

Bio-Efficacy of Bio-Pesticides against Jassid, *Amrasca biguttula biguttula* Ishida Infesting Cotton

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SUMMARY

An experiment was conducted to evaluate the bio-efficacy of bio-pesticides against jassid, *Amrasca biguttula biguttula* Ishida infesting hybrid cotton at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during *Kharif* season of 2007. The results revealed that the treatments of thiamethoxam 0.008 per cent and acetamiprid 0.005 per cent were most effective insecticidal treatments against the pest. Among the biopesticides, combination of biopesticides with thiamethoxam 0.008 per cent was superior over combination of biopesticides with acetamiprid 0.005 per cent. Also, thiamethoxam 0.008 per cent recorded the highest yield of cotton (1154 kg/ha) followed by acetamiprid 0.005 per cent (1072 kg/ha). As far as the economics of various insecticides are concerned, acetamiprid 0.005 per cent gave the highest cost benefit ratio (1: 9.08) followed by thiamethoxam 0.008 per cent (1: 8.38).

Key words :

Bio-pesticides,
jassid, *A.
biguttula
biguttula*, cotton

Cotton, the “white gold” is a premier commercial crop of Gujarat. In Gujarat, cotton is cultivated in 23.90 lakh hectares with a production of 101.00 lakh bales and productivity of 718 kg/ha (Anonymous, 2008). In India, 160 species of insect pests have been reported to attack the cotton crop right from the time of germination till the final harvesting of cotton (Agrawal, 1978). Due to introduction of transgenic cotton in India, problem of bollworm has been solved up to greater extent. However, sucking pest *viz.* aphid, jassid, thrips and whitefly cause damage throughout the crop period. Information regarding effectiveness of bio-pesticides against jassid infesting cotton is meagre. Hence, an attempt was made to study the bio-efficacy of bio-pesticides against jassid, *A. biguttula biguttula* infesting hybrid cotton.

MATERIALS AND METHODS

With a view to test the bio-efficacy of bio-pesticides against jassid, *A. biguttula biguttula*, a field trial was conducted during *Kharif* season of 2007 at Instructional Farm, College of Agriculture, Junagadh on cotton variety G. Cot. Hybrid-10. Eleven treatments were tested in Randomized Block Design with four replications. The crop was sown at the spacing of 120 cm x 45 cm having gross and net plot size of 5.4 m x 4.8 m and 3.6 x 2.4 m, respectively. All the recommended agronomical

practices were followed for raising the crop. Total three applications of the treatments were given with the help of high volume knapsack sprayer. Five plants were randomly selected from each net plot and tagged. Observation of jassid was recorded before 24 hours and 1, 3 and 7 days after treatment from three leaves (upper, middle and lower) of each tagged plant. The data thus, obtained were converted into per cent mortality by using a modified formula given by Henderson and Tilton (1955).

RESULTS AND DISCUSSION

Data presented in Table 1 indicate that the differences in mortality per cent of jassid in different treatments after 1 day, 3 days and 7 days of spraying was found statistically significant.

After 1 day of insecticidal spray, thiamethoxam 0.008 per cent recorded the highest mortality per cent (98.46%) which was statistically at par with acetamiprid 0.005 per cent, *V. lecanii* @ 1.25 kg/ha + thiamethoxam 0.004 per cent and *B. bassiana* @ 1 kg/ha + thiamethoxam 0.004 per cent which recorded 96.98, 95.13 and 93.08 per cent mortality, respectively were found equally effective against the pest.

The treatments of *M. anisoplae* @ 1.25 kg/ha + thiamethoxam 0.004 per cent, *V. lecanii* @ 1.25 kg/ha + acetamiprid 0.0025 per

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Table 1 : Bio-efficacy of different insecticides against jassid infesting hybrid cotton after first spray

Sr. No.	Treatments	Per cent mortality of jassid after days		
		1 DAS	3 DAS	7 DAS
1.	<i>Beauveria bassiana</i> 2.0 kg/ha	6.75* (1.38)	10.94 (3.60)	12.75 (4.43)
2.	<i>Verticillium lecanii</i> 2.5 kg/ha	9.50 (2.72)	15.39 (7.04)	17.10 (8.65)
3.	<i>Metarrhizium anisoplae</i> 2.5 kg/ha	5.75 (1.00)	9.32 (2.62)	10.35 (3.23)
4.	Thiamethoxam 0.008 %	82.88 (98.46)	82.13 (98.12)	81.63 (97.88)
5.	Acetamiprid 0.005 %	80.00 (96.98)	79.50 (96.68)	79.00 (96.36)
6.	<i>Beauveria bassiana</i> 1.0 kg/ha + Thiamethoxam 0.004 %	74.75 (93.08)	74.25 (92.63)	73.75 (92.17)
7.	<i>Verticillium lecanii</i> 1.25 kg/ha + Thiamethoxam 0.004 %	77.25 (95.13)	76.75 (94.75)	76.25 (94.35)
8.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Thiamethoxam 0.004 %	71.75 (90.19)	71.25 (89.67)	70.75 (89.13)
9.	<i>Beauveria bassiana</i> 1.0 kg/ha + Acetamiprid 0.0025 %	66.75 (84.42)	66.25 (83.78)	65.75 (83.13)
10.	<i>Verticillium lecanii</i> 1.25 kg/ha + Acetamiprid 0.0025 %	69.00 (87.16)	68.50 (86.57)	68.00 (85.97)
11.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Acetamiprid 0.0025 %	64.00 (80.78)	63.50 (80.09)	63.00 (79.39)
	S. E. ±	2.63	2.92	3.08
	C. D. (P=0.05)	7.60	8.42	8.89
	C. V. %	9.51	10.39	10.97

*Angular transformation.

Figures in parentheses are original values.

cent, *B. bassiana* @ 1 kg/ha + acetamiprid 0.0025 per cent and *M. anisoplae* @ 1.25 kg/ha + acetamiprid 0.0025 per cent recorded the pest mortality from 90.19 to 80.78 per cent and found moderately effective. Whereas, the treatments of bio-pesticides alone viz., *V. lecanii* @ 2.5 kg/ha, *B. bassiana* @ 2 kg/ha and *M. anisoplae* @ 2.5 kg/ha recorded significantly less mortality per cent of jassid i.e. 2.72, 1.38 and 1.00 per cent, respectively and thus were found least effective against the pest after 1 day of spraying. More or less similar observations were recorded on 3 and 7 days of insecticidal spray. The only difference was that all the three bio-pesticides alone showed increasing trend in the

pest mortality with the duration.

Second and third spray:

Similar trend in the mortality of the pest in different treatments was observed in second (Table 2) and third (Table 3) applications. The present investigations are in confirmation with the results of Solanki (2005) and Ulaganathan and Gupta (2004).

Yield:

The yield of hybrid cotton (Table 4) in different treatments was significantly higher over control. The highest yield (1154 kg/ha) was obtained from the treatment

Table 2 : Bio-efficacy of different insecticides against jassid infesting hybrid cotton after second spray

Sr. No.	Treatments	Per cent mortality of jassid after days		
		1 DAS	3 DAS	7 DAS
1.	<i>Beauveria bassiana</i> 2.0 kg/ha	8.55* (2.21)	10.93 (3.59)	13.78 (5.67)
2.	<i>Verticillium lecanii</i> 2.5 kg/ha	11.03 (3.66)	14.09 (5.92)	17.76 (9.31)
3.	<i>Metarrhizium anisoplae</i> 2.5 kg/ha	6.98 (1.47)	8.91 (2.40)	11.24 (3.80)
4.	Thiamethoxam 0.008 %	82.38 (98.24)	81.75 (97.94)	81.50 (97.82)
5.	Acetamiprid 0.005 %	79.50 (96.68)	79.00 (96.36)	78.75 (96.19)
6.	<i>Beauveria bassiana</i> 1.0 kg/ha + Thiamethoxam 0.004 %	74.25 (92.63)	73.75 (92.17)	73.50 (91.93)
7.	<i>Verticillium lecanii</i> 1.25 kg/ha + Thiamethoxam 0.004 %	76.75 (94.75)	76.25 (94.35)	76.00 (94.15)
8.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Thiamethoxam 0.004 %	71.25 (89.67)	70.75 (89.13)	70.50 (88.86)
9.	<i>Beauveria bassiana</i> 1.0 kg/ha + Acetamiprid 0.0025 %	66.25 (83.78)	65.75 (83.13)	65.50 (82.80)
10.	<i>Verticillium lecanii</i> 1.25 kg/ha + Acetamiprid 0.0025 %	68.50 (86.57)	68.00 (85.97)	67.75 (85.66)
11.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Acetamiprid 0.0025 %	63.50 (80.09)	63.00 (79.39)	62.75 (79.04)
	S. E. ±	2.69	2.68	2.72
	C. D. (P=0.05)	7.77	7.73	7.85
	C. V. %	9.72	9.62	9.66

*Angular transformation Figures in parentheses are original values

Table 3 : Bio-efficacy of different insecticides against jassid infesting hybrid cotton after third spray

Sr. No.	Treatments	Per cent mortality of jassid after days		
		1 DAS	3 DAS	7 DAS
1.	<i>Beauveria bassiana</i> 2.0 kg/ha	9.50* (2.72)	12.35 (4.57)	17.80 (9.34)
2.	<i>Verticillium lecanii</i> 2.5 kg/ha	12.25 (4.50)	16.23 (7.81)	23.88 (16.38)
3.	<i>Metarrhizium anisoplae</i> 2.5 kg/ha	7.75 (1.82)	10.08 (3.06)	14.73 (6.46)
4.	Thiamethoxam 0.008 %	81.88 (98.00)	81.38 (97.75)	80.75 (97.42)
5.	Acetamiprid 0.005 %	79.00 (96.36)	78.50 (96.03)	78.00 (95.68)
6.	<i>Beauveria bassiana</i> 1.0 kg/ha + Thiamethoxam 0.004 %	73.75 (92.17)	73.25 (91.69)	72.75 (91.21)
7.	<i>Verticillium lecanii</i> 1.25 kg/ha + Thiamethoxam 0.004 %	76.25 (94.35)	75.75 (93.94)	75.25 (93.52)
8.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Thiamethoxam 0.004 %	70.75 (89.13)	70.00 (88.30)	69.50 (87.74)
9.	<i>Beauveria bassiana</i> 1.0 kg/ha + Acetamiprid 0.0025 %	65.75 (83.13)	65.25 (82.47)	64.75 (81.80)
10.	<i>Verticillium lecanii</i> 1.25 kg/ha + Acetamiprid 0.0025 %	68.00 (85.97)	67.50 (85.36)	67.00 (84.73)
11.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Acetamiprid 0.0025 %	63.00 (79.39)	62.50 (78.68)	62.00 (77.96)
	S. E. ±	2.67	2.73	2.74
	C. D. (P=0.05)	7.72	7.87	7.91
	C. V. %	9.67	9.78	9.63

*Angular transformation. Figures in parentheses are original values.

Table 4 : Effect of bio-pesticides alone and in combination with insecticides on yield of hybrid cotton

Sr. No.	Treatments	Yield (kg/ ha)	Increase in yield over control (%)
1.	<i>Beauveria bassiana</i> 2.0 kg/ha	640	26.98
2.	<i>Verticillium lecanii</i> 2.5 kg/ha	684	35.71
3.	<i>Metarrhizium anisoplae</i> 2.5 kg/ha	608	20.63
4.	Thiamethoxam 0.008 %	1154	128.96
5.	Acetamiprid 0.005 %	1072	112.69
6.	<i>Beauveria bassiana</i> 1.0 kg/ha + Thiamethoxam 0.004 %	924	83.33
7.	<i>Verticillium lecanii</i> 1.25 kg/ha + Thiamethoxam 0.004 %	988	96.03
8.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Thiamethoxam 0.004 %	868	72.22
9.	<i>Beauveria bassiana</i> 1.0 kg/ha + Acetamiprid 0.0025 %	748	48.41
10.	<i>Verticillium lecanii</i> 1.25 kg/ha + Acetamiprid 0.0025 %	812	61.11
11.	<i>Metarrhizium anisoplae</i> 1.25 kg/ha + Acetamiprid 0.0025 %	720	42.85
12.	Control (water spray)	504	-
	S. E. ±	34.10	-
	C. D. (P=0.05)	98.21	-
	C. V. %	8.42	-

of thiamethoxam 0.008 per cent (128.96% increase over control). However, it was at par with acetamiprid 0.005 per cent (1072 kg/ha, 112.69% increase over control). The combinations of bio-pesticides with thiamethoxam

0.004 per cent recorded more yield (868 to 988 kg/ha) as compared to combined with acetamiprid 0.0025 per cent (720 to 812 kg/ha). The biopesticides alone were not much effective and recorded the yield to the tune of 608 to 684 kg/ ha. The minimum yield of 504 kg/ha was recorded from untreated (control) plots. Among the bio-pesticides, *V. lecanii* gave higher yield alone or in combinations with the insecticides followed by *B. bassiana* and *M. anisoplae*.

Economics:

The results (Table 5) indicated that three applications of thiamethoxam 0.008 per cent gave the highest net return (Rs. 20772) followed by acetamiprid 0.005 per cent (Rs. 19296), *V. lecanii* 1.25 kg/ha + thiamethoxam 0.004 per cent (Rs. 17784) and *B. bassiana* 1 kg/ha + thiamethoxam 0.004 per cent (Rs. 16632). The net returns (Rs./ha) received from rest of the treatments ranged from Rs. 15624 to Rs. 10944.

Considering the cost: benefit ratio, acetamiprid 0.005 per cent gave the highest cost benefit ratio of 1: 9.08 followed by thiamethoxam 0.008 per cent (1: 8.38), *B. bassiana* 1 kg/ha + thiamethoxam 0.004 per cent (1: 5.20) and *V. lecanii* 1.25 kg/ha + thiamethoxam 0.004 per cent (1: 5.09). Rest of the treatments gave the cost benefit ratio of 1: 3.66 to 1: 0.86.

Thus, looking to the effectiveness and economics of different insecticidal treatments, it can be concluded that three sprays of acetamiprid 0.005 per cent, thiamethoxam 0.008 per cent and the combination of *B. bassiana* 1 kg/ha or *V. lecanii* 1.25 kg/ha with thiamethoxam 0.004 per cent were found economically

Table 5 : Economics of different insecticides applied against jassid on hybrid cotton

Sr. No.	Treatments	Total qty. of treatment (lit/ha or kg/ha)	Cost of insecticide (Rs./ha)	Total cost (Rs./ha)	Yield (kg/ha)	Gross realization (Rs./ha)	Net realization over control (Rs./ha)	C: B Ratio (CBR)
1.	<i>B. bassiana</i> 2.0 kg/ha	6.0	1284	1509	640	11520	2448	1: 1.62
2.	<i>V. lecanii</i> 2.5 kg/ha	7.5	1800	2025	684	12312	3240	1: 1.60
3.	<i>M. anisoplae</i> 2.5 kg/ha	7.5	1950	2175	608	10944	1872	1: 0.86
4.	Thiamethoxam 0.008 %	0.480	1171	1396	1154	20772	11700	1: 8.38
5.	Acetamiprid 0.005%	0.375	900	1125	1072	19296	10224	1: 9.08
6.	<i>B. bassiana</i> 1.0 kg/ha + Thiamethoxam 0.004 %	3.0 + 0.24	1228 (642 + 586)	1453	924	16632	7560	1: 5.20
7.	<i>V. lecanii</i> 1.25 kg/ha + Thiamethoxam 0.004%	3.75 + 0.24	1486 (900 + 586)	1711	988	17784	8712	1: 5.09
8.	<i>M. anisoplae</i> 1.25 kg/ha + Thiamethoxam 0.004%	3.75 + 0.24	1561 (975 + 586)	1786	868	15624	6552	1: 3.66
9.	<i>B. bassiana</i> 1.0 kg/ha + Acetamiprid 0.0025%	3.0 + 0.187	1092 (642 + 450)	1317	748	13464	4392	1: 3.33
10.	<i>V. lecanii</i> 1.25 kg/ha + Acetamiprid 0.0025%	3.75 + 0.187	1350 (900 + 450)	1575	812	14616	5544	1: 3.52
11.	<i>M. anisoplae</i> 1.25 kg/ha + Acetamiprid 0.0025%	3.75 + 0.187	1425 (975 + 450)	1650	720	12960	3888	1: 2.35
12.	Control (water spray)	-	-	-	504	9072	-	-

(1) Market price of cotton: Rs.18/kg

(2) Labour charges: Rs.75/ha/spray

effective for the control of jassid on hybrid cotton, G Cot. Hybrid-10.

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