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## Bio efficacy of newer insecticide tolfenpyrad (15% EC) against major sucking pests of brinjal

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### Abstract

Field trials were conducted at R.C.A., Udaipur during 2016 and 2017 to evaluate the bioefficacy of tolfenpyrad 15 EC at different dosages for the management of major sucking insect pests of brinjal (*Solanum melongena* Guen.). The standard insecticides viz., Imidacloprid 17.8 % SL @ 22.5 g a.i. /ha, Chlorantraniliprole 18.5 SC @ 40 g a.i. /ha, Cypermethrin 25 EC @ 50 g a.i. /ha and Pyriproxyfen 5 EC + Fenprothrin 15 EC @ 100 g a.i. /ha were used for comparison. Overall, the field trials revealed that, tolfenpyrad 15 EC @ 150 g a.i./ha provided cross-spectrum control of insect pests as it registered highest mean reduction of whitefly (91.82%), jassids (86.80%), thrips (86.47%) and aphids (91.54%) during 2016. Whereas the standard insecticides, imidacloprid 17.8 % SL @ 22.5 g a.i. /ha was found next most effective in the mean reduction of sucking pests. The same trend was noticed during 2017.

**Keywords:** Bioefficacy, insecticides, sucking pests, Brinjal

### Introduction

Brinjal (*Solanum melongena* Guen.) also known as egg plant that belongs to family Solanaceae, is a rich source of minerals (calcium, magnesium, phosphorus, sodium, potassium, chlorine and iron), vitamins and also has some medicinal importance (Choudhary, 1967) [5] is native to India and an important vegetable crop grown throughout the world. India is second largest cultivator of eggplants next to China (Anonymous, 2010) [1]. Total vegetable production, the brinjal alone occupy 9% of the country. It is grown in almost all states of India with an area of 7.29 lakh hectares under cultivation and production of 12.6 MT (Anonymous, 2017-18) [2]. Brinjal production is severely affected by various pests. The crop is infested by 26 species of insect pests and mites from germination to harvest (Vevai, 1970) [16] the sap sucking insect and mite pests are cosmopolitan in distribution causing damage to the crop directly fruit infestation up to 70 per cent (Lall, 1964) [7], 37.32 per cent (Tewari *et al.* 1984) [15] and 32.42 per cent (Behera *et al.* 1999) [4] have been reported on this crop. (Rosaih, 2001) [9] reported as 20 to 89 per cent losses due to infestation by the shoot and fruit borer, jassid, and aphid. Sucking pests also act as vectors of different diseases in brinjal such as little leaf by jassids and sooty mold by aphids and whiteflies. Farmers mostly rely on chemical pesticides for controlling pest population. In the past, several chemical insecticides have been proved effective in controlling the pests. However, development of resistance to conventional insecticides against the pest is a serious threat to India. Therefore, efforts have been made in the present study to evaluate the efficacy and to find out the optimum dose of tolfenpyrad against insect pests of brinjal.

### Materials and Methods

The experiment on the bioefficacy of tolfenpyrad (15% EC) against whiteflies, jassids, thrips and aphids was conducted in Randomized Block Design with three replications at R.C.A., Udaipur during *Rabi*, 2016 and *Kharif*, 2017. Brinjal variety *Kavch* was transplanted in the plots each measuring 4.0 x 5.0 Sq. m. at row to row and plant to plant spacing of 75 cm x 45 cm, respectively. The Brinjal variety *Kavch* was transplanted on 6<sup>th</sup> September, 2016 and 26<sup>th</sup> April, 2017. There were eight treatments replicated three times. The test chemical, tolfenpyrad (15% EC) was tested at three doses viz. 100, 125 and 150 g a.i. /ha. Different doses of tolfenpyrad was tested in comparison with standard check treatment viz. Imidacloprid 17.8 % SL @ 22.5 g a.i. /ha, Chlorantraniliprole 18.5 SC @ 40 g a.i. /ha, Cypermethrin 25 EC @ 50 g a.i. /ha and Pyriproxyfen 5 EC + Fenprothrin 15 EC @ 100 g a.i. /ha along with untreated check. Each treatment was applied two times initiating first spray as soon as the pest population crossed the ETL level and subsequent second spray was given at 17 days interval.

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### Observations

The observation on the population of whiteflies, jassids, thrips and aphids was recorded on five randomly tagged plants (5 leaves /plant). The observation on the population of whiteflies, jassids, thrips and aphids was recorded one day before (PTP) and 1, 3, 7, 10 and 15 days after first and second spray. The percent correct mortality of the pests was calculated from the formula given by Henderson and Tilton (1955) [6].

$$\text{Percent corrected mortality} = 100 \left[ 1 - \frac{T_a \times C_b}{T_b \times C_a} \right]$$

T<sub>a</sub> = Number of insects after treatment,

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

C<sub>a</sub> = Number of insects in control after treatment

C<sub>b</sub> = Number of insects in control before treatment

### Results & Discussion

The insecticides were sprayed on the test dosages on the brinjal crop at threshold levels of sucking pests and their population was recorded before spray and 1<sup>st</sup>, 3<sup>rd</sup>, 7<sup>th</sup>, 10<sup>th</sup> and 15<sup>th</sup> day after spray. During the present investigation, there populations were above threshold during investigating season and have been presented here as under:-

**Table 1:** Bioefficacy of Tolfenpyrad (15% EC) against whiteflies in brinjal crop during Rabi, 2016

S. No	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control					II Spray % Reduction over control					
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	4.14* (16.67)	36.50 (35.38)**	39.00 (39.60)	61.26 (76.88)	52.46 (62.87)	40.70 (42.53)	35.59 (33.88)**	38.20 (38.25)	60.31 (75.47)	52.14 (62.33)	42.55 (45.73)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	4.22 (17.33)	36.98 (36.18)	42.07 (45.12)	67.07 (84.83)	57.59 (71.27)	46.87 (53.27)	35.75 (34.14)	43.67 (47.68)	66.40 (83.97)	58.33 (72.43)	46.29 (52.25)
T <sub>3</sub>	Tolfenpyrad (15% EC)	150	4.22 (17.33)	39.03 (39.66)	44.56 (49.23)	73.38 (91.82)	60.90 (76.35)	52.48 (62.90)	38.70 (39.09)	45.47 (50.82)	72.42 (90.88)	62.98 (79.36)	52.97 (63.74)
T <sub>4</sub>	Imidacloprid 17.8 % SL	22.5	4.10 (16.33)	38.08 (38.03)	42.81 (46.19)	70.87 (89.26)	59.97 (74.96)	50.12 (58.89)	37.52 (37.09)	44.40 (48.96)	70.95 (89.35)	61.38 (77.06)	51.06 (60.50)
T <sub>5</sub>	Chlorantraniliprole 18.5 SC	40	4.10 (16.33)	36.97 (36.17)	41.68 (44.22)	59.98 (74.97)	50.12 (58.89)	41.88 (44.57)	36.44 (35.28)	39.65 (40.71)	59.63 (74.44)	50.01 (58.71)	42.29 (45.28)
T <sub>6</sub>	Cypermethrin 25 EC	50	4.10 (16.33)	36.97 (36.17)	40.55 (42.26)	57.68 (71.41)	48.03 (55.27)	37.70 (37.40)	37.42 (36.92)	39.15 (39.86)	58.76 (73.11)	47.30 (54.02)	38.19 (38.23)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenpropathrin 15 EC	100	4.10 (16.33)	37.33 (36.77)	41.80 (44.43)	62.63 (78.86)	45.60 (51.04)	39.68 (40.77)	36.48 (35.35)	38.16 (38.18)	62.77 (79.06)	46.34 (52.34)	38.81 (39.29)
T <sub>8</sub>	Untreated control	-	4.14 (16.67)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.39	0.71	1.03	1.38	1.17	1.87	1.33	2.30	1.55	2.09	2.30
	C.D. at 5%		N.S	2.16	3.12	4.17	5.20	5.66	4.04	6.98	4.69	6.33	6.98

\*Figures are square root ( $\sqrt{x+0.5}$ ) transformation value of population.

\*\* Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

**Table 2:** Bioefficacy of Tolfenpyrad (15% EC) against whiteflies in brinjal crop during Kharif, 2017

S. No.	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control					II Spray % Reduction over control					
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	4.08* (16.67)	34.47 (32.04)**	37.97 (37.85)	61.38 (77.06)	53.60 (64.78)	42.62 (45.86)	35.60 (33.89)**	39.02 (39.63)	57.39 (70.95)	53.16 (64.05)	42.56 (45.75)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	4.01 (15.67)	36.53 (35.43)	41.35 (43.64)	64.87 (81.97)	59.05 (73.55)	47.37 (54.14)	35.76 (34.15)	43.61 (47.57)	63.04 (79.45)	58.76 (73.10)	47.21 (53.85)
T <sub>3</sub>	Tolfenpyrad (15% EC)	150	4.02 (15.67)	38.82 (39.29)	46.43 (52.50)	74.87 (93.19)	62.21 (78.26)	55.46 (67.86)	38.81 (39.28)	46.14 (51.98)	73.41 (91.85)	63.19 (79.65)	54.00 (65.45)
T <sub>4</sub>	Imidacloprid 17.8% SL	22.5	3.95 (15.33)	38.23 (38.29)	44.09 (48.41)	72.48 (90.94)	60.91 (76.36)	53.83 (65.17)	36.29 (35.03)	44.99 (49.99)	68.79 (86.91)	60.35 (75.53)	52.37 (62.73)
T <sub>5</sub>	Chlorantraniliprole 18.5 SC	40	4.06 (16.00)	36.54 (35.45)	40.71 (42.54)	61.71 (77.55)	50.13 (58.91)	43.06 (46.62)	36.46 (35.32)	40.14 (41.56)	60.13 (75.20)	53.70 (64.95)	44.14 (48.50)

T <sub>6</sub>	Cypermethrin 25 EC	50	3.98 (15.33)	37.00 (36.23)	39.24 (40.02)	58.50 (72.71)	48.62 (56.30)	39.14 (39.85)	38.15 (38.16)	39.96 (41.24)	60.00 (75.00)	46.86 (53.25)	38.28 (38.37)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenpropathrin 15 EC	100	4.02 (15.67)	37.35 (36.80)	39.00 (39.61)	64.44 (81.38)	46.32 (52.31)	40.21 (41.69)	36.70 (35.71)	39.88 (41.11)	61.52 (77.26)	47.83 (54.93)	39.86 (41.07)
T <sub>8</sub>	Untreated control	-	4.03 (16.00)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.29	1.32	1.08	2.03	1.60	1.70	1.32	1.41	3.25	1.96	1.79
	C.D. at 5%		N.S	4.00	3.28	6.17	4.86	5.14	4.01	4.27	9.85	5.95	5.43

\*Figures are square root ( $\sqrt{x+0.5}$ ) transformation value of population.

\*\*Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

### Jassids

The data recorded on the population of jassids in present investigation during pre and post spray period (Table 3 & 4) showed that population of jassids before first spray ranged, from 8.00 to 9.67 and 7.00 to 9.67; 6.67 to 8.33 and 5.33 to 11.00 jassids/ plant and there was no significant difference in the population of jassids among the treatments. The data revealed that during *Rabi*, 2016 and *Kharif*, 2017 all the treatments were found significantly superior to untreated control. The highest mean reduction in the population of jassids was recorded from the application of tolfenpyrad (15% EC) @ 150 g a.i/ha which resulted in 86.80 and 88.83 per cent

reduction in the mean population of jassids over control during *Rabi*, 2016 and *Kharif*, 2017, respectively. It was found at par with Imidacloprid 17.8% SL @ 22.5 g a.i. /ha which caused 84.84 and 87.06 per cent reduction in the mean population of jassids. Tolfenpyrad (15% EC) @ 125 g a.i. /ha was recorded as the next effective treatment which caused 81.22 and 80.89 per cent reduction in the mean population of jassids during *Rabi*, 2016 and *Kharif*, 2017, respectively. The two years data indicated that spray of tolfenpyrad (15% EC) @ 150 g a.i/ha caused highest mean reduction in the population of jassids on brinjal crop.

**Table 3:** Bioefficacy of Tolfenpyrad (15% EC) against Jassids in brinjal crop during *Rabi*, 2016

S No.	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control					II Spray % Reduction over control					
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	2.90* (8.00)	33.37 (30.25)**	36.53 (35.43)	57.15 (70.57)	51.76 (61.69)	39.95 (39.20)	35.21 (33.25)**	39.13 (39.82)	56.08 (68.87)	52.82 (63.47)	39.13 (39.82)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	2.92 (8.00)	36.15 (34.81)	42.31 (45.32)	64.32 (81.22)	56.42 (69.42)	53.03 (46.74)	36.73 (35.77)	41.23 (43.45)	63.60 (80.23)	57.35 (70.89)	43.88 (48.04)
T <sub>3</sub>	Tolfenpyrad (15% EC)	150	3.08 (9.00)	38.76 (39.19)	44.79 (49.63)	68.28 (86.31)	60.51 (75.77)	66.79 (54.81)	40.00 (41.31)	44.23 (48.65)	68.69 (86.80)	60.55 (75.83)	48.73 (56.50)
T <sub>4</sub>	Imidacloprid 17.8% SL	22.5	2.92 (8.00)	38.35 (38.50)	43.84 (47.98)	67.03 (84.77)	57.94 (71.83)	62.87 (52.46)	39.08 (39.74)	42.57 (45.77)	67.09 (84.84)	57.27 (70.77)	46.63 (52.85)
T <sub>5</sub>	Chlorantraniliprole 18.5 SC	40	3.19 (9.67)	38.01 (37.92)	42.07 (44.89)	61.11 (76.66)	49.99 (58.66)	45.74 (42.55)	38.50 (38.75)	41.88 (44.57)	60.14 (75.22)	50.11 (58.88)	41.99 (44.76)
T <sub>6</sub>	Cypermethrin 25 EC	50	3.00 (8.67)	34.66 (32.35)	38.23 (38.30)	58.29 (72.37)	48.83 (56.66)	35.33 (36.47)	35.08 (33.03)	38.48 (38.72)	59.30 (73.93)	49.09 (57.11)	38.33 (38.52)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenpropathrin 15 EC	100	3.12 (9.33)	36.49 (35.37)	42.31 (45.31)	62.38 (78.51)	49.57 (57.94)	44.89 (42.07)	37.28 (36.68)	42.11 (44.96)	62.51 (78.70)	57.11 (70.52)	43.64 (47.63)
T <sub>8</sub>	Untreated control	-	2.92(8.00)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.35	4.67	5.18	2.18	3.11	4.63	1.79	1.88	1.46	1.32	2.53
	C.D. at 5%		N.S	14.17	15.73	6.63	9.42	14.06	5.42	5.69	4.43	4.00	7.69

\*Figures are square root ( $\sqrt{x+0.5}$ ) transformation value of population.

\*\* Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

**Table 4:** Bioefficacy of Tolfenpyrad (15% EC) against Jassids in brinjal crop during *Kharif*, 2017

S No.	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control					II Spray % Reduction over control					
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	2.73* (7.00)	33.60 (30.62)**	38.46 (38.69)	57.80 (71.60)	52.49 (62.92)	40.66 (42.45)	35.10 (33.05)**	37.69 (37.38)	56.90 (70.18)	51.34 (60.98)	38.96 (39.53)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	2.68 (6.67)	36.75 (35.80)	41.31 (43.58)	64.08 (80.89)	55.77 (68.36)	44.62 (49.34)	36.75 (35.80)	42.59 (45.80)	63.93 (80.69)	53.98 (65.42)	42.57 (45.76)
T <sub>3</sub>	Tolfenpyrad (15% EC)	150	2.79 (7.33)	39.75 (40.89)	43.93 (48.13)	70.47 (88.83)	61.10 (76.64)	48.50 (56.09)	39.23 (40.00)	44.10 (48.42)	67.87 (85.81)	60.19 (75.28)	47.08 (53.62)
T <sub>4</sub>	Imidacloprid 17.8% SL	22.5	2.86 (7.67)	38.81 (39.27)	43.35 (47.12)	68.92 (87.06)	60.47 (75.71)	47.73 (54.76)	38.77 (39.21)	43.39 (47.18)	66.94 (84.66)	57.43 (71.02)	45.99 (51.72)
T <sub>5</sub>	Chlorantraniliprole 18.5 SC	40	2.80 (7.33)	37.95 (37.83)	40.95 (42.95)	60.32 (75.49)	48.66 (56.38)	41.07 (43.16)	36.95 (36.14)	42.89 (46.31)	60.13 (75.20)	50.73 (59.94)	40.83 (42.75)

T <sub>6</sub>	Cypermethrin 25 EC	50	2.97 (8.33)	35.41 (33.58)	38.82 (39.30)	58.65 (72.94)	48.08 (55.37)	38.51 (38.77)	34.64 (32.31)	38.23 (38.30)	57.50 (71.12)	49.20 (57.31)	38.15 (38.15)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenprothrin 15 EC	100	2.86 (7.67)	37.03 (36.27)	42.95 (46.42)	62.19 (78.23)	55.48 (67.89)	43.76 (47.84)	36.86 (35.99)	41.78 (44.39)	60.79 (76.19)	54.32 (65.98)	41.45 (43.82)
T <sub>8</sub>	Untreated control	-	2.90(8.00)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.41	1.52	1.26	1.54	2.11	2.38	1.15	1.86	1.32	1.92	3.69
	C.D. at 5%		N.S	4.62	3.81	4.67	6.40	7.22	3.50	5.65	3.99	5.83	11.18

\*Figures are square root ( $\sqrt{X+0.5}$ ) transformation value of population.

\*\* Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

### Thrips

The data recorded on the population of thrips in present investigation during pre and post spray period (Table 5 & 6) showed that thrips population before first spray ranged, from 6.00 to 7.67 and 5.00 to 7.67; 7.00 to 8.33 and 5.33 to 8.00 thrips/ plant and there was no significant difference in the population of thrips among the treatments. The data revealed that during *Rabi*, 2016 and *Kharif*, 2017, all the treatments were found significantly superior to untreated control. The highest mean reduction in the population of thrips was recorded from the application of tolfenpyrad (15% EC) @ 150 g a.i/ha which resulted 86.47 and 86.67 per cent reduction in

the mean population of thrips over control during *Rabi*, 2016 and *Kharif*, 2017, respectively. It was found at par with Imidacloprid 17.8% SL @ 22.5 g a.i. /ha which caused 84.13 and 83.92 per cent reduction in the population of thrips. Tolfenpyrad (15% EC) @ 125 g a.i. /ha was recorded as the next effective treatment which caused 81.66 and 81.45 per cent reduction in the mean population of thrips during *Rabi*, 2016 and *Kharif*, 2017, respectively. The two years data indicated that spray of tolfenpyrad (15% EC) @ 150 g a.i/ha caused highest reduction in the population of thrips on brinjal crop.

**Table 5:** Bioefficacy of Tolfenpyrad (15% EC) against Thrips in brinjal crop during *Rabi*, 2016

S No.	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control					II Spray % Reduction over control					
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	2.65* (6.67)	34.24 (31.66)**	37.33 (36.78)	58.86 (73.26)	52.48 (62.91)	39.32 (40.16)	34.04 (31.33)**	38.21 (38.26)	57.38 (70.94)	51.61 (61.44)	40.20 (41.67)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	2.54 (6.00)	36.85 (35.97)	41.57 (44.13)	63.59 (80.22)	54.56 (66.38)	43.46 (47.31)	37.36 (36.83)	40.89 (42.84)	64.65 (81.66)	54.92 (66.97)	43.28 (47.01)
T <sub>3</sub>	Tolfenpyrad (15% EC)	150	2.64 (6.67)	38.29 (38.39)	43.88 (48.04)	68.42 (86.47)	58.78 (73.13)	49.23 (57.35)	39.10 (39.77)	44.45 (49.04)	67.46 (85.31)	58.25 (72.32)	48.64 (56.34)
T <sub>4</sub>	Imidacloprid 17.8% SL	22.5	2.50 (6.00)	37.66 (37.32)	43.45 (47.30)	66.52 (84.13)	57.61 (71.30)	47.77 (54.83)	38.44 (38.65)	44.09 (48.41)	66.28 (83.82)	57.86 (71.70)	48.26 (55.69)
T <sub>5</sub>	Chlorantranilprole 18.5 SC	40	2.57 (6.33)	36.87 (36.00)	41.13 (43.27)	60.70 (76.05)	48.63 (56.31)	42.24 (45.18)	37.68 (37.36)	41.49 (43.89)	61.28 (76.90)	49.37 (57.60)	42.13 (44.99)
T <sub>6</sub>	Cypermethrin 25 EC	50	2.78 (7.33)	34.58 (32.21)	38.26 (38.35)	60.49 (75.73)	50.10 (58.85)	38.77 (39.21)	35.79 (34.21)	39.65 (40.72)	60.55 (75.82)	48.51 (56.12)	39.41 (40.31)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenprothrin 15 EC	100	2.81 (7.67)	37.12 (36.42)	41.73 (44.00)	62.87 (79.21)	54.35 (66.02)	42.65 (45.90)	37.03 (36.27)	42.32 (45.34)	63.88 (80.62)	54.17 (65.74)	43.18 (46.83)
T <sub>8</sub>	Untreated control	-	2.49(6.00)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.52	1.78	1.29	1.52	1.98	1.93	1.41	2.04	1.50	1.78	1.62
	C.D. at 5%		N.S	5.40	3.92	4.61	6.01	5.86	4.27	6.18	4.56	5.39	4.90

\*Figures are square root ( $\sqrt{X+0.5}$ ) transformation value of population.

\*\* Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

**Table 6:** Bioefficacy of Tolfenpyrad (15% EC) against Thrips in brinjal crop during *Kharif*, 2017

S No.	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control					II Spray % Reduction over control					
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	2.79* (7.33)	34.65 (32.33)**	38.38 (38.54)	58.47 (72.65)	52.52 (62.98)	40.97 (42.99)	34.31 (31.77)**	37.75 (37.48)	58.78 (73.14)	51.98 (62.07)	39.30 (40.11)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	2.83 (7.67)	36.00 (34.55)	42.35 (45.38)	64.49 (81.45)	54.76 (66.71)	44.27 (48.73)	35.71 (34.07)	40.59 (42.34)	62.42 (78.56)	54.97 (67.05)	42.86 (46.27)
T <sub>3</sub>	Tolfenpyrad (15% EC)	150	2.77 (7.33)	38.80 (39.26)	44.99 (49.98)	67.58 (85.46)	58.96 (73.41)	49.34 (57.54)	37.12 (36.42)	44.52 (49.17)	68.58 (86.67)	57.52 (71.16)	48.79 (56.59)
T <sub>4</sub>	Imidacloprid 17.8% SL	22.5	2.85 (7.67)	38.01 (37.93)	42.67 (45.93)	66.36 (83.92)	57.61 (71.30)	47.80 (54.87)	36.59 (35.53)	43.59 (47.54)	66.08 (83.56)	57.20 (70.66)	47.48 (54.33)
T <sub>5</sub>	Chlorantranilprole 18.5 SC	40	2.71 (7.00)	36.31 (35.06)	40.07 (41.44)	61.02 (76.53)	47.91 (55.07)	41.48 (43.87)	37.42 (36.92)	41.70 (44.25)	59.77 (74.66)	48.16 (55.50)	43.03 (46.57)
T <sub>6</sub>	Cypermethrin 25 EC	50	2.78	34.95	38.59	60.20	47.56	38.40	34.83	37.83	58.36	47.77	36.57

			(7.33)	(32.82)	(38.90)	(75.31)	(54.46)	(38.58)	(32.62)	(37.62)	(72.48)	(54.83)	(35.51)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenpropathrin 15 EC	100	2.96 (8.33)	37.04 (36.28)	43.58 (47.52)	63.97 (80.75)	53.79 (65.11)	42.79 (46.14)	37.42 (36.92)	40.55 (42.26)	61.14 (76.70)	53.65 (64.86)	45.32 (50.57)
T <sub>8</sub>	Untreated control	-	2.70(7.00)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.26	1.49	2.15	1.63	2.29	2.35	1.44	1.52	2.57	3.00	1.40
	C.D. at 5%		N.S	4.53	6.52	4.94	6.94	7.12	4.35	4.61	7.79	9.11	4.24

\*Figures are square root ( $\sqrt{X + 0.5}$ ) transformation value of population.

\*\* Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

### Aphids

The data recorded on the population of aphids in present investigation during pre and post spray period (Table 7 & 8) showed that aphid population before first spray ranged, from 17.67 to 19.33 and 9.33 to 19.00; 17.00 to 19.00 and 9.33 to 16.67 aphids/plant and there was no significant difference in the population of aphids among the treatments. The data revealed that during *Rabi*, 2016 and *Kharif*, 2017 and all the treatments were found significantly superior to untreated control. Tolfenpyrad (15% EC) @ 150 g a.i./ha recorded as the most effective treatment which resulted in 91.54 and 91.41 per cent reduction in the mean population of aphids over control during *Rabi*, 2016 and *Kharif*, 2017, respectively. It was found at par with Imidacloprid 17.8% SL @ 22.5 g a.i./ha which caused 90.31 and 90.18 per cent reduction in the population of aphids during *Rabi*, 2016 and *Kharif*, 2017, respectively.

Tolfenpyrad (15% EC) @ 125 g a.i./ha was recorded as the next effective treatment which caused 89.84 and 89.96 per cent reduction in the mean population of aphids over control

during *Rabi*, 2016 and *Kharif*, 2017, respectively. The two years data indicated that spray of tolfenpyrad (15% EC) @ 150 g a.i./ha caused highest reduction in the population of aphids on brinjal. Cypermethrin 25 EC @ 50 g a.i./ha recorded as the least effective treatment with minimum per cent reduction in the population of aphids.

Many research workers have evaluated and reported the bio-efficacy of insecticides against sucking pests of brinjal. According to S. Ramesh Babu and Virendra Singh (2014), tolfenpyrad @ 150 and 125 g a.i./ha found highly effective against hopper complex of mango. Similar finding were also recorded by Walun *et al.* (2015) [17]. Spray application of imidacloprid found effectively reduced sucking pests of brinjal (shaikh and patel, 2012 [12], Rajesh *et al.* 2017 [8], Shivanna *et al.* 2011) [13]. However, cypermethrin 25 EC @ 62.50 g a.i./ha found effective against aphid, whiteflies and thrips in tomato (Wagh *et al.* 2017 [3] and Sudeepa and Manoj, 2017) [14]. Roy *et al.* (2017) [10] reported that pyriproxyfen 5% + fenpropathrin 15% EC was superior against hoppers complex infesting mango.

**Table 7:** Bioefficacy of Tolfenpyrad (15% EC) against Aphids in brinjal crop during *Rabi*, 2016

S No.	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control						II Spray % Reduction over control				
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	4.34* (18.33)	34.99 (32.89)**	43.72 (47.77)	65.06 (82.22)	54.76 (66.71)	47.30 (54.00)	34.09 (31.41)**	33.69 (30.78)	62.19 (78.23)	54.90 (66.94)	47.80 (54.87)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	4.45 (19.33)	35.68 (34.02)	45.48 (50.83)	71.41 (89.84)	60.00 (75.01)	50.66 (59.82)	36.72 (35.75)	41.38 (43.70)	69.32 (87.53)	56.98 (70.31)	48.81 (56.63)
T <sub>3</sub>	Tolfenpyrad (15% EC)	150	4.34 (18.33)	37.22 (36.59)	46.63 (52.84)	72.64 (91.10)	64.13 (80.96)	56.17 (69.00)	38.69 (39.08)	44.12 (48.46)	73.09 (91.54)	60.42 (75.64)	51.42 (61.12)
T <sub>4</sub>	Imidacloprid 17.8% SL	22.5	4.34 (18.33)	36.76 (35.82)	46.06 (51.86)	71.58 (90.01)	63.09 (79.51)	55.42 (67.79)	38.40 (38.58)	42.67 (45.94)	71.86 (90.31)	59.27 (73.90)	50.46 (59.47)
T <sub>5</sub>	Chlorantraniliprole 18.5 SC	40	4.30 (18.00)	34.74 (32.47)	44.37 (48.90)	66.12 (83.61)	54.33 (65.99)	45.90 (51.58)	35.65 (33.98)	40.05 (41.41)	63.70 (80.36)	54.86 (66.88)	46.80 (53.13)
T <sub>6</sub>	Cypermethrin 25 EC	50	4.45 (19.33)	34.21 (31.61)	41.78 (44.39)	64.32 (81.22)	53.67 (64.90)	44.99 (49.99)	33.97 (31.22)	33.29 (30.12)	61.45 (77.16)	54.79 (66.75)	46.34 (52.33)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenpropathrin 15 EC	100	4.26 (17.67)	35.58 (33.86)	45.28 (50.49)	67.38 (85.21)	59.78 (74.67)	48.38 (55.89)	36.11 (34.72)	40.71 (42.55)	68.25 (86.27)	55.59 (68.07)	48.22 (55.61)
T <sub>8</sub>	Untreated control	-	4.3(18.33)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.24	1.33	2.13	1.53	2.00	1.75	1.75	1.53	1.95	2.55	2.47
	C.D. at 5%		N.S	4.05	6.45	4.63	6.08	5.32	5.32	4.65	5.92	7.74	7.50

\*Figures are square root ( $\sqrt{X + 0.5}$ ) transformation value of population.

\*\* Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

**Table 8:** Bioefficacy of Tolfenpyrad (15% EC) against Aphids in brinjal crop during *Kharif*, 2017

S No.	Treatment	Dosage (g.a.i/ha)	I Spray % Reduction over control						II Spray % Reduction over control				
			PTP	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	1 DAS	3 DAS	7 DAS	10 DAS	15 DAS
T <sub>1</sub>	Tolfenpyrad (15% EC)	100	4.30* (18.00)	34.87 (32.69)**	43.13 (46.73)	63.94 (80.70)	54.66 (66.54)	47.95 (55.15)	35.06 (33.00)**	38.23 (38.29)	58.80 (73.16)	51.83 (61.80)	42.38 (45.43)
T <sub>2</sub>	Tolfenpyrad (15% EC)	125	4.41 (19.00)	36.03 (34.60)	45.58 (51.02)	71.53 (89.96)	60.32 (75.48)	49.33 (57.52)	37.13 (36.43)	41.44 (43.81)	63.80 (80.51)	53.77 (65.07)	44.95 (49.91)

T <sub>3</sub>	Tolfenpyrad (15% EC)	150	4.33 (18.33)	37.59 (37.21)	46.64 (52.86)	72.96 (91.41)	63.30 (79.81)	54.53 (66.33)	39.25 (40.03)	44.56 (49.23)	67.60 (85.48)	58.36 (72.48)	49.32 (57.51)
T <sub>4</sub>	Imidacloprid 17.8% SL	22.5	4.30 (18.00)	36.98 (36.19)	45.85 (51.49)	71.74 (90.18)	61.87 (77.78)	55.38 (67.73)	38.36 (38.52)	44.36 (48.89)	66.69 (84.34)	57.31 (70.83)	47.64 (54.60)
T <sub>5</sub>	Chlorantraniliprole 18.5 SC	40	4.22 (17.67)	35.12 (33.10)	43.96 (48.19)	67.86 (85.80)	54.54 (66.35)	46.07 (51.88)	36.24 (34.95)	40.74 (42.60)	60.99 (76.49)	48.39 (55.90)	39.83 (41.02)
T <sub>6</sub>	Cypermethrin 25 EC	50	4.39 (19.00)	34.10 (31.44)	41.16 (43.31)	65.68 (83.04)	53.36 (64.39)	44.39 (48.94)	34.40 (31.92)	37.75 (37.49)	58.38 (72.51)	47.58 (54.49)	38.87 (39.38)
T <sub>7</sub>	Pyriproxyfen 5EC+ Fenprothrin 15 EC	100	4.18 (17.00)	35.22 (33.26)	45.51 (50.88)	67.43 (85.27)	58.49 (72.68)	47.91 (55.07)	36.28 (35.01)	41.14 (43.28)	62.98 (79.36)	50.56 (59.65)	42.67 (45.95)
T <sub>8</sub>	Untreated control	-	4.30(18.00)	-	-	-	-	-	-	-	-	-	-
	S. Em ±		0.22	0.91	1.38	1.58	1.42	1.14	2.02	1.80	1.79	1.40	1.41
	C.D. at 5%		N.S	2.77	4.17	4.80	4.30	3.46	6.11	5.46	5.42	4.24	4.28

\*Figures are square root ( $\sqrt{X+0.5}$ ) transformation value of population.

\*\* Figures in parenthesis are retransformed percent value.

PTP: Pretreatment population

DAS: Days after spray

N.S: Non Significant

## Conclusion

It is evident from the above results that tolfenpyrad @ 150g a.i./ha was found most effective against sucking pests and it was significantly at par with Imidacloprid 17.8% SL @ 22.5 g a.i. /ha.

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