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## Bio-efficacy of imidacloprid 17.1 SL against sucking pests of cotton

**Roop Singh Meena, Keshav Mehra and Vikram**

### Abstract

An experiment was conducted at Agricultural Research Station, Sriganganagar, (SKRAU, Bikaner) to evaluate the bio-efficacy of imidacloprid 17.1 SL against important sucking pests of cotton viz., jassid, whitefly and thrips during the *Kharif*, 2016. The insecticides viz., imidacloprid 17.1% SL @ 150, 200 & 250 ml ha<sup>-1</sup>, imidacloprid 17.8% SL @ 125 ml ha<sup>-1</sup>, acetamiprid 20% SP @ 100 g ha<sup>-1</sup> and thiamethoxam 25% WG @ 200 g ha<sup>-1</sup> were applied two times at ETL. Among the treatments, imidacloprid 17.1% SL @ 250 ml ha<sup>-1</sup> was found most effective against jassid, whitefly and thrips in cotton crop which was at par with imidacloprid 17.1% SL @ 200 ml ha<sup>-1</sup> and thiamethoxam 25% WG @ 200 g ha<sup>-1</sup>. Highest seed cotton yield (16.17 q ha<sup>-1</sup>) was recorded in the plots treated with imidacloprid 17.1% SL @ 250 ml ha<sup>-1</sup>.

**Keywords:** Cotton, jassid, whitefly, thrips, imidacloprid

### Introduction

Cotton is considered as the most important cash crop of India. This crop is attacked by several insect pests throughout its life spans *i.e.* early in the season, during the seedling stage, mid-season and in the late season (boll formation stage). In recent years, jassid, whitefly and thrips have become deleterious pests of cotton. They suck the cell sap of green leaves in the early stage, making it sometimes necessary to re-sown (Salama *et al.* 2006)<sup>[9]</sup>. Therefore, the use of systemic insecticides is considered as one of the most effective methods to control these pests. Neonicotinoid insecticides represent the fastest growing class of insecticides introduced to the market since the launch of pyrethroids (Nauen and Bretschneider 2002)<sup>[6]</sup>. The benefit of using systemic insecticides over contact insecticides is that, they provide continuous plant protection through most of the growing season without the need for repeated applications.

### Materials and Methods

A field experiment was carried out for evaluating bio-efficacy of imidacloprid 17.1% SL against sucking insect pests of cotton during *Kharif* 2016 at ARS, Sriganganagar (SKRAU, Bikaner). The crop was raised as per recommended package of practices of irrigated North west plain Zone-Ib of Rajasthan. Two applications of imidacloprid 17.1% SL @ 150, 200 & 250 ml ha<sup>-1</sup>, imidacloprid 17.8% SL @ 125 ml ha<sup>-1</sup>, acetamiprid 20% SP @ 100 g ha<sup>-1</sup> and thiamethoxam 25% WG @ 200 g ha<sup>-1</sup> were applied when the pests population reached at ETL by using hand operated, high volume Knapsack sprayer. Pre & Post treatments observations on sucking pests population viz., jassid, whitefly and thrips were recorded on five selected leaves from top (3 leaves), mid (1 leave) and bottom (1 leave) of 5 randomly selected plants in each plots at 3, 5 and 7 days after spray. Plot wise seed cotton yield was also recorded at the time of harvesting. Efficacy of different treatments was analyzed by analysis of variance. The population data were corrected by the correction factor described by Henderson and Tilton (1955)<sup>[3]</sup> given as under.

$$\text{Per cent reduction in population} = 100 \left( 1 - \frac{T_a \times C_b}{T_b \times C_a} \right)$$

Where,

T<sub>a</sub> = Number of insect after treatment

T<sub>b</sub> = Number of insect before treatment

C<sub>a</sub> = Number of insect in untreated check after treatment

C<sub>b</sub> = Number of insect in untreated check before treatment

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## Results and Discussion

### Jassid (*Amrasca biguttula biguttula*)

The data presented in Table 1 and 2 showed that the maximum jassid population reduction was recorded in treatment of imidacloprid 17.1% SL @ 250 ml ha<sup>-1</sup> (76.40, 71.09 & 66.38 and 72.84, 69.14 & 61.43 per cent reduction at 3<sup>rd</sup>, 5<sup>th</sup> & 7<sup>th</sup> days after first and second spray, respectively) followed by imidacloprid 17.1% SL @ 200 ml ha<sup>-1</sup> and thiamethoxam 25% WG @ 200g ha<sup>-1</sup> with 71.67, 67.17 & 62.31 and 71.53, 67.98 & 61.65 and 70.45, 67.44 & 54.71 and 69.12, 64.35 & 54.89 percent reduction at 3<sup>rd</sup>, 5<sup>th</sup> & 7<sup>th</sup> days after first and second spray, respectively.

### White Fly (*Bemisia tabaci*)

The highest per cent population reduction of white fly was recorded in the treatment of imidacloprid 17.1% SL @ 250 ml ha<sup>-1</sup> (75.84, 71.03 & 62.19 and 78.85, 73.18 & 65.27 per cent reduction at 3<sup>rd</sup>, 5<sup>th</sup> & 7<sup>th</sup> days after first and second spray, respectively) and it was found at par with thiamethoxam 25% WG @ 200 g ha<sup>-1</sup> and imidacloprid 17.1% SL @ 200 ml ha<sup>-1</sup> with 72.14, 67.68 & 56.68 and 71.17, 66.78 & 56.62 and 73.69, 68.90 & 61.21 and 71.78, 67.82 & 60.43 percent at 3<sup>rd</sup>, 5<sup>th</sup> & 7<sup>th</sup> days after first and second spray, respectively (Table 1 and 2).

### Thrips (*Thrips tabaci*)

The treatment containing imidacloprid 17.1% SL @ 250 ml ha<sup>-1</sup> gave maximum per cent population reduction of thrips (79.05, 74.78 & 69.80 and 76.47, 69.87 & 63.70 per cent at

3<sup>rd</sup>, 5<sup>th</sup> & 7<sup>th</sup> days after first and second spray, respectively) which was followed by thiamethoxam 25% WG @ 200 g ha<sup>-1</sup> and imidacloprid 17.1% SL @ 200 ml ha<sup>-1</sup> with 74.14, 69.25 & 63.33 and 73.01, 67.80 & 63.22 and 72.05, 65.32 & 58.15 and 70.38, 66.01 & 59.99 per cent at 3<sup>rd</sup>, 5<sup>th</sup> & 7<sup>th</sup> days after first and second spray, respectively (Table 1 and 2).

### Seed cotton yield

The data presented in Table 3 indicated that seed cotton yield was recorded significantly higher in all the insecticidal treated plots over control. Highest seed cotton yield (16.17 q ha<sup>-1</sup>) was recorded in the plots treated with imidacloprid 17.1% SL @ 250 ml ha<sup>-1</sup> followed by imidacloprid 17.1% SL @ 200 ml ha<sup>-1</sup> and thiamethoxam 25% WG @ 200 g ha<sup>-1</sup> with 15.90 and 15.41 q ha<sup>-1</sup>, respectively.

Superiority of imiacloprid is well documented against sucking pests of cotton by different scientists *viz.*, Misra and Senapati (2003) [5], Khan (2011), Begum and Patil (2016) [1], Sarkar (2016) [10], Dabhi *et al.*, (2014) [2]. Similarly, Pawar *et al.*, (2016) [7] reported lowest mean population of jassid and whiteflies after three sprays of imidacloprid and found thiamethoxam as next best treatment. Preetha *et al.*, (2009) [8] reported that imidacloprid was found effective against jassids and whiteflies, the other neonicotinoid, thiamethoxam also provided similar levels of protection as that of imidacloprid. It has also been reported that imidacloprid had a better efficacy against sucking pests than thiamethoxam because it is highly systemic in nature.

**Table 1:** Bio-efficacy of imidacloprid 17.1% SL against sucking pests of cotton during *Kharif*-2016 (First spray)

S. No.	Treatments	Dose (ml or g/ha)	Per cent population reduction after 1 <sup>st</sup> spray									
			Jassid			Whitefly			Thrips			
			3 DAS	5 DAS	7 DAS	3 DAS	5 DAS	7 DAS	3 DAS	5 DAS	7 DAS	
1	Control	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Imidacloprid 17.1% SL	150	65.97 (54.31)	61.46 (51.62)	56.20 (48.55)	65.67 (54.11)	61.00 (51.34)	50.60 (45.33)	66.64 (54.71)	61.58 (51.67)	54.87 (47.78)	
3	Imidacloprid 17.1% SL	200	71.67 (57.83)	67.17 (55.03)	62.31 (52.14)	71.17 (57.51)	66.78 (54.82)	56.62 (48.80)	74.14 (59.45)	69.25 (56.34)	63.53 (52.85)	
4	Imidacloprid 17.1% SL	250	76.40 (60.92)	71.09 (57.52)	66.38 (54.68)	75.84 (60.84)	71.03 (57.50)	62.19 (52.04)	79.05 (62.90)	74.78 (59.89)	69.80 (56.66)	
5	Imidacloprid 17.8% SL	125	64.85 (53.65)	57.96 (49.60)	52.12 (46.19)	65.04 (53.76)	59.85 (50.70)	49.84 (44.89)	65.06 (53.79)	59.46 (50.44)	53.06 (46.74)	
6	Acetamiprid 20% SP	100	62.11 (52.01)	55.14 (47.93)	49.49 (44.69)	61.82 (51.82)	56.75 (48.89)	48.60 (44.17)	62.75 (52.41)	56.71 (48.87)	49.52 (44.71)	
7	Thiamethoxam 25% WG	200	71.53 (57.91)	67.98 (55.53)	61.65 (51.82)	72.14 (58.13)	67.68 (55.34)	56.68 (48.82)	73.01 (58.68)	67.80 (55.43)	63.22 (52.72)	
	CV%	-	7.59	7.53	10.74	7.54	7.11	8.15	7.15	8.13	8.33	
	S.Em ±	-	3.65	3.34	4.30	3.62	3.18	3.09	3.51	3.69	3.44	
	CD at 5%	-	0.45	11.26	10.30	13.48	11.16	9.79	10.81	11.38	10.60	

DAS: Days after Spray, Values in parentheses are angular transformed values

**Table 2:** Bio-efficacy of imidacloprid 17.1 SL against sucking pests of cotton during *Kharif*-2016 (Second spray)

S. No.	Treatments	Dose (ml or g/ha)	Per cent population reduction after 2 <sup>nd</sup> spray								
			Jassid			Whitefly			Thrips		
			3 DAS	5 DAS	7 DAS	3 DAS	5 DAS	7 DAS	3 DAS	5 DAS	7 DAS
1	Control	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Imidacloprid 17.1% SL	150	63.71 (53.05)	58.35 (49.80)	50.15 (45.07)	67.02 (54.94)	62.63 (52.32)	54.30 (47.46)	63.66 (52.92)	56.42 (48.67)	49.46 (44.67)
3	Imidacloprid 17.1% SL	200	69.12 (56.24)	64.35 (53.33)	54.89 (47.80)	73.69 (59.12)	68.90 (56.16)	61.21 (51.48)	72.05 (58.09)	65.32 (53.92)	58.15 (49.71)
4	Imidacloprid 17.1% SL	250	72.84 (58.60)	69.14 (56.38)	61.43 (51.66)	78.85 (62.62)	73.18 (58.80)	65.27 (53.89)	76.47 (60.99)	69.87 (56.69)	63.70 (52.94)
5	Imidacloprid 17.8% SL	125	62.80 (52.40)	57.78 (49.46)	48.54 (44.14)	67.96 (55.51)	61.90 (51.88)	53.00 (46.70)	62.79 (52.51)	54.22 (47.41)	49.09 (44.46)
6	Acetamiprid	100	60.50	55.48	47.78	64.61	60.45	50.99	60.40	52.18	45.21

	20% SP		(51.09)	(48.13)	(43.71)	(53.59)	(51.02)	(45.55)	(50.99)	(46.23)	(42.23)
7	Thiamethoxam 25% WG	200	70.45 (57.05)	67.44 (55.19)	54.71 (47.68)	71.78 (57.99)	67.82 (55.43)	60.43 (51.00)	70.38 (57.01)	66.01 (54.41)	59.99 (50.78)
	CV%	-	8.73	8.43	9.21	6.63	7.08	7.38	7.87	8.11	7.38
	S.Em ±	-	4.07	3.68	3.41	3.2	3.26	2.94	3.73	3.44	2.80
	CD at 5%	-	12.53	11.33	10.51	10.11	10.05	9.05	11.48	10.61	8.63

DAS: Days after Spray, Values in parentheses are angular transformed values.

**Table 3:** Seed cotton yield recorded in various treatments during Kharif 2016

S. No.	Treatments	Dose (ml or g/ha)	Yield (q ha <sup>-1</sup> )
1.	Control	-	13.20
2.	Imidacloprid 17.1% SL	150	14.94
3.	Imidacloprid 17.1% SL	200	15.90
4.	Imidacloprid 17.1% SL	250	16.17
5.	Imidacloprid 17.8% SL	125	14.34
6.	Acetamiprid 20% SP	100	14.68
7.	Thiamethoxam 25% WG	200	15.41
	CV%	-	5.38
	S.Em ±	-	0.66
	CD at 5%	-	2.02

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