COMPARATIVE EFFICACY OF PESTICIDES AGAINST SUCKING INSECTS PEST OF COTTON (*Gossypiumhirsutum L.*) CROP UNDER ARID CONDITION.

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ABSTRACT*: The experiments were conducted during the year 2015, at Adaptive Research Farm Karor District Layyah Punjab,Pakistan and at farmer field mouzasergani, tehsil karor using cotton variety Bt. MNH- 886 with seed rate of 25 kg ha^{-1}.The objective is to determine the efficacy of different pesticides against sucking insect's pest of cotton (Gossypiumhirsutum L.) crop under arid condition.The insecticide Ulala (Flanicamid 50 % WG) @ 148.26 gmha^{-1} is best against all the sucking pest of cotton under arid condition. The experiment was designed in randomized complete block design with five treatments viz, T1. Flyban 10.8EC (Pyriproxyfin11.3% W/W) @ 1235 mlha^{-1} T2. Decode 36% SC (Chlorofinapyre) @ 556 ml ha-1, T3. Ulala (Flanicamid 50 % WG) @ 148.26 gmha^{-1}, T4. Calypso (Thiacloprid) 240 SC) @625 mlha^{-1}, T5 (control) and replicated three times. The yield 1963.60 kgha^{-1} was maximum in T3 (Ulala (Flanicamid 50% WG) @ 148.26gmha^{-1}) that was significant to all other treatments yield.*

Keywords: Cotton (*Gossypium hirsutum L.*) ,sucking pests, insecticides, arid zone, Pakistan.

INTRODUCTION

Cotton, *Gossypiumhirsutum*L. (family Malvaceae) is one of the major cash crops of Pakistan and is also known as silver fiber [1].The cotton crop manufacture accounts for 1.5 percent in GDP and 7.1 percent in agriculture assessment addition. During July-March 2014-15, textile industry fetched foreign exchange of US$ 10.22 billion. During 2014-15, the cropped area of cotton stood at 2961 thousand hectares, screening an increase of 5.5 percent over last year's area of 2806 thousand hectares. Cotton production for the year 2014-15 stood at 13.983 million bales against 12.769 million bales last year performance an increase of 9.5 percent [2]. It is a main earning source of foreign substitute and occupies the largest section after wheat. The millions of farmers are reliant on this crop along the whole value chain from weaving to textile, clothing exports, good fabrication and consumption in the country [3, 4, 5]. After U.S.A and China, Pakistan is ranked third largest producer of lint in the world and comes at fifth position in cotton consumption [6].

The yield of cotton in Pakistan is still lower than cotton mounting countries [7]. Insects are imperative in agriculture due their beneficial as well as critical aspects [8,9]. Insect pests are considered as the foremost threat and hurdle in improving cotton production. It is predicted that about 20-40% losses take place annually due to different insect pests of cotton [10, 11].

Ninety three insects and mites are reported to attack cotton crop in Pakistan [12]. A few years ago, bollworms were severe problems to cotton crop causing serious loss to cotton crop but with the opening of Bt-cotton, the problem of bollworms has been reduced to some point except armyworm. Now the main problem to cotton crop is the attacks of sucking insect pests, especially jassid and whitefly [13]. Important sucking insect pests are jassid (*Amarascadevastans)*, whitefly*Bemisiatabaci*(Genn.), cotton thrips, *Thripstabaci*Lind.(Thysanoptera: Thripidae) and cotto aphid, *Aphis gossypii*Glover. In which whitefly (*Bemisiatabaci*Genn.), jassid (*Amrascabiguttulabiguttula*Ishida) and thrips (*Thripstabaci*Lind.) are more deleterious to the cotton which causes collectively 40-50 percent damage in the crop [14].

Mode of damage of cotton whitefly;

Whitefly causes enormous damage to the cotton crop, by sucking the cell sap from under surface of leaves, it secrets the honey dews, as a result sooty mold grows which reduces the photosynthetic area of leaves and transmitting the viral diseases to cotton crop [15].

Mode of damage of cotton Jassid;

Jassid is most critical sucking pest [16].It sucks the cell sap and injects the poisonous saliva insideveins during feeding. Due to heavy attack at early stage reduced plant growth, cause the abortion of the first fruiting branch and increase detaching of squares and young bolls by heartwarming the photosynthesis [17, 18 , 19]).In case of cotton jassid it has been reported that it causes up to 23.67% reduction in cotton yield [20].

Mode of damage of cotton Thrips;

Thrips *(Thrips tabaci)* assault cotton crop early in the season but high inhabitants densities can be seen during second fortnight in September. Both nymph and adult stages of thrips damage the tissues and destroy leaves by sucking the cell sap. Due to the attack of this pest, leaves twist up and in case of severe attack ;plants remain underdeveloped at initial stage.

No single pest control method is adequate for good production. With effective control of cotton pests, yield of cotton can be increased by 200-300 kg ha^{-1}[21].Crop security with chemicals is advantageous and unavoidable part of integrated pest management [22]]. Evenin the technologically advanced countries, about three percent of market value of agriculture crops is spent on poisonous chemicals and their submission. In Pakistan, pesticides worth more than 10 billion rupees are imported, out of which about 70-80% are sprayed alongside cotton pests. To find out the specific chemicals the efficiency of different insecticides was investigated and reported in this document.

MATERIALS AND METHODS

Location

The experiments were conducted during the year 2015, at Adaptive Research Farm Karor District Layyah Punjab,Pakistan and at farmer fieldmouzasergani, tehsil karorusing cotton variety Bt. MNH- 886 with seed rate of 25 kg ha^{-1}.The fertilizers NPK was applied as per recommendation and standard agronomic practices were given at a proper time.The experiment was laid out in Randomized Complete Block Design (RCBD).

Treatments

Trials were comprised of five treatments viz, T1. Flyban 10.8EC (Pyriproxyfin11.3% W/W)@ 1235 ml ha^{-1} T2. Decode 36% SC (Chlorofinapyre) @ 556 ml ha^{-1}, T3. Ulala (Flanicamid 50 % WG) @ 148.26 gm ha^{-1}, T4. Calypso (Thiacloprid) 240 SC) @625 ml ha^{-1}, T5 (control) and replicated three times. The treatments were applied after performing the proper pest scouting of sucking insects and pests.

Pest scouting and Data recording

For the assessment of insect pests of cotton a diagonal method was used. To assess population of sucking insects, data were recorded early in the morning by counting number of Sucking insect & pest through the use of magnifying lens on six randomly selected plants per treatment. Three leaves of upper, middle and lower portion from these different plants were observed. The crop was sprayed when the pest attack reached economic threshold level. .e. Jassids:1 adult/nymph per leaf [23], White fly 5 nymph or adult/leaf, thrips 8-10 nymph or adult/leaf . Insecticides were dissolved in water to prepare insecticide solutions on vol. / vol. and Wt. / Vol. basis. Pest scouting 24 hours, 72 hours and 7 days after spray was done. The crop was sprayed in the morning before 9 a.m. Pre and post spray data on the number of live nymphs & adults were recorded on five randomly selected plants per treatment. Post spray data were recorded at the intervals of 24 hrs, 36 hrs and 7 days by counting the total number of live nymphs & adults on five randomly selected plants in a treatment. The mean number of the pest per plant was computed and data generated was statistically analyzed.

Parameters

The following growth parameters including plant height (cm) and yield parameters include the No.of bolls $plant^{-1}$, Boll weight (gm) and yield kg ha^{-1} also recorded

Statistical Analysis

Year wise data was subjected to statistical analysis separately by using analysis of variance technique. The difference among treatment means was compared by using least significant difference test at 5% probability level [24].

RESULTS AND DISCUSSION

A. RESULTS

Plant Height (cm)

Data presented in table I & II showed significant differences among the treatments regarding Ph (cm) of cotton in both the locations. Data revealed in table-1 that maximum ph 160 cm was obtained in T3, where insecticide ulala was applied @ 148.26 gm ha^{-1}which is statistically significant to T1(154cm) & T2 (150 cm) where flyban& decode were applied respectively.It is due to high efficacy of ulalaas compared to other insecticides.Plant height remain stunted in T5 (control) is a due to heavy infestation of all sucking insects because no insecticide was sprayed in check treatment. The similar trend of results was observed in location : II as shown in table :II

Average Pest Population before Spray.

Data presented in table I & II showed significant population among the treatments regarding average pest population of white fly of cottonin T3, Jassid in T5 ,Thrips in T4 and Mite Population was similar in all the treatments except T3 in both the locations.

Pest scouting after 24 hour Spray (*Average Population*)

Data presented in table I & II showed significant differences among the treatments regarding Pest scouting after 24 hour Spray ,average minimum Population of cotton white fly was in T3, Jassid in T2, thrips in T2 and mite in T3 & T4 at both the locations. Data revealed in table-1 that minimum average population of pest was obtained in T3, where insecticide ulala was applied @ 148.26 gm ha^{-1} which is statistically significant to T1, T2 & T4 where flyban , decode &thiacloprid were applied respectively.It is due to high efficacy of ulala as compared to other insecticides.The maximum average pest population was in T5 (control) that was due to heavy infestation of all sucking insects because no insecticide was sprayed in check treatment.The similar trend of results was observed in location : 2 as shown in table :2

Pest scouting after 72 hour spray (*Average Population*)

Data presented in table I & II showed significant differences among the treatments regarding Pest scouting after 72 hoursof Spray ,average minimum Population of cotton white fly was in T3, Jassid in T2, thrips in T2 and mite in T3 & T4 at both the locations. Data revealed in table-1 that minimum average population of pest was obtained in T3, where insecticide ulala was applied @ 148.26 gm ha^{-1} which is statistically significant to T1, T2 & T4 where flyban , decode &thiacloprid were applied respectively.It is due to high efficacy of ulala as compared to other insecticides.The maximum average pest population was in T5 (control) that was due to heavy infestation of all sucking insects because no insecticide was sprayed in check treatment.The similar trend of results was observed in location : 2 as shown in table :2

Pest scouting after 7 days sprays (Average Population)

Data presented in table I & II showed significant differences among the treatments regarding Pest scouting after 7 days of Spray, averageminimum Populationof cotton white fly was in T3, Jassid in T2, thrips in T2 and mite in T3 & T4 at both the locations. Data revealed in table-1 that minimum average population of pest was obtained in T3, where insecticide ulala was applied @ 148.26 gm ha^{-1} which is statistically significant to T1, T2 & T4 where flyban , decode &thiacloprid were applied respectively. It is due to high efficacy of ulala as compared to other insecticides.The maximum average pest population was in T5 (control) that was due to heavy infestation of all sucking insects because no insecticide was sprayed in check treatment.The

Average boll weight in (gm)

Data presented in table I & II showednon-significant differences among the treatments regarding average boll weight (gm). The maximum average boll weight (gm) was in T3 and the treatment T1, T2 &T4 atboth the locations are at par with each other. Data revealed in table-1 that maximum average boll weight (gm) was in T3, where insecticide ulala was applied @ 148.26 gm ha^{-1}.It is due to high efficacy of ulala as compared to other insecticides. The minimum average boll weight (gm) was in T5 (control) that was due to

Table.1 Adaptive Research Farm Karor , District layyah, *location -I.*

Treatments	Plant Height (cm)	Average Pest Population before Spray				Pest scouting after 24 hour spray (Average Population)				Pest scouting after 72 hour spray (Average Population)				Pest scouting after 7days spray (Average Population)				Av.no. of bolls plant^{-1}	Av.boll weight in (gm)	Yield kg ha^{-1}
	Means	W/f	Jº	T€	M£	W/f *	Jº	T€	M£	W/f *	Jº	T€	M£	W/f *	Jº	T€	M£	Means	Means	Means
T1:**Flyban 10.8 EC(pyriproxyfin 11.3% w/w)1235 ml ha^{-1}**	154.33 ab	5a	1.66 a	11.33 a	0.33a	0.33b	0.66bc	0.66b	0b	1 b	1b	1 b	0 b	1.33 b	1.33 a	1.33 b	0.33 a	38.66 ab	2.65 a	1788 b
T2: **Decode 36% sc (chlorfinapyre) @ 556 ml ha^{-1}.**	150b	5a	1.33 a	12.66 a	0.33a	0.66b	0c	0b	0b	1 b	0.33b	0.33 b	0.33 b	1 b	0.66 b	0.66 b	0.33 a	38 bc	2.64 a	1675 c
T3:**Ulala (Flanicamid 50% WG) @ 148.26gm ha^{-1}.**	160 a	5.33 a	1.66 a	10a	0a	0b	1b	0.66b	0b	0.33 a	0.33 a	0.33 a	0.33 a	0.33 a	0.33 a	0.33a	0.33 a	41 a	2.99 a	1963.60 a
T4: Thiacloprid 240 SC (Calypso) @ 625ml ha^{-1}	155.66 a	4.33 a	2a	13a	0.33a	1b	0.33bc	0.33b	0b	1 b	0.66 b	1 b	0 b	1.66 b	1.33 a	1.33 b	0.33a	37.66 bc	2.64 a	1690 c
T5: **Control**	149 b	4a	2.33 a	10.33 a	0.33a	5.66a	3.33a	7.66a	1.33 a	6.66 a	4 a	13 a	1.33 a	11.33 a	11 a	14.66 a	1.33 a	36 c	2.44 b	1487 d

Abbreviation;
W/f *= White fly, **Jº**=Jassid, **T€**=Thrips, **M£**= Mite

Table.2 Mouzasergani, tehsil karor district layyah ,farmers field *location- II*

Treatments	Plant Height (cm)	Average Pest Population before Spray				Pest scouting after 24 hour spray (Average Population)				Pest scouting after 72 hour spray (Average Population)				Pest scouting after 7days spray (Average Population)				Av.no.of bolls plant^{-1}	Av.boll weight in (gm)	Yield kg ha^{-1}
	Means	W/f *	Jº	T€	M£	W/f *	Jº	T€	M£	W/f *	Jº	T€	M£	W/f *	Jº	T€	M£	Means	Means	Means
T1:**Flyban 10.8 EC(pyriproxyfin 11.3% w/w)1235 ml ha^{-1}.**	151ab	6a	2.33 a	7.33 a	0.33a	0.33b	0.33a	0.33 b	0a	0.66b	0.66 b	0.66b	0b	1b	1.33b	1.33 b	0.33a	38.66 ab	2.64a	1782 b
T2: **Decode 36% sc (chlorfinapyre) @ 556 ml ha^{-1}.**	150.66 b	7a	3.33 a	5.66 a	0.66a	0.66b	0b	0b	0.33 a	0.66b	0.33 b	0.33b	0.33ab	1b	0.66b	0.66 b	0.33a	37.66bc	2.70a	1670 c
T3:**Ulala (Flanicamid 50% WG) @ 148.26gm ha^{-1} .**	161a	7a	3a	5.33 a	0.33a	0.33b	0.66b	0.33 b	0.33 a	0.33b	0.66 b	0.66b	0.33ab	0.33 a	0.33a	0.33 a	0.33a	40.66a	2.77a	1955.60 a
T4: Thiacloprid 240 SC (Calypso) @ 625ml ha^{-1}.	156.66 a	8.33a	2.33 a	5.66 a	0a	0b	0.66b	0.66 b	0a	1b	1b	1b	0b	1.66 b	1.33b	1.33 b	0a	37.66bc	2.67a	1678 c
T5: **Control**	150b	7a	3a	7a	0.33a	0.33a	4.33a	8.66 a	0.66 a	11.33 a	4.66 a	9.66a	1a	13.33a	5.33a	12.33a	0.66a	35c	2.44b	1479 d

Abbreviation;W/f *= White fly, **Jº** =Jassid, **T€**= Thrips ,**M£**= Mite

heavy infestation of all sucking insects because no insecticide was sprayed in check treatment. The similar trend of results was observed in location: 2 as shown in table: 2

Yield kg ha^{-1}

The data pertainining to the cotton yield at both locations showed highly significant difference among the treatmemts. The analysis of data regarding the cotton yield at location; 1 as indicated (Table 1) showed that T3 (Ulala (Flanicamid 50% WG) @ 148.26gm ha^{-1}) was significant as compared to all other treatments. It had maximum yield 1963.60 kg/ha that was significant to all other treatments yield. The yield of treatment T2: Decode 36% sc (chlorfinapyre) @ 556 ml/ha and T4: Thiacloprid 240 SC (Calypso) @ 625ml ha^{-1}was at par with each other. The minimum yield 1487 kg ha^{-1} was recorded in T5: (Control).

B. DISCUSSION

[25], reported that continuous use of Confidor may result in increase in whitefly population, [26] found that both Confidor and Polo resulted almost 72.6% mortality of whitefly, , [27]they investigated that Confidor effectively controlledcotton Thrips, [28]found that Confidor 200 SL was significantly more effective against jassid than Polo at 24 hours and 72 hours after spray. Our findings demonstrated thatnew chemistry insecticide (Ulala (Flanicamid 50% WG) @ 148.26gm ha^{-1}) was highly effective against whitefly, jassid,thrips and miteas shown in table 1. So that thisnew chemistry insecticides(Ulala (Flanicamid 50% WG) @ 148.26gm ha^{-1}) can be recommended to the growers in arid zone to manage the population of the sucking insect pests of cotton below economic threshold.

CONCLUSION

The insecticide (Ulala (Flanicamid 50% WG) @ 148.26gm ha^{-1}) was more effective against all major sucking pest of cotton and thus the yield of cotton crop was maximum 1264 kg ha^{-1}

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