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Comparative bio-efficacy of some newer insecticides against jasssid (*Amrasca biguttula biguttula*, Ishida) in Bt cotton crop

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Abstract
Cotton (*Gossypium* spp.) popularly known as 'white gold' is one of the most ancient important cash crop of India. The development of Bt cotton containing a genetically introgresses endotoxin gene from the gram negative soil bacteria (*Bacillus thuringiensis* Hubner) represents a significant technological land mark in the global cotton research. Jassid is a major sucking pest on cotton crop, causing quantitative and qualitative losses to Bt cotton. It sucks the cell sap and injects the toxic saliva inside veins during feeding. An experiment was conducted at Agriculture Research Station, Sri Ganganagar to evaluate the bio-efficacy of some newer insecticides viz., Acephate 75% SP, Thiomethoxam 25% WG, Acetamiprid 20% SP, Diafenthiuron 50% SP, Calypso 24% OD, Sulfoxaflor 24% SC, Triazophos 40% EC, Imidacloprid 17.8% SL and Pyriproxyfen 10% EC at field recommended doses against jassid on Bt cotton. These insecticides were sprayed when population of jassid reached to Economic Threshold Level (ETL) i.e. jassid 1-1.5/ leaf. The population of jassid was recorded 24 hours before and after 1, 3, 5 and 10 days of treatment and percent reduction in population was calculated. Among these insecticides, Acephate75 SP% was found most effective with 76.10% reduction in jassid population. It was found significantly superior over rest of the treatments. Acephate is a systemic insecticide used to control sucking and biting insect by direct contact or ingestion. The phytotoxic effect on crop could not be observed during the experimental period.

Keywords: Soil bacteria, Insecticides, Bt cotton

1. Introduction
Cotton is one of the prominent industrial and economic crops of India. The pest spectrum of Bt cotton crop is quite complex and these pests not only reduce the yield but also adversely affect the quality of lint and seed. The development of Bt cotton containing a genetically introgresses endotoxin gene from the gram negative soil bacteria (*Bacillus thuringiensis* Hubner) represents a significant technological land mark in the global cotton research. India adopted this technology in 2002-03. The major reason for the interest on Bt cotton in India is attributed to the menace of the pest *Helicoverpa armigera* having a damage potential of 60-80 percent yield loss (Vennila *et al*., 2004) [7]. Last few decades bollworm attack on cotton was a serious problem but, with the introduction of Bt varieties of cotton this problem has been solved to some extent and a significant change in cropping scheme in the cotton growing areas has been observed (Ahsan & Altaf, 2009) [1]. But the problem of sucking insect pests attack is remained unsolved still now. Among them jassid is most destructive sucking pest (Amin *et al*., 2008) [2]. It causes quantitative and qualitative losses to cotton. Its attack starts on the vegetative phase of the crop and suck the cell sap and injects the toxic saliva inside veins during feeding. The first symptom of its attack is leaves turned yellowish due to sucking and letter on turned to reddish colouration of the margins of leaves followed by dryness. The lint quality, ginning percentage, oil content and its quality are also adversely affected due to infestation of jassid. This insect is widely distributed in northern area. The chemical control is the one of the rapid methods to reduce the losses caused by sucking insect pests to the cotton crop (Gogi *et al*., 2006) [4]. Many new chemical insecticides are introduced in the market for management jassid therefore, the present study was undertaken to evaluate the new insecticidal for management of jassid *(Amrasca biguttula biguttula*, Ishida) in Bt cotton.

Materials and Methods
The experiment was conducted in Randomized Block design with 10 treatments including

Control and three replication at the Agriculture Research Station, Sri Ganganagar (Raj.). The crop was raised in 10 m x 5 m plotes with 100 cm row to row and 60 cm plant to plant distance. Total four sprays of each insecticide viz., Acephate 75% SP, Thiomethoxam 25% WG, Acetamiprid 20% SP, Diafenthiuron 50% SP, Calypso 24% OD, Sulfoxaflor 24% SC, Triazophos 40% EC, Imidacloprid 17.8% SL and Pyriproxyfen 10% EC were given at 10-15 days interval depending upon climatic condition. The efficacy of various insecticides will be assessed by counting the living population of jassid on 5 randomly selected plants in each plot 24 hours before and after 1, 3, 5 and 10 days of treatment. The observations on the surviving insects after each treatment at definate time intervals were recorded and percent reduction in population was calculated. Percent reduction was calculated by using the below mentioned formula:

$$\text{Percent Reduction } \frac{(Pop.before\ spray)-(Pop.After\ Spray)}{Pop.before\ Spray}\times 100$$

The data recorded were presented as mean values, which were subjected to Analysis of Variance (ANOVA) and Critical Difference (CD) was worked out to compare different treatments. For Analysis of Variance, the data on percentage reduction were transformed into angular values. The critical difference calculated was compared between mean percent reduction at definite time interval.

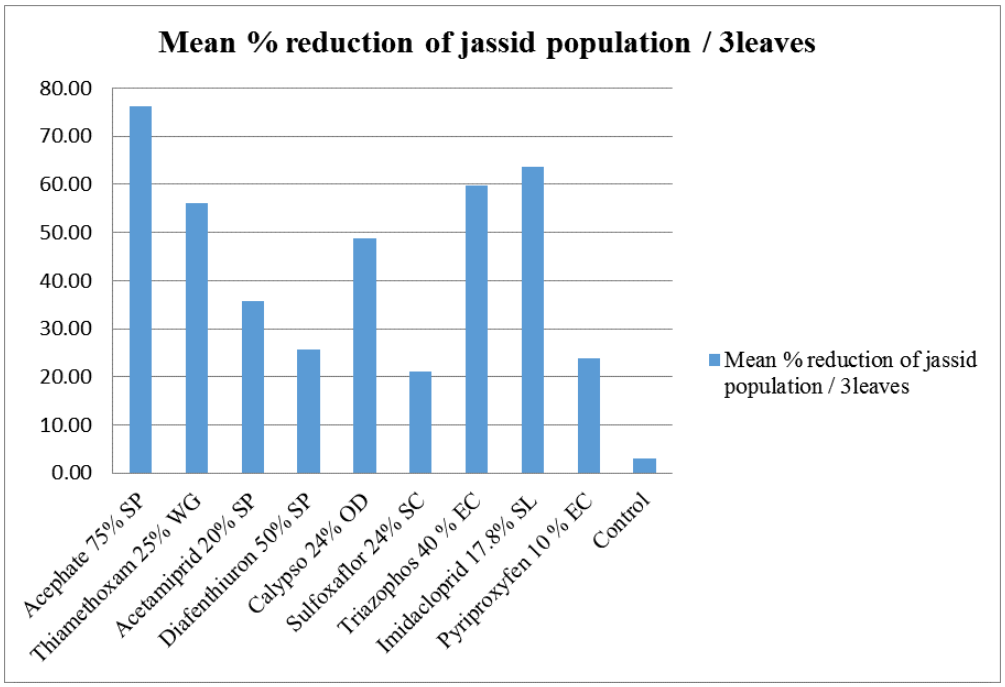
Results and Discussion

The efficacy of new molecules against the control of jassid depicted in the Table-1 clearly indicate that jassid population was significantly low in all the plots treated with insecticides over control. The treatment of Acephate75% SP proved most effective with highest (76.10%) mean reduction of jassid population and was significantly superior over rest of the treatments. The phytotoxic effect on crop could not be observed during the experimental period. In our experiment, nine chemicals were tested against jassid adults and nymphs under field conditions, among these chemicals some were found effective against jassid while others were found to be less effective. Our results suggested that acephate was found to be the most effective insecticide resulted in significant reduction of jassid adults and nymphs populations as compared to all other insecticides. The results agree with of the findings of Eijaza *et al*., (2012) [3] & Patil *et al*., (2014) [6] who reported Acephate to be most effective insecticide against jassid population. Similarly, Karar *et al*. (2013) [5] observed maximum reduction in jassid population with Acephate 75% SP. The treatment module in the applied does not show any phytotoxic effect on cotton plants. During the experimentation period, ssthe natural enemies were spiders, chrysopa, and wasp among the main predators of insect pests of cotton.

Table 1: Bio-efficacy of new insecticides on percent reduction of jassid population

Treatment	Doses (a. i./ha)	Pooled mean of four sprays				
		Mean % Reduction of Jassid / 3 leaves				Pooled
		1 DAS	3 DAS	5 DAS	10 DAS	
Acephate 75% SP	800 g	82.26# (65.24)*	79.87# (63.40)*	73.46# (59.06)*	68.81# (56.11)*	76.10# (60.95)*
Thiamethoxam 25% WG	200 g	61.61 (51.72)	60.50 (51.05)	55.43 (48.11)	47.18 (43.37)	56.18 (48.56)
Acetamiprid 20% SP	160 g	38.24 (38.12)	40.03 (39.21)	34.98 (36.20)	29.96 (33.11)	35.80 (36.66)
Diafenthiuron 50% SP	800 g	28.68 (32.30)	31.53 (34.06)	24.23 (29.34)	18.50 (25.30)	25.73 (30.25)
Calypso 24% OD	400 g	62.01 (51.96)	56.77 (48.93)	45.41 (42.33)	30.47 (33.42)	48.67 (44.16)
Sulfoxaflor 24% SC	400 g	25.70 (30.37)	23.04 (28.56)	18.88 (25.54)	16.53 (23.81)	21.04 (27.07)
Triazophos 40 % EC	1000 ml	66.93 (54.91)	62.70 (52.41)	58.48 (49.90)	50.90 (45.50)	59.75 (50.68)
Imidacloprid 17.8% SL	133 ml	72.75 (58.57)	68.59 (55.94)	63.79 (53.04)	49.36 (44.61)	63.62 (53.04)
Pyriproxyfen 10 % EC	400 ml	26.65 (30.23)	25.68 (30.37)	24.21 (28.57)	18.48 (25.34)	23.75 (28.63)
Control		3.08 (10.03)	3.08 (10.03)	3.08 (10.03)	3.08 (10.03)	3.08 (10.03)
SEM		1.88	1.74	2.02	1.84	1.87
CD		5.58	5.17	5.99	5.46	5.55
CV%		7.69	7.28	9.13	9.35	8.36

Pooled mean of four spyays
***** Values in parenthesis are transformed angular values
DAS Days after spray



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