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COMPARATIVE EFFICACY OF INSECTICIDES AGAINST JASSID ON COTTON CROP UNDER FIELD CONDITIONS OF DERA GHAZI KHAN

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ABSTRACT

The experiment was conducted in local field conditions of Dera Ghazi Khan during the 2021 Kharif season on three different sites. The core objective of this experiment is to manage Jassid on the cotton crop a major pest. Five different insecticides Dinotefuran, Thiamethoxam, Nitenpyram, Dimethoate and clothianidin were evaluated at recommended doses. The treatments were laid out in randomized complete block designs with three replications. Data regarding the Jassid population before a spray of insecticides and after 24-, 48-, and 72-hour's of spray were recorded. The reduction in the Jassid population is evaluated by the Abbots formula. The results indicated that Nitenpyram was found most effective on Jassid with mean mortality of 63.47%, 65.07 and 61.86% followed by Dinotefuran with 59.22%, 59.33% and 51.45%. Other treatments thiamethoxam, Dimethoate and clothianidin were at par and did not reduce the Jassid population after 24 and 48 hours. However, thiamethoxam and clothianidin reduced the Jassid population below ETL after 72 hours of spray as compared to Dimethoate. Therefore, it is recommended that Nitenpyram and Dinotefuran should be used for Jassid control at the recommended dose.

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INTRODUCTION

Cotton is one of the key crops in Pakistan, regarded as a cash crop. Pakistan is the 5th largest producer of cotton in the world. During 2021-22, cotton was cultivated on 1937 '000' hectares and production was recorded at 8320 million bales (Government of Pakistan, 2022). Whereas, whereas cotton contributed 0.6% to the national GDP of Pakistan and 2.4% to the value added in agriculture (Government of Pakistan, 2022).

Cotton is regarded as a sensitive crop and due to its lush green leaves cotton is attacked by many vigorous pests. Cotton receives a severe attack of sucking pests like Jassid, whitefly, and thrips especially due to the increase in BT cotton area. Bt cotton varieties are not resistant to sucking pests (Sharma and Pampapth, 2006) therefore, insect pressure remains higher during its fruiting stage. Gouda *et al*. (2014) was of the view that BT cotton attack of sucking pests was higher because of extensive extension in the cultivated area of cotton (Ahsan and Altaf, 2009; Abdullah, 2010).

Among all sucking pests, the Jassid is one of the major and serious pests of the cotton crop. Both nymphs and adults not only suck the plant cell sap but also inject the toxins into the lower side of the leaves. The leave under severe Jassid attack first turn pale and then rusty red. The leaves are seen as turned downward and ultimately fell to the ground. The prolonged occurrence of Jassid becomes the reason for loss of plant life, boll drop and results in yield reduction from 18.75 to 35% (Ali, 1992). There are various approaches to control the Jassid like mechanical control, biological control, and cultural control (Chinniah and Ali, 2000).

The widely used approach to control Jassid infestation is the use of chemical control, although this should only be used when the Jassid infestation crosses the threshold level (Korjo *et al*., 2000). The chemicals used to control Jassid are non-selective and wide-ranging. Frequent use of these chemicals can contaminate the environment and produce resistance in Jassid (Ahmad *et al*., 1999). The current experiment was conducted to estimate the efficacy of five presently available insecticides under field conditions to identify whether these insecticides can reduce the population of Jassid below an economic threshold level (ETL).

MATERIAL AND METHODS

The present experiment was conducted in Dera Ghazi khan during the Kharif season of 2021. The variety (IUB 2013) was sown on 19.04.2021 at three different sites. Treatments Dinotefuran, thiamethoxam, Nitenpyram, Dimethoate and Clothianidin were sprayed on the cotton crop at standard doses when the Jassid population reached ETL. The experiment was laid out in a randomized complete block design (RCBD) with five treatments with a net plot size of 9.15 × 13.72 m^2. Recommended agronomic strategies were adopted for all treatments.

The insecticides were applied on the particular plots by knapsack sprayer with a hollow cone nozzle. The data was noted from randomly selected 20 plants. The population of Jassid was counted, from the upper leaf of 1st plant, middle leaf of 2nd plant, and the lower leaf of 3rd plant and then was repeated with the same sequence. Pre-Treatment data was observed before the application of treatments. The data regarding pre-treatment and post-treatment was collected after 24-, 48- and 72-hour application. Data recorded were analyzed with computer-based software Statistix 8.1, by analysis of variance and means were separated by LSD test at 5% level of significance. Jassid percent population change/reduction was corrected by using the modified Abbotts formula (Flemings and Ratnakaran, 1985). The percentage reduction in population was calculated by using the following formula:

$$\text{Percentage population reduction} = \frac{A - B}{X} \times 100$$

A: Pretreatment population;

B: Post-treatment population.

RESULTS AND DISCUSSION

The Jassid population before and after spray during the experiment in Kharif 2021 as recorded is presented in Table 1, 2 and 3.

Data in Table 1 reveals that the Jassid population was significantly decreased by applying Nitenpyram from 1.88 above ETL to 0.92, 0.62 and 0.52 below ETL with mortality percentages of 51.06%, 67.02% and 72.34% respectively after 24, 48 and 72 hours of spray. Dinotefuran also reduced the Jassid population from 1.95 above ETl to 1.13, 0.73 and 0.53 with mortality percentages of 42.33%, 62.53% and 72.82% after 24, 48 and 72 hours of spray. Other insecticides Thiamethoxam and Clothianidin also gave Jassid control after 72 and brought its population level below ETL and were statistically significant as compared to Nitenpyram and Dinotefuran. While Dimethoate produced the Jassid control even after 72 hours of spray. These results correlate with the findings of Khan *et al*. (2016) who reported that new chemistry insecticides were selective and specific (insect species and insect stage). These groups of insecticides were more effective and more toxic to the Jassid.

Table 2 depicts that the maximum reduction in the Jassid population was caused by the spray of Nitenpyram from 1.89 to 0.81, 0.69 and 0.48 with mortality percentages of 57.14%, 63.49% and 74.60%, respectively. Dinotefuran showed significant control of Jassid from 1.92 to 1.14, 0.76 and 0.44 after 24, 48 and 72 hours of spray. Other insecticides Thiamethoxam and Clothianidin decreased the Jassid count per leaf after 72 hours of spray keeping the population below ETL. Dimethoate produced effective results in reducing the Jassid population below ETl even after 72 hours of spray. These results are in line with the findings of Bambhaniya *et al*. (2018) who stated that new chemistry insecticides are selective and specific. These groups of insecticides were effective in controlling the infestation of Jassid.

Table 3 indicates that Nitenpyram was found most effective for Jassid control as it decreased its population from 1.85 to 0.97 0.67 and 0.47 with mortality percentages of 47.25%, 63.78% and 74.59 % after 24, 48 and 72 hours of spray. Dinotefuran also produced statistically significant control from 1.6 to .98, 0.73 and 0.62 with mortality of 38.75%, 54.37% and 61.25% in prescribed time intervals. Thiamethoxam and Clothianidin reduced the population below ETL after 72 hours but Dimethoate fail to change the Jassid count per

leaf below ETL. Qaiser *et al. (*2011), endorsed the use of new chemistry insecticides for the effective control of Jassid. The other three insecticides Thiamethoxam, Dimethoate and Clothianidin were non-significant and were at par with each other. 48 hours after spray maximum reduction in the Jassid population was recorded in plots sprayed with Nitenpyram showing mortality percentages of 69.68, 63.43 and 63.50 % at three sites followed by Dinotefuran with mortality percentages of 62.53, 60.47 and 60.50%.

Table 1. Site A; Jassid population and Mortality percentage against pre and post-treatment of different insecticides during 2021 Kharif.

Treatments	Pre-treatment	Post-treatment			Mean
		24 hours	48 hours	72 hours	
Dinotefuran	1.95 b	1.13 c	0.73 d	0.53 d	0.79 d
	mortality %	42.33 b	62.53 b	72.82 a	59.22 b
thiamethoxam	1.87 e	1.50 b	1.11 c	0.76 c	1.12 b
	mortality %	19.78 d	40.64 e	59.35 b	39.92 c
Nitenpyram	1.88 d	0.92 d	0.62 e	0.52 e	0.68 a
	mortality %	51.06 a	67.02 a	72.34 e	63.47a
Dimethoate	2.01 a	1.61 a	1.12 b	1.03 a	1.25 a
	mortality %	19.09 e	44.27 c	48.75 d	37.37 e
Clothianidin	1.92 c	1.49 b	1.13 a	0.94 b	1.18 a
	mortality %	22.40 c	41.14 d	51.04 c	38.19 d

Table 2. Site B; Jassid population and Mortality percentage against pre and post treatment of different insecticides during 2021 Kharif.

Treatments	Pre-treatment	Post-treatment			Mean
		24 hours	48 hours	72 hours	
Dinotefuran	1.92 c	1.14 d	0.76 d	0.44 e	0.78 d
	mortality %	40.62 b	60.42 b	77.08 a	59.33 b
thiamethoxam	1.88 e	1.53 b	1.12 c	0.75 c	1.13 c
	mortality %	18.61 d	40.42 c	60.11 c	39.71 c
Nitenpyram	1.89 d	0.81 e	0.69 e	0.48 d	0.66 e
	mortality %	57.14 a	63.49 a	74.60 b	65.07 a
Dimethoate	1.99 a	1.68 a	1.19 b	1.1 a	1.32 a
	mortality %	15.58 e	40.20 d	44.72 e	33.5 e
Clothianidin	1.94 b	1.37 c	1.29 a	0.9 b	1.18 b
	mortality %	29.38 c	33.50 e	53.61 d	38.83 d

Table 3. Site C; Jassid population and Mortality percentage against pre and post-treatment of different insecticides during 2021 Kharif.

Treatment	Pre-treatment	Post-treatment			Mean
		24 hours	48 hours	72 hours	
Dinotefuran	1.6 b	0.98 d	0.73 d	0.62 d	0.78 d
	mortality %	38.75 a	54.37 b	61.25 b	51.45 b
Thiamethoxam	1.6 b	1.30 b	1.09 c	0.74 c	1.04 a
	mortality %	18.53 d	31.87 e	53.75 c	34.62 d
Nitenpyram	1.85 a	0.97 c	0.67 e	0.47 e	0.70 b
	mortality %	47.25 b	63.78 a	74.59 a	61.86 a
Dimethoate	1.89 a	1.59 a	1.13 b	1.04 a	1.25 a
	mortality %	15.87 e	40.21 c	44.97 e	33.68 e
Clothianidin	1.86 a	1.32 b	1.16 a	0.87 b	1.11 b
	mortality %	29.03 c	37.04 d	53.22 d	39.76 a

CONCLUSIONS AND RECOMMENDATIONS

This study concluded that Nitenpyram was most effective to control the cotton Jassid population below ETL followed by Dinotefuran. While Thiamethoxam showed the least control on the pest population. The chemicals controlled the pests as result it increased the production of cotton. These insecticides can be used as a replacement for a large spectrum of conventional insecticides which have already developed resistance against the insects.

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