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Research Article

Efficacy of Different Pesticides For The Control of Cotton Jassid Under The Changing Arid Envirnoment of Thal Zone

Muhammad Irshad[1], Ghulam. Abbas[2], Marghub. Amer[2], Muhammad Bukhsh Khokhar[2], Muhammad Ahmad[3*], Muhammad Zakria[3] and Ghulam Abbas Khan [4]

[1]Pest Warning and Quality Control of pesticides, Layyah, Punjab, Pakistan
[2]Adaptive Research Farm, Karor, Layyah, Punjab, Pakistan
[3]Agricultural Training Institute, Karor, Layyah, Punjab, Pakistan
[4]Adaptive Research Station, Mianwalli, Punjab Pakistan
*Corresponding author: *mahmada2003@yahoo.co.uk*

Abstract

Prolonged summer season has magnified the infestation of jassid in Thal zone. Therefore, experiments were, conducted for two consecutive years 2012, and 2013 at Adaptive Research Farm, Karor Lal Eason, Layyah, Pakistan to evaluate the efficacy of different pesticides for the control of cotton jassid under arid environment, using cotton variety Bt- 886 with seed rate of 25 kg ha-^{1} during both year. The insecticides used for the management of jassid in the changing climate of Thal zone are given below:

S.No	Insecticides		Source	Dose ha^{-1}
	Active Ingredient	Trade Mark		
1	Nytenyram	Paramid 10 SL	Kanzo AG	625 ml
2	Thiamethoxam	Actara 25WP	Syngenta	60 gm
3	Acephate	Acephate 75SP	Target	825 gm
4	Dimethaote	Dimethoate 40 SL	Swat Agro	1000 ml
5	Thiocloprid	clypso 240 SC	Bio Traders	625 ml

It was observed that Acephate increased seed cotton yield (1292 Kg ha^{-1}) by 22.7 % over the control during 2012, and in the next cropping season 2013, Nitenpyram @ 625ml ha^{-1} gave maximum yield (1698.7 kg ha^{-1}). Overall results indicated that treatment Acephate 75WP @ 825gm ha^{-1} and Nitenpyram @ 625ml ha^{-1} recorded 22.7% and 18.95% increase in yield over control plot during cropping season 2012 and cropping season 2013 respectively ,due to better control of jassid in cotton crop. The reason of this increase was high mortality of jassid, for prolonged duration of sustainable management of jassid, better development and growth of cotton in terms of boll weight and number of bolls per plant. It is therefore, suggested that Acephate should be preferably used for jassid management in climate of Thal zone.

Keywords: Cotton, Jassid, insecticides, arid zone, Punjab, Pakistan.

Introduction

Cotton (*Gossipium hirsutum.* L) is the backbone of the economy of Pakistan. Cotton is one of the main cash crops of Pakistan. It is preliminary grown for fiber, but its seed provides edible oil for human and important animal feed, also economic manure (Khan *et al*., 1995). The cotton lint, cloth yarn and garments are big source of foreign exchange (Awan, 1994).It is cultivated on an area about 2879000 hectares with the total annual production of 13026000 bales (Anonymous, 2013)

A lot of factors are contributing towards low yield, but the intense attack of sucking insect pest complex play an important role in the reduction of yield (Aslam *et al.,* 2004). Insect pests are the key source of crop damage in Pakistan and elsewhere in the world, reducing the yield and deteriorating the quality of the end product. Cotton crop known as white gold is the most hit crop in Pakistan by various insect pests. The sucking pests causes about 40-50% damage to cotton crop .Cotton crop is attacked by 145 insect pest species. These insect pests caused 30% reduction in cotton yield in Pakistan (Bo, 1992). *Bemisia tabaci, Amrasca devastans, Thrips tabaci, Earias insulana, Pectinophora gossypiella* and *Helicoverpa armigera* are the major insect pests of cotton crop. These pests directly reduce the quantity by feeding on cotton crop and indirectly reduce the quality of the product by transmitting different diseases.

Cotton jassids and cotton whitefly are regular sucking insect pests of crop. Cotton yield is very low as similarly some population of jassids has been reported to be resistant against pesticides (Ahmed *et al*., 1999) compared to other cotton growing countries. Jassid (*Amrasca biguttula biguttula* Dist.) (Hemiptera: Cicadellidae), a sucking pest alone causes 24.45% (Bhat *et al.,* 1986), 18.78% (Ali, 1992) reduction in cotton production. Jassids are reported to 19 percent reduction in cotton yield in cotton yield (Ali, 1992: Uthamasamy, 1994.).

Jassid sucks the cell sap and reduces the photosynthetic area of the plant. Both nymphs and adults cause damage to the crop by injecting its toxic saliva into tissues. Further investigation has found that extreme damage during mid season reduce yield and if the same amount of damage occurs late in season yield is heavily reduced (Borah,1995; Patel and Patel,1998; Rafique and Shah,1998; Sudhakar *et al*.,1998).

According to an estimate bollworms and sucking pest complex cause about 20-40% yield losses in Pakistan. No single pest control method is sufficient for good production. With effective control of cotton pests, yield of cotton can be increased by 200-300 kilogram/hectare (Khan *et al.,* 1987). Crop protection with chemicals is desirable and unavoidable part of Integrated Pest Management (Mohyuddin *et al.,* 1997.).So it is very important to overcome the incidence of insect pests attack in order to fulfill the food and clothing necessities of the country. The most successful method in managing cotton insect pests after resistant varieties is chemical control, but should only be used as final option (Korejo *et al.,* 2000).Insecticides have been the only weapons to control these insect pests (Afzal and Ali, 1983). Economic Threshold Levels (ETL) has been suggested to reduce pesticide loads. A huge number of synthetic pesticides are used annually for the control of these pests. No doubt agrochemicals have a major role in improving yields in food production (Dinham *et al*., 1993)

Present study was therefore conducted to compare the efficacy of conventional insecticides under the field conditions to know that either these insecticides can reduce the population of jassids below ETL.

Keeping in view the importance of pest, socio-economic status of the crop the present the study was therefore conducted to compare the efficacy of conventional insecticides against cotton Jassids under the field conditions of arid zone of Karor region (Distt. Layyah) to know that either these insecticides can reduce the population of jassids below ETL or not?

Materials and Methods

The experiments were conducted during two consecutive years 2012 and 2013, at Adaptive Research Farm, Karor, District Layyah, Punjab, Pakistan using cotton variety Bt- 886 with seed rate of 25 kg ha^{-1} during both years. The crop was sown in 5 x 3.5 m^2 plots maintaining 25 cm and 75 cm inter plant and inter row distances. The crop was applied two times NPK and standard agronomic practices were given at a proper time. The experiment was laid out in Randomized Complete Block Design (RCBD). Trials were comprised of six treatments *viz*., $T_{1:}$ Control (no pesticide), $T_{2:}$ Nitenpyram (Pyramid) 10 SL @ 625 ml ha^{-1}, $T_{3:}$ Thiamethoxam 25WSP (Actara) @ 60 gm ha^{-1}, T_4: Acephate 75WSP@ 825 gm ha^{-1} , T_5: Dimethoate 40EC @1000 ml/ ha^{-1} and T_6: Thiachloprid 240SC (Calypso) @ 625 ml ha^{-1} and replicated three times.

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 jassids, 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 ETL *i.e*. jassids: 1-2 adult/nymph per leaf (Ahmad et al., 2000). Insecticides were dissolved in water to prepare insecticide solutions on volume / volume and weight / volume basis. The crop was sprayed in the morning before 9 a.m. Pre and post spray data on the number of live adults of jassids were recorded on 5 randomly selected plants per treatment. Post spray data were recorded at the intervals of 24 hours, 36 hours and 7 days by counting the total number of live 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.

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 (Steel *et al*., 1997).

MORTALITY OF COTTON JASSID DURING CROPPING SEASON, 2012

Mortality of jassids 24 hours after spray

The data regarding mortality of jassids 24 hours after spray are given in table-1. All treatments decreased the mean population of jassid as compared to control. The maximum decreased in the mean population of jassids (0.40) was recorded in plot treated with Actara 25WG (Thiamethoxam) followed Acephate 75WP (0.62) that is at par with Niterpyron (0.46). All the treatments gave significant control of jassid population over control (2.00).

Mortality of jassids 36 hours after spray

The data regarding mortality of jassids 36 hours after spray are presented in table-1. All treatments decreased the mean population of jassids for leaf as compared to control. The minimum population of jassids (1.2) was recorded per treatment T_6 where Thiacloprid was applied. The result is at par with rest of the treatments. The maximum mean population was found in treatment T3 where Thiamethoxam was applied.

MORTALITY AND JASSIDS POPULATION DURING CROPPING SEASON, 2013

Mortality of jassids 24 hours after spray

The data regarding mortality of jassids 24 hours after spray are given in table-II. All the treatments gave significant control over jassids population as compared to control. However the differences among treatments are non-significant. The minimum mean population (0.33) was recorded in treatment T_4 = Acephate 75WP @ 825gm/ha was applied that is at par with rest of the treatments. The mean maximum population was recorded (2.80) in control plots (T1).

Mortality of jassids 36 hours after spray

The data regarding mortality and mean jassids population is shown in table-II. All the treatments gave significantly control over jassids population as compared to control. The minimum jassids mean population (maximum mortality) was recorded in the treatment T_2= Nitenpyram @ 625ml/ha was applied followed by T_4=Acephate 75WP @ 825gm/ha that is statistically similar to treatment T_3, T_5 and T_6. The maximum insect population (1.90) was recorded in treatment T_3 after 36 hours after spray.

Effect of Insecticides on yield of cotton during cropping season 2012 and 2013

The effects of insecticides on number bolls, boll weight and yield (kg/ha) of cotton are shown in table-III. The results indicate that all insecticides had positive impact on per hectare yield of seed cotton during both cropping season, 2012 and cropping season, 2013. However the differences in yield among treatments are significant. The treatment T_4-Acephate @ 825gm/ha gave maximum yield (1292 kg/ha) followed by Thiamethoxam and Dimathoate that are significantly at par with T2 and T6 during cropping season 2012. In the next cropping season 2013, Nitenpyram @ 625ml/ha gave maximum yield (1698.7 kg/ha) followed by Thiamethoxam (1592.0 kg/ha), Acephate (1591.8 kg/ha). The minimum yield was recorded in control plot. Overall results indicated that treatment Acephate 75WP @ 825gm/ha and Nitenpyram @ 625ml/ha recorded 22.7% and 18.95% increase in yield over control plot, respectively, during cropping season 2012 and cropping season 2013 respectively due to better control of jassids in cotton crop. The less yield of cotton during cropping season

is due to cotton leaf curl virus incidence on cotton crop.

DISCUSSION

Cotton jassids during, 2012 considered the yield of cotton up to 25% (Bhat *et al*., 1986) various control measures are being adopted worldwide for the management of jassids. The insecticides consider the quick control that saved the crops from the damage of jassids and it is important practice in the IPM (Mohyuddin *et al*., 1997 and Gogi *et al*., 2006).

These results are in conformity with those of Stefanov and Dimetrov (1986), who reported that acephate was effective against jassid. These results also favour the findings of Wahla *et al*. (1997), who reported that acephate was excellent against sucking pests. Actara gave satisfactory control up to three days after spray, while Polo remained the least effective against cotton thrips.

New chemistry insecticides, Nitenpyram, and Acephate, proved effective in reducing jassid population below ETL seven days after application during 2012 and 2013. It is important to note that their use is increasing in Pakistan. It is, therefore, necessary to reduce their use for long term sustainable control by avoiding the development of resistance. Insecticides resistance management (IRM) strategies have been developed and implemented in Austraila, Israel and various parts of USA. These strategies include rotation of unrelated chemicals on per generation basis (Forrester *et al*., 1993). Even in USA cross-commodity program has developed for jassid, if population of same generation of jassid receives insecticides of one mode of action on a crop and then this generation move to other crop these insecticides will not be applied (Palumbo *et al*., 2001). Therefore, it is need of the time to develop and implement such strategies for pest management of cotton in our country, as cotton is more important for economy of Pakistan then that of the developed countries.

Table-I **Average population of jassid per leaf of cotton at different time intervals after application of different insecticides during, 2012**

Treatment	Average population of jassids before spray		24 hours after spray	36 hours after spray	168 hours after spray
	(Dose ha^{-1})				
T1=Control	0	1.93 a	2.00 a	2.80 a	9.26 a
T2= Nitenpyram	625ml	1.72 a	0.46 b	1.40 c	3.56 b
T3= Thiamethoxam	60gm	1.83 a	0.40 b	1.73 b	3.53 b
T4=Acephate	825gm	1.65 a	0.42 b	1.42 bc	3.2 b
T5=Dimethaote	1000ml	1.70 a	0.533 b	1.13 c	2.8 b
T6=Thiocloprid	625ml	1.73 a	0.56 c	1.2 b	2.93 b

Means within the column sharing the different letters are significantly different (P = 0.05) with each other.
NS –non significant

Table-IIIAverage population of jassid per leaf of cotton at different time intervals after application of different insecticides during, 2013

Treatment	Dose ha^{-1}	Jassid population (Mean population/leaf)			
		Before spray	After 24 hours	After 36 hours	After 118 hours
T1=Control	0	2.53 a	2.80 a	3.66 a	9.73 a
T2= Nitenpyram	625ml	2.36 a	0.46 b	1.33 c	3.13 b
T3= Thiamethoxam	60gm	2.60 a	0.51 b	1.90 bc	3.60 b
T4=Acephate	825gm	2.33 a	0.33 b	1.60 bc	3.46 b
T5=Dimethaote	1000ml	2.60 a	0.40 b	1.80 b	3.56 b
T6=Thiocloprid	625ml	2.40 a	0.47 b	1.63 b	3.20 b

Means within the column sharing the different letters are significantly different (P = 0.05) with each other.
NS –non significant

Table-IV **EFFECT OF INSECTICIDES ON THE YIELD OF COTTON DURING 2012 & 2013 (Pooled data of two years)**

Treatments	Cropping season, 2012				Cropping season, 2013			
	No. of bolls m^{-2}	Boll weight (gm)	Yield (kg/ha)	% increase/decrease	No. of bolls/m^2	Boll weight (gm)	Yield (kg/ha)	% increase/ decrease
T1=Control	36.00 b	2.47 c	998.3 b		36.33 b	2.50 b	1376.7 c	
T2= Nitenpyram	39.00 a	2.61 bc	1086.7 a		38.66 a	2.75 ab	1618.7 ab	18.95%
T3= Thiamethoxam	39.60 a	2.78 cd	1158.0 a		39.00 a	2.83 a	1592.06 b	
T4=Acephate	40.00 a	2.98 bc	1292.0 a	22.7 5	37.66 a	2.95 a	1591.3 b	
T5=Dimethaote	39.33 a	3.26 ab	1099.0 a		37.33 a	2.96 a	1550.0 b	
T6=Thiocloprid	38.00 b	3.20 a	1089.0 a		37.2 a	2.90 a	1566.0 ab	

Means within the column sharing the different letters are significantly different (P = 0.05) with each other.
NS –non significant

Conclusion

It is concluded that, treatment Acephate 75WP @ 825gm/ha and Nitenpyram @ 625ml/ha recorded 22.7% and 18.95% increase in yield over control plot during cropping season 2012 and cropping season 2013, respectively, due to better control of jassids in cotton crop.

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