; the triazophos and the combination within the deltamethrin+triazophos also showed little difference in their effectiveness against spotted bollworm, respectively. The overall reduction % of the insect pest after 2nd spray against spotted bollworm is depicted in (Fig. 4). The different letters on the error bar show the significant difference among the insecticides found at ($P< 0.05$) level.

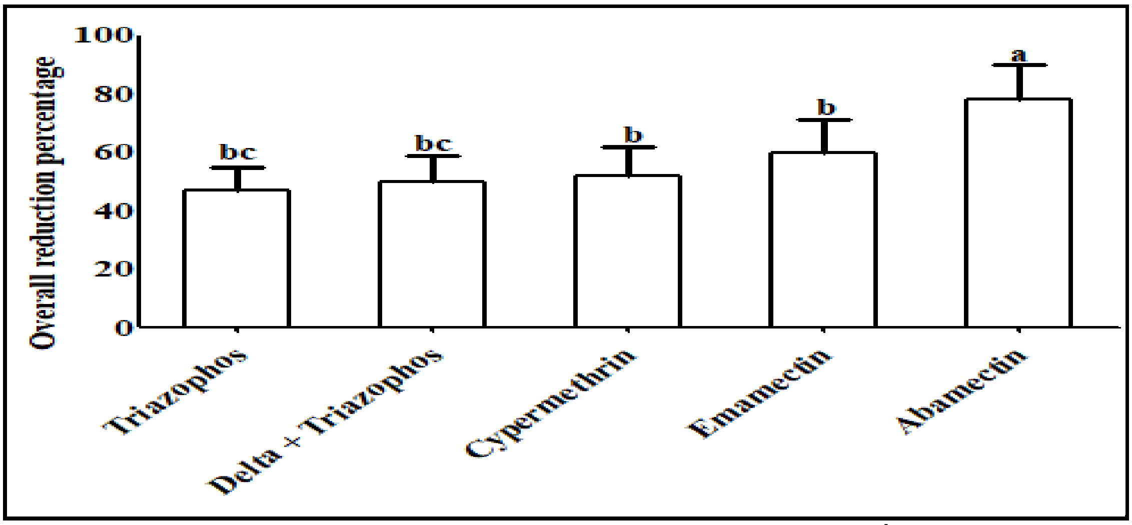

Fig. 4. Overall reduction % of different time intervals of spotted bollworm 2nd spray

1st spray against pink bollworm: The treatment effect showed that the pre-treatment counts of pink bollworm in plots sprayed with triazophos, deltamethrin+triazophos, cypermethrin, emamectin, abamectin, and control was (5.62), (6.55), (6.82), (5.26), (6.76) and (7.07) per leaf which decreased to (1.84), (2.26), (2.00), (1.95), (0.35) and (6.87) per leaf, giving pest reduction % of (3.78), (4.29), (4.82), (3.31), (6.41) with control mean at (0.20) per leaf, respectively after 14th day of spray. The population of pink bollworm population on cotton crop found non-significant difference (DF=17; F=1.09; P=0.40) before the application of insecticides. The population of pink bollworm found significant differences in plots sprayed with different insecticides after 3rd days (DF=17; F=35.81; P=0.01), 7th days (DF=17; F=70.47; P=0.02), and 14th days (DF=17; F=101.28; P=0.03) after 1st spray. The different letters in (Fig. 5), indicate the significant difference among the applied insecticides against pink bollworm found at ($P< 0.05$) level, respectively.

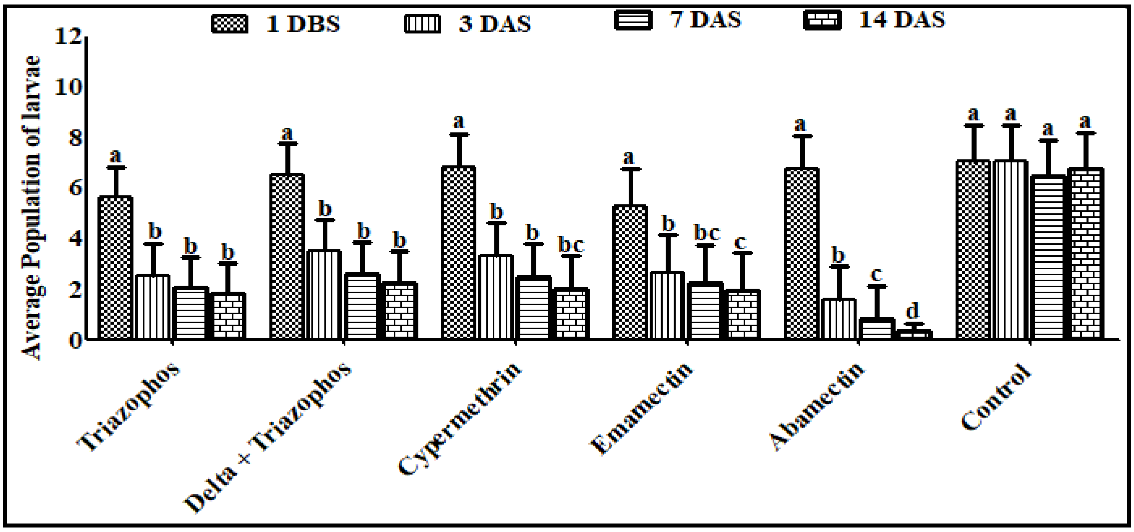

Fig. 5. After 1st spray efficacy of different insecticides against pink bollworm

Overall reduction % of 1st spray against pink bollworm: The overall reduction % after 1st spray against pink bollworm and the efficacy of insecticides on the basis of insect highest reduction % showed abamectin (94.75%), followed by deltamethrin+triazophos (73.25%), cypermethrin (70.45%), triazophos (65.25%), and emamectin (62.45%). In control (water-washed) plot, the pink bollworm population was found throughout the monitoring period till 14th days after spray. It was concluded that insecticides ranked for their efficacy as abamectin, cypermethrin, triazophos, deltamethrin+triazophos, and emamectin. Statistically, all the insecticides remained effective but abamectin with maximum efficacy compared to other insecticides. The different letters in (Fig. 6), show the significant difference among the treatments found at the level (P< 0.05).

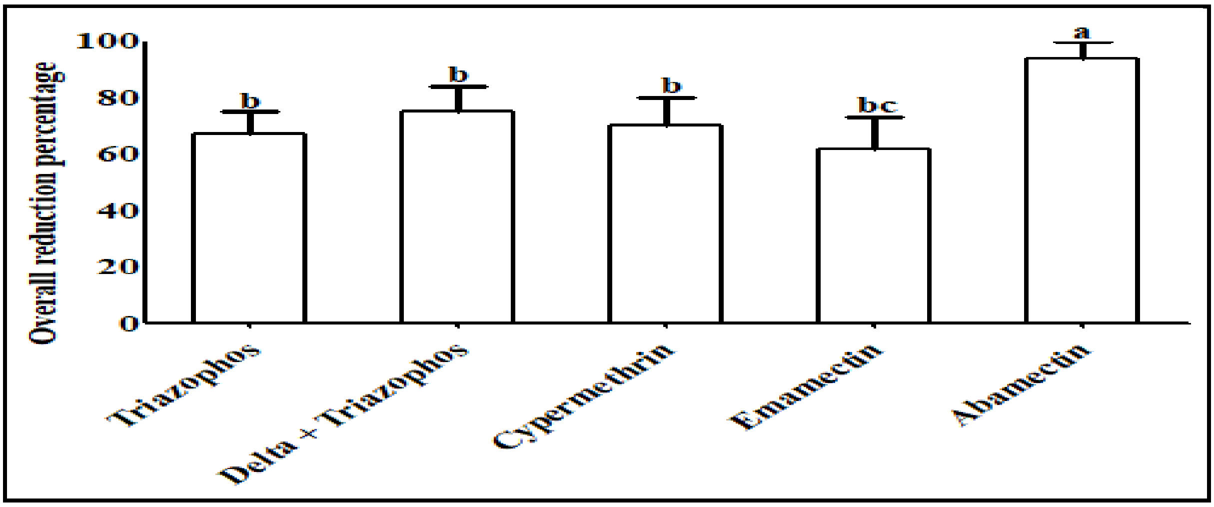

Fig. 6. Overall reduction % of different time intervals of pink bollworm after 1st spray

2nd spray against pink bollworm: The pre-treatment counts of pink bollworm in plots sprayed with triazophos, deltamethrin+triazophos, cypermethrin, emamectin, abamectin, and control (water-washed) was (5.63), (6.30), (6.35), (5.39), (6.76) and (6.17) per leaf which decreased to (1.68), (2.15), (1.75), (2.12), (0.14) and (5.85) per leaf after 14th days of spray, giving pest reduction % of (3.95), (4.15), (4.60), (3.27), (6.62) with control mean at (0.32) per leaf, respectively. The population fluctuations of pink bollworm in different cotton plots were found non-significant (DF=17; F=0.94; P=0.40) in pre-treatment. While significant difference was observed after 3rd days (DF=17; F=51.89; P=0.02), 7th days (DF=17; F=117.01; P=0.02), and 14th days (DF=17; F=155.65; P=0.03) after post-treatment. The different letters in (Fig. 7), indicate the significant difference among the applied insecticides found at (P< 0.05) level, respectively.

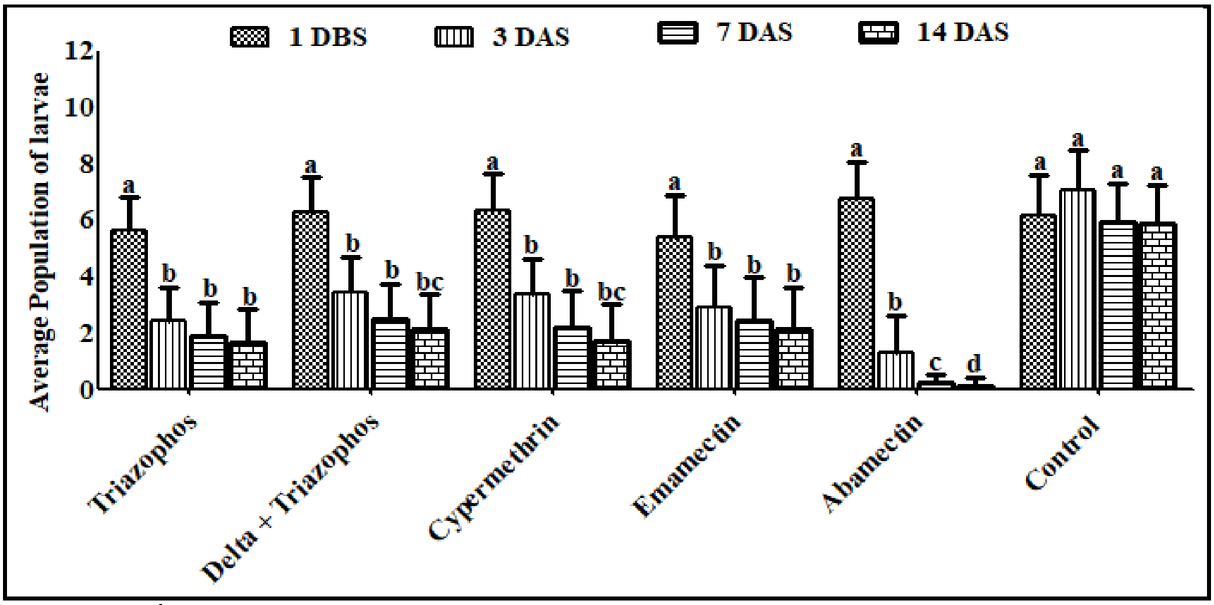

Fig. 7. After 2nd spray efficacy of different insecticides against pink bollworm

Overall reduction % of 2nd spray against pink bollworm: The overall reduction % after 2nd spray against pink bollworm and the efficacy of insecticides, abamectin found with highest reduction (97.15%), followed by cypermethrin (71.35%), deltamethrin+triazophos (63.65%) emamectin (60.75%), and triazophos (59.55%), against the population of pink bollworm. In control (water-washed) plot, the pink bollworm population remained steady during the whole monitoring period up to the 14th day after 2nd spray. On the basis of insect reduction % caused by insecticides, the treatments ranked as cypermethrin, triazophos, deltamethrin+triazophos, emamectin. Triazophos, deltamethrin+triazophos, cypermethrin, and emamectin but abamectin with maximum efficacy compared to other insecticides against pink bollworms. The different letters in (Fig. 8), show the significant difference among the treatments found at ($P< 0.05$).

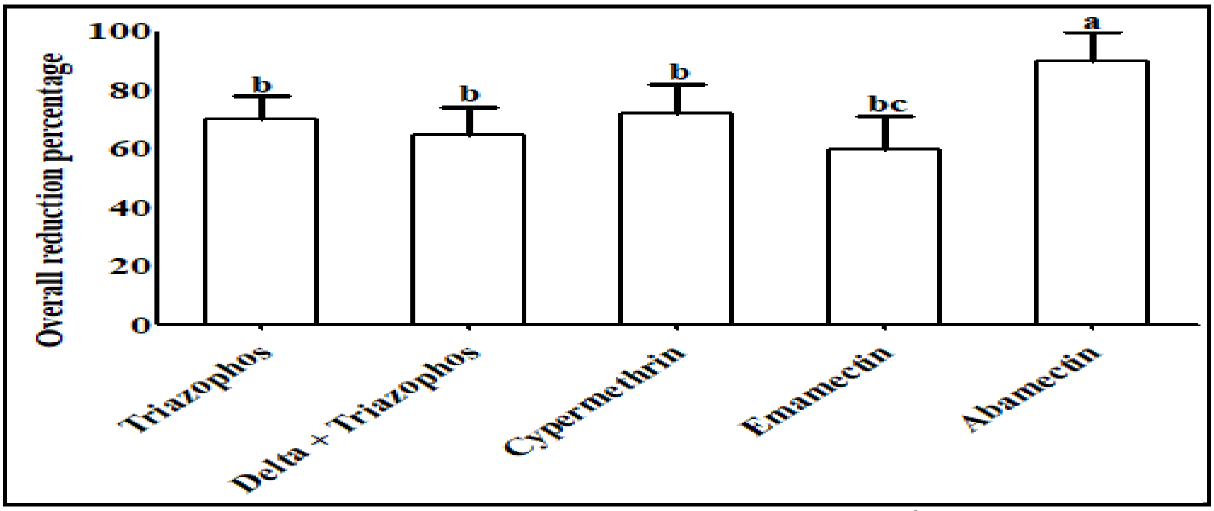

Fig. 8. Overall reduction % of different time intervals of pink bollworm after 2nd spray

DISCUSSION

The findings of the current study showed that after 1st spray against bollworms, abamectin found with highest reduction % followed by deltamethrin+triazophos, cypermethrin, emamectin, and triazophos. Our findings are in agreement with (Awan and Saleem, 2012), who reported that cypermethrin+deltaphos 360 EC, cypermethrin+confidor 200SL, deltaphos 360EC+confidor 200SL, and deltaphos 360 EC+confidor 200SL were effective against *E. insulana*. (Hanchinal *et al*., 2018), applied spinetoram 10%+sulfoxaflor 40%, and (Salama *et al.*, 2013), used spinosad, methomyl, indoxacarb, azadirachtin, lambda-cyhalothrin, oxymatrix, prosuler, methomyl, and *Bacillus thuringiensis* all insecticides proved effective against pink bollworms. After 2nd replication against spotted bollworm, abamectin showed the highest efficacy compared to emamectin, cypermethrin, deltamethrin+triazophos, and triazophos with the work similarity (Akhtar *et al*., 2016), found high survival rate of the pink bollworm on transgenic and non-transgenic cotton but resistance power has evolved against transgenic cotton under field and laboratory conditions. (Asif *et al.,* 2016) applied confidor 200 SL+imidacloprid 100mL, nockout 25SP+nitenpyram 100gm, karate 1.5EC+lambad 330ml, talstar 10EC, polytrin-C 44EC+cypermethrin 600ml, per acre after 24h, 72h, and 7th days against sucking complex and nitenpyram proved most effective. After 2nd spray in first replication against bollworms, abamectin caused the highest efficacy power followed by deltamethrin+triazophos, cypermethrin, triazophos, and emamectin. As results are in agreement with the (Aslam *et al*., 2020), reported confidor was jassid, mospilan actara, mospilan, and tamron insecticides were the most effective against bollworms. Hence, the results are co-related to the research conducted by (Mangrio and Sahito, 2022-23) who applied belt, regent, coragen, helmet, and emamectin and proved the belt with maximum reduction % against the larvae of *P. demoleus* on *C. limon* leaves. After 2nd replication against pink bollworm, the abamectin was found with highest reduction % followed by cypermethrin, deltamethrin+triazophos, emamectin, and triazophos also (Khan *et al*., 2007), applied emamectin benzoate, cypermethrin, deltaphos, cypermethrin, karate and all insecticides found effective against *E. insulana* and *E. vittella.* (Badii and Asante, 2011) used busulfan, and endosulfan, but triazophos 40 EC found the greatest control of spotted bollworms. (Hafeez *et al*., 2019) applied lufenuron insecticide and esterase, monooxygenase, cytochrome P459, and glutathione transferase against *E. vittella* and proved effective as reduced adult longevity, pupal weight, fecundity, and egg but no effect was observed on reproductive parameters. (Tomar, 2009), used indoxacarb 14.5 SC, endosulfan 35EC, *Bacillus thuringiensis* but spinosad 45 SC, most effective against spotted bollworms and pink bollworms. (Abd El-Mageed *et al*., 2007) applied beta-cyfluthrin, malathion, spinosad, and lufenuron insecticides against *E. insulana* and *P. gossypiella* but cygron proved with more efficacy against pink bollworms. (Tadas *et al.,* 1994), applied endosulfan, polytrin-C, and chlorpyriphos and found positive control against the population reduction of pink bollworms. For insect pest management the IPM is a wide ecological approach and potential key solution within single management system that combines several control approaches and stable eco-friendly IPM techniques are the best tool for future endeavors (Mangrio *et al*., 2020). It is needed to develop modern cultivation strategies to enhance crop protection and productivity.

CONCLUSION

The cotton crop is economically important and cash crop grown in every corner of Sindh, Pakistan, but cotton bollworms are vigorous internal feeders causing extensive boll damage and it is very difficult to control with the application of insecticides. However, in the current scenario, against cotton insect pest species insecticides should be used as the last option to minimize or reduce the pest population at general equilibrium level. The present research work proved that after the application of five different insecticides against the larvae population of *Earias vittella*, *Pectinophora gossypiella*, abamectin found most effective with more efficacy power followed by cypermethrin, deltamethrin+triazophos, emamectin, and triazophos. It is strongly needed and immediate call to implement advanced control measures to combat the cotton potential insect pests and to boost cotton yield.

RECOMMENDATIONS

In Pakistani ecosystems, different categories of insects are attacking cotton crop but spotted bollworm and pink bollworm cause serious damage to cotton, resulting in huge yield losses annually. However, many insecticides are not always effective due to the narrow window for boll damage between hatching and penetration into the cotton bolls. Nowadays, pesticide residues, environmental pollution, and pest resistance power are caused by the massive application of chemical insecticides. It is recommended to apply different control measures instead of depending on the most toxic insecticides are needed to explore.

AUTHOR'S CONTRIBUTION

W.M. Mangrio is the main author of this research paper who arranged materials, data analyzed, and wrote the paper. Z.A. Chachar performed experiments and data collected. H.A. Sahito played key role as supervised point by point throughout the completion of this scientific work. F.I. Sahito designated, conceived, and arranged tools. K.A. Pathan and A.H. Mastoi helped in the article review to be finalized.

IMPACT STATEMENT

However, cultivation point of view Pakistan occupied the 5th position in cotton yield after China, considering the above facts, here is the dire need to enhance the production of cotton is an urgent prerequisite, especially in Pakistan. For the conservation of susceptibility, it is necessary to select the right insecticide and should apply them at the recommended dose. The insecticide which develops resistance to pests and induces vegetative growth should be avoided.

DECLARATION AND COMPETING INTEREST

The authors of the manuscript declare that there is no financial or personal relationship regarding the work is detailed described in this research manuscript.

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AVAILABILITY OF DATA AND MATERIALS

All the findings of this research paper are due to the ethical privacy and restrictions available at the request of the corresponding author.

CONSENT FOR PUBLICATION

For releasing this scientific research documentary, the corresponding author accepts all responsibilities.

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