International Journal of Advanced Multidisciplinary Research
ISSN: 2393-8870
www.ijarm.com
DOI: 10.22192/ijamr Volume 6, Issue 5 -2019

Research Article

DOI: http://dx.doi.org/10.22192/ijamr.2019.06.05.004

Efficacy of new chemistry insecticides against cotton jassid (*Amamsca devastans* Dist.) in ecological zone of Rahim Yar Khan

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Abstract

A field experiment was conducted during summer seasons 2017 and 2018 to determine the efficacy of different insecticides against cotton jassid (*Amrasca devastans*) at Adaptive Research Farm Rahim Yar Khan. Five different insecticides Nitenpyrem 50%WG @100g/ha, Flonicamide 50% WG @150g/ha, Dinotefuran 20%SG @250g/ha, Sulfoxaflor 24% SC @75g/ha and Chlorpenpyre 360GL @375ml/ha were evaluated in a three replicated RCBD method including an unchecked. Before application of insecticides, the pre treatment observations were taken on jassid, while post treatment observations were taken after 48 and 168 hours of application of insecticides. However, Flonicamide 50% WG @150g/ha showed its effectiveness up to 7th day of the spray (86%) during both years. The mortality percentage of jassid on cotton was observed in case of Dinotefuran 20%SG @250g/ha (80.5%) and Sulfoxaflor 24% SC @75g/ha (78%). This attained its effectiveness up to 7th day after application. Least controlled was observed when applied Chlorpenpyre 360GL @375ml/ha (58%) during both years 2017-18.

Keywords

cotton jassid,
insecticides,
RCBD method,
mortality percentage.

Introduction

Cotton is most important commercial crop known as “king of natural fiber” and world over commonly referred as “white gold” which belongs to family Malvaceae and genus Gossypium. Cotton plays an important role in strengthening economy of 82 countries across the world (CICR, 2015). It is the most important and economy dependent crop of Pakistan (Hakim et al. 2011). It contributes a huge share in the foreign exchange earnings and is important fiber crop (Ahmad et al. 2011). Severe attack of insect pests like thrips, whitefly, jassids and disease like cotton leaf curl virus are the major crop limiting factors (Annonymos, 2013). The insect pest infestation in cotton caused deterioration in lint quality and 10-40%

losses in crop yield (Gahukar, 2006). Amongst, several factors responsible for low productivity of cotton, menace caused by the insect-pests is a major one. Cotton hybrids and high yielding varieties are more susceptible to insect pests like bollworms and sucking pests. Cotton crop is subjected to damage by 162 species right from emergence till the final picking (Manjunath, 2004). Introduction of Bt cotton technology solved the bollworm problem but continuous cultivation of Bt cotton has at some places led to increased incidence of sucking and other pests in the recent years (Nagrare et al, 2009). After the introduction of Bt cotton, due to the reduction of insecticidal sprays, especially during flowering and boll formation phase, some minor pests which are not susceptible to Cry 1 Ac showed resurgence in many parts of the world (Kranthi, 2007). In Southeast Asian countries, jassid, is one of the major pests of cotton. It is reported to cause 24.45% reduction in cotton yield (Bhat et al., 1986). Its incidence results in the loss of plant vigour, toxemia, hopper burn and spreads the mosaic virus diseases affecting fruit yield perceptibility (Samal and Patnaik, 2008; Shivanna et al., 2009). The insect-pests cause 5-10 percent losses on an average but severe attack of insect-pests can cause heavy qualitative and quantitative losses varying from 40- 50% (Naqvi, 1976). Jassid nymphs and adults feed on sap of tender leaves which cause severe damage to crop results in downward curling of leaf lamina; leaves turn yellowish then brownish before drying and shedding of leaves. The hopper bum symptoms were observed on jassid infected leaves and finally the young infected plants remain stunted. While, thrips nymph and adults lacerating the leaf and cause damage to seedling and seedling becomes wrinkled and distorted with white shiny patches, infected older crop presents rusty appearance in the field. Jassid nymph and adults feeding on sap which causes crumpling and downward curling of leaves, sticky cotton due to deposits of honey dew like substance on open balls and leaves. Similarly, nymphs and adults of whiteflies by sucking cell sap causes upward curling of leaves reduce plant vigour, lint contamination with honey dew and associated fungi and also transmit leaf curl vims disease. Sucking insect pests reported to cause 21.20 to 22.86 per cent reduction in seed cotton yield (Satpute et al, 1990). Hence, Bt cotton requires control measures for sucking pests. Use of chemicals is an essential part of integrated pest management in crop protection measures (Mohyuddin et al. 1997). Neonicotinoids are among the most effective insecticides for the control of sucking insect pests. Non selective use of pesticides leads to water pollution, soil degradation, pest resistance and resurgence and ozone depletion (Naeem et al. 2012). Seal et al. (2006) evaluated the efficacy of spinosad, imidacloprid, chlorfenapyr, novaluron, abamectin, spiromesifen, cyfluthrin, methiocarb and azadirachtin against thrips, Scirtothrips dorsalis and recorded that chlorfenapyr was the most effective treatment in reducing the densities of S. dorsalis followed by spinosad and imidacloprid. Kshirsagar (2012) monitored the insecticide resistance in *Amrasca biguttula higuttula* and revealed the moderate to high level of resistance against the neonicotinoid tested, viz., imidacloprid and acetamiprid as compared to dimethoate which was found to be the most effective insecticides amongst the tested chemicals. Keeping in view the economic importance and pest status of jassid this study was conducted to obtain data on relative toxicities of insecticides labeled for the control of jassids.

Materials and Methods

The experiment was conducted at Adaptive Research Farm Rahim Yar Khan during 2017 and 2018 against cotton jassid (*Amrasca devastans*) to test the efficacy of five insecticides viz. Nitenpyrem 50%WG @100g/ha, Flonicamide 50% WG @150g/ha, Dinotefuran 20%SG @250g/ha, Sulfoxaflor 24% SC @75g/ha and Chlorpenpyre 360GL @375ml/ha on cotton variety IUB-2013. The experiment was laid out in Randomized Complete Block Design (RCBD). The insecticides used in the present experiment were obtained from the local market and were sprayed at field recommended doses when the population of pest reached the Economic Threshold Level (ETL). The ETL for the Jassid was considered as 1/leaf. There were 6 treatments including control, having 3 repeats. The plot size was kept as 30 ft x 60 ft. The plant inspection method was used for sampling the pest population. The field recommended doses of the insecticides as presented in Table 1 were sprayed with hand operated knapsack sprayer having 20 liters capacity fitted with hollow cone nozzle. The control plot remained unsprayed. The sprayer was calibrated using simple water by calculating the amount of water required for spraying on a unit area prior to experiment. All agronomic practices like irrigation, fertilizer applications etc. were kept uniform throughout the experiment on all plots. Pest data was recoded from 12 randomly selected plant leaves. To study the efficacy of different insecticides as mentioned in (Table 1), population of jassid was recorded by the same method a day before spray and

after 48 hours and 168 hours after treatment. Crop was kept free from weeds. Population change increase or decrease was calculated by using modified Abbot's formula as below:

$$\% \text{ Population Change} = 1 - \frac{\text{Post treatment population in treatment}}{\text{Pre treatment population in treatment}} \times \frac{\text{Pre treatment population in control}}{\text{Post treatment population in control}} \times 100$$

(Flemings and Ratnakaran 1985)

Data were analyzed statistically with M-stat package and means were compared by DMR test at 5 percent probability level (Duncan, 1955).

Table 1. Different insecticides used against cotton jassid, (*Amrasca devastans*) with respective doses per hectare.

S. #	Insecticides with formulation	Dose (ml or gm/ha)
1	Nitenpyrem 50%WG	100
2	Flonicamide 50% WG	150
3	Dinotefuran 20%SG	250
4	Sulfoxaflor 24% SC	75
5	Chlorpenpyre 360GL	375

Results and Discussion

Insecticides (Table 1) were sprayed in recommended doses when the population of cotton jassid reached economic threshold level (ETL). Insecticides were dissolved in water to prepare insecticide solutions on vol. / vol. and Wt. / Vol. basis. The crop was sprayed in the morning before 10 a. m. The population of insect pests was recorded 2nd and 7th days after application of insecticides. The data on pest population were analyzed by using the effectiveness of various insecticides was considered to be an indirect reflection of pest population in various treatments i.e. lower population of insect pests would represent higher toxicity and vice versa. The population of cotton jassid was significantly lower ($P<0.05$) in insecticides treated plots as showed in (Table 2). jassid population fluctuated in terms of mortality (%) after 2nd and 7th day spray application. All tested insecticides in (Table 2) caused significant mortality in population of cotton jassid even 7th days after spray. Flonicamide 50% WG was statistically highly effective with mortality in cotton jassid population as 95 and 88 % even 2rd and 7th days of treatment during 2017 followed by Dinotefuran 20%SG that caused mortality in population of cotton jassid as 91 and 81. While in case of Sulfoxaflor 24% SC the mortality of cotton jassid was observed even after 2rd and 7th days after treatment i.e (85 & 79) as described in table 3. In case of Nitenpyrem 50%WG the mortality in population as 78 and 47% after 2rd and 7th days of treatment. In case of Chlorpenpyre 360GL the mortality % of jassid was observed as 71 and 53 after 2rd and 7th day of spray application. Flonicamide 50% WG @150g/ha proved to be the best product even after 2rd and 7th days after application of insecticides. Non selective use of pesticides leads to water pollution, soil degradation, pest resistance and resurgence and ozone depletion (Naeem et al. 2012). Seal et al. (2006) evaluated the efficacy of spinosad, imidacloprid, chlorfenapyr, novaluron, abamectin, spiromesifen, cyfluthrin, methiocarb and azadirachtin against thrips.

Table 2. Mean percent population change of cotton jassid after application of different insecticides on cotton during 2017.

Treatments	Dose/ha (g,ml)	A.v pest population before spray	Post treatment average population/plant		(%) Population Change	
			2nd day	7th day	2nd day	7th day
Nitenpyrem	100	7.30	1.10d	2.97d	78	47
Flonicamide	150	8.25	0.32a	0.81a	95	88
Dinotefuran	250	6.56	0.43b	0.99b	91	81
Sulfoxaflor	75	7.30	0.73c	1.20c	85	79
Chlorpenpyre	375	8.55	1.68e	3.10e	71	53
Control		6.85	4.56	5.20	-	-
LSD (0.05)						

Each value is a mean of three replications. Means sharing similar letters in columns are not significantly different by DMR test (P=0.05)

It is evident from the (Table 3) that insecticides were found to be effective in controlling population of cotton jassid during 2018 under field conditions. All tested insecticides (Table 1) caused significant mortality in population of cotton jassid even 7 days after spray. Flonicamide 50% WG was statistically highly effective with mortality in cotton jassid population as 93 and 84 % even 2rd and 7th days of treatment during 2018 followed by Dinotefuran 20%SG that caused mortality in population of cotton jassid as 89 and 80. While in case of Sulfoxaflor 24% SC the mortality of cotton jassid was observed even after 2rd and 7th days after treatment i.e (86 & 77) as described in table 3. In case of Nitenpyrem 50%WG the mortality in population as 82 and 68 % after 2rd and 7th days of treatment. In case of Chlorpenpyre 360GL the mortality % of jassid was observed as 74 and 63 after 2rd and 7th day of spray application. Flonicamide 50% WG @150g/ha proved to be the best product even after 2rd and 7th days after application of insecticides. Use of chemicals is an essential part of integrated pest management in crop protection measures (Mohyuddin et al. 1997).

Table 3. Mean percent population change of cotton jassid after application of different insecticides on cotton during 2018.

Treatments	Dose/ha (g,ml)	A.v pest population before spray	Post treatment average population/plant		(%) Population Change	
			2nd day	7th day	2nd day	7th day
Nitenpyrem	100	5.8	1.12d	2.13d	82	68
Flonicamide	150	5.4	0.41a	0.99a	93	84
Dinotefuran	250	6.1	0.72b	1.40b	89	80
Sulfoxaflor	75	6.5	0.99c	1.68c	86	77
Chlorpenpyre	375	7.2	1.95e	2.96e	74	63
Control		5.9	6.10	6.54	-	-
LSD (0.05)						

Each value is a mean of three replications. Means sharing similar letters in columns are not significantly different by DMR test (P=0.05)

Conclusion

It is concluded from the research trial that all the insecticides proved to be effective for controlling cotton jassid but Flonicamide 50% WG @150g/ha proved to be more effective against cotton jassid followed by Dinotefuran 20%SG @250g/ha.

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DOI:10.22192/ijamr.2019.06.05.004	

How to cite this article:
Ashiq Hussin Sanghi, Tanweer Ahmed, Muhammad Aslam and Mrs. Laila Yaseen. (2019). Efficacy of new chemistry insecticides against cotton jassid (*Amamsca devastans* Dist.) in ecological zone of Rahim Yar Khan. Int. J. Adv. Multidiscip. Res. 6(5): 17-21.
DOI: http://dx.doi.org/10.22192/ijamr.2019.06.05.004