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BIO EFFICACY OF DINOTEFURAN 4% + ACEPHATE 50% (54%) SG AGAINST SUCKING INSECT PESTS OF COTTON

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ABSTRACT

Bioefficacy of Dinotefuran 4% + Acephate 50% (54%) SG at 439, 496 and 550 g/ha along with Dinotefuran 20% SG at 125 g/ha, Acephate 75% SP at 400 g/ha and Imidacloprid 17.8% SL at 125 ml/ha was evaluated against sucking insect pests of cotton for two crop seasons, *kharif* 2013 and 2014. The trial was conducted in a RBD at Instructional farm of Rajasthan College of Agriculture, Udaipur. The population of sucking insect pests viz. aphid, thrips, jassid and whitefly was brought below ETL with two sprays during *kharif* 2013 and 2014 with different dosages of the new chemicals. Among different treatments tested, Dinotefuran 4% + Acephate 50% (54%) SG at 550 g/ha caused maximum reduction in population of aphid, thrips, jassid and whitefly with 76.16 and 96.39; 76.15 and 96.39 (aphid), 65.20 and 92.92; 64.17 and 91.45 (thrips), 73.47 and 95.03; 75.02 and 94.12 (jassid), 76.47 and 93.04; 77.51 and 96.10 (whitefly) per cent reduction at 10 days after first and second spray during *kharif* 2013 and 2014, respectively. It was found at par with Dinotefuran 4% + Acephate 50% (54%) SG at 496 g/ha. Significantly highest seed cotton yield of 29.75 q/ha (2013) and 28.65 q/ha (2014) was recorded with higher dosage of Dinotefuran 4% + Acephate 50% (54%) SG at 550 g/ha followed by the dosage of 496 g/ha.

Key words: Bio efficacy, sucking insect pests, yield, cotton.

INTRODUCTION

Cotton is an important fibre crop and is grown extensively in the country for use in the Indian textile industry. The losses in cotton production are due to its susceptibility to about 162 species of insect pests (Manjunath, 2004). Among the important key pests of cotton the sucking pests *viz.,* aphid, *Aphis gossypii* (Glover), thrips, *Thrips tabaci* (Linnman), jassid, *Amrasca devastans* (Dist.) and whitefly, *Bemisia tabaci* (Gennadius) cause severe damage to the crop at early stage of the crop growth and can also affect the crop stand and yield of cotton. Heavy infestation at times reduces the crop yield to the extent of 21.20 percent (Patil, 1998 and Dhawan and Sidhu, 1986). The introduction of synthetic pyrethriods, though brought desirable control of bollworms, resulted in resurgence of sucking pests *viz.,* aphids, leafhopper, thrips and whitefly (Patil *et al.,* 1986). Cotton growers in India rely mainly on synthetic pesticides to combat sucking pests.

Continuous and indiscriminate use of insecticides resulted in resistance development to these insecticides. To overcome these problems, discovery of novel molecules are essential, which are effective at lower doses. However, in spite of these, newer insecticides have come to stay in modern farming, which may not be dispensed off due to their efficacy and economic. Taking into consideration the above facts, there is need of better and more effective methods of pest management with the judicious utilization of ecosafe pesticide molecules. Thus, the present study was conducted to evaluate bioefficacy of Dinotefuran 4% + Acephate 50% (54%) SG against sucking insect pests *viz.,* aphid, thrips, jassid and whitefly of cotton.

MATERIALS AND METHODS

The bio-efficacy of Dinotefuran 4% + Acephate 50% (54%) SG at 439, 496 and 550 g/ha along with Dinotefuran 20% SG at 125 g/ha, Acephate 75% SP at 400 g/ha and Imidacloprid 17.8% SL at 125 ml/ha was evaluated against sucking insect pests *viz.,* aphid, thrips, jassid and whitefly in cotton during *kharif* 2013 and 2014. The experiment was conducted in randomized block design with seven treatments replicated three times at R.C.A., Udaipur. Cotton variety Gujarat Ankur-Bt was sown on 27th June and 14th June during 2013 and 2014, respectively. Sowing was done in plots each measuring 4.5 x 4.5 sq. m. at row to row and plant to plant spacing of 90 cm x 90 cm. Each treatment was applied two times at an interval of ten days.

The observations on the population of aphid, thrips, jassid and whitefly was recorded on three leaves per plant on five plants randomly selected and tagged plant. The observations were recorded one day before and at 1, 3, 7 and 10 days after each spray and mean reduction in

population was calculated at 1, 3, 7 and 10 days after each sprays.

The experimental data were subjected to the analysis of variance (ANOVA) using appropriate statistical tools. The population data was corrected by the correction factor given by Henderson and Tilton (1955) as under:

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

Where;

Ta = Number of pests after treatment

Tb = Number of pests before treatment

Ca = Number of pests untreated check after treatment

Cb = Number of pests in untreated check before treatment

The effect of Dinotefuran 4% + Acephate 50% (54%) SG along with other treatments on natural enemies was studied by counting the population of common predatory fauna *viz.;* population of grub and adults of *Coccinella* spp., *Chrysoperla carnea* and *Cheilomenes* sp. at regular intervals in each replication.

The open bolls were picked from each treatment at regular intervals. The weight of seed cotton of all pickings was pooled together for each treatment separately and yield per hectare was computed.

RESULTS AND DISCUSSION

The data recorded on mean reduction in the population of aphid, thrips, jassid and whitefly at 1, 3, 7 and 10 days after first and second spray have been presented in Tables 1 to 8. The data reveal that all the treatments were significantly superior to untreated control. The highest mean reduction in the population of aphid, thrips, jassid and whitefly was recorded in case of two sprays of Dinotefuran 4% + Acephate 50% (54%) SG at 550 g/ha during *kharif* 2013 and 2014.

Spray of Dinotefuran 4% + Acephate 50% (54%) SG at 496 g/ha was at par treatment with followed by Imidacloprid 17.8 SL at 125 ml/ha. The remaining treatments were found moderately effective.

These findings conform to the results of Sreenivas *et al.* (2015) who observed that dinotefuran 20 SG at 30 g a.i/ha performed significantly superior by recording lowest population of leafhopper (1.47), thrips (4.72), aphids (9.10) and whitefly (0.30) for leaf, and dinotefuran 20 SG at 30 and 25 g a.i/ha dosages did not cause adverse effect on the predator population and recorded the highest yield. Kadam *et al.* (2014) observed that significantly lowest population of sucking pests on Bt cotton per three leaves was recorded in dinotefuran 20 per cent SG @ 50 g a.i./ha Dhere *et al.* (2014) observed that population of aphids and jassids was brought below ETL with different dosages of combination of acephate (0.15%) and other treatments. Patil *et* al. (2003) who observed that imidacloprid as seed treating chemical reduced sucking pest population below the economic threshold level up to 40 days after sowing and 61 days after germination. Banbote *et al*. (1995) recorded acephate (0.05%) to be effective against aphids [Aphididae], jassids [Cicadellidae], thrips [Thripidae] and whitefly [Aleyrodidae] in cotton.

The data recorded on the population of grubs and adults of *Coccinella* spp. and *Menochilus* revealed that their population did not vary significantly and were at par to each other in different treatments. It indicates that sprays of Dinotefuran 4% + Acephate 50% (54%) SG at 439, 496 and 550 g/ha and along with other treatments did not cause significant adverse effects on the common natural enemies present in cotton eco-system (Table -9 & 10).

The data presented in Table-11 reveal that all the treatments yielded significantly higher over untreated control. The seed cotton yield among different treatments ranged from 21.80 to 29.75 and 22.90 to 228.65 q/ha against 19.35 and 18.40 q/ha in untreated control during *kharif* 2013 and 2014, respectively. The highest seed cotton yield of 29.75 and 28.65 q/ha was recorded in case of spray of Dinotefuran 4% + Acephate 50% (54%) SG at 550 g/ha during *kharif* 2013 and 2014, respectively. It was at par to spray of Dinotefuran 4% + Acephate 50% (54%) SG at 496 g/ha which yielded 27.80 and 27.20 q/ha during *kharif* 2013 and 2014, respectively. It was followed by Imidacloprid 17.8% SL at 125 ml/ha than Dinotefuran 20% SG at 125 g/h and remaining treatments superior to untreated control.

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REFERENCES

Banbote, B. G. Gawande, R. B. Satpute, S. U. 1995. Efficacy of different synthetic and herbal insecticides against the pests of cotton. *PKV Research Journal*; **19**:104-106

Dhawan, A.K. and Sidhu, A.S. 1986. Assessment of losses due to attack of cotton jassid on hirsutum cotton. *Indian Journal of Plant Protection*, **14**: 45-50.

Dhere, D. A. Wadnerkar, D. W. More, D. G. Jadhav, Y. T. 2014. Field efficacy of combination insecticides on

Table 1. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against aphids in cotton (2013)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of aphids days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	92.33 (9.63)	42.30 (45.30)	44.28 (48.75)	47.50 (54.36)	44.78 (49.62)	45.39 (50.68)	48.29 (55.73)	50.13 (58.91)	46.53 (52.67)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	87.67 (9.39)*	51.66 (61.51)**	55.75 (68.32)	61.51 (77.25)	57.98 (71.88)	59.91 (74.87)	64.88 (81.98)	67.93 (85.89)	73.72 (92.14)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	90.00 (9.51)	53.57 (64.74)	57.55 (71.21)	63.77 (80.47)	60.77 (76.16)	64.91 (82.02)	67.41 (85.24)	71.59 (90.02)	79.04 (96.39)
T_4	Dinotefuran 20% SG @25 g.ai./ha	125	89.33 (9.48)	43.60 (47.55)	45.53 (50.92)	48.63 (56.32)	45.65 (51.14)	47.50 (54.36)	50.87 (60.18)	52.72 (63.31)	49.19 (57.30)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	90.33 (9.53)	47.53 (54.41)	51.34 (60.98)	53.44 (64.51)	51.90 (61.92)	52.87 (63.56)	55.87 (68.52)	57.97 (71.87)	54.48 (66.25)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	92.67 (9.65)	50.24 (59.09)	54.33 (66.00)	58.51 (72.72)	56.54 (69.60)	57.98 (71.89)	62.06 (78.04)	64.45 (81.40)	68.47 (86.54)
T_7	Untreated control	-	92.00 (9.61)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S.Em ±		0.15	0996	1.05	1.27	1.14	1.29	1.41	1.70	2.58
	C.D. at 5%		0.49	3.03	3.30	4.00	3.58	4.05	4.46	5.35	8.14

*Figures in parenthesis are square root ($\sqrt{}$ x+.5) transformation value of population.
** Figures in parenthesis are retransformed percent value.

Table 2. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against aphids in cotton (2014)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of aphids days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	92.33 (9.63)	42.30 (45.30)	44.28 (48.75)	47.50 (54.36)	44.78 (49.62)	45.39 (50.68)	48.29 (55.73)	50.13 (58.91)	46.53 (52.67)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	87.67 (9.39)*	51.66 (61.51)**	55.75 (68.32)	61.59 (77.37)	58.02 (71.95)	59.98 (74.96)	65.01 (82.16)	68.16 (86.16)	73.72 (92.14)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	90.00 (9.51)	53.57 (64.74)	57.55 (71.21)	63.76 (80.45)	60.77 (76.15)	64.88 (81.98)	67.39 (85.22)	71.54 (89.98)	79.04 (96.39)
T_4	Dinotefuran 20% SG @25 g.ai./ha	125	89.33 (9.48)	43.60 (47.55)	45.53 (50.92)	48.63 (56.32)	45.65 (51.14)	47.50 (54.36)	50.87 (60.18)	52.71 (63.60)	49.19 (57.30)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	90.33 (9.53)	47.53 (54.41)	51.34 (60.98)	53.44 (64.52)	51.90 (61.93)	52.87 (63.57)	55.88 (68.54)	57.98 (71.89)	54.48 (66.25)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	92.67 (9.65)	50.24 (59.09)	54.33 (66.00)	58.48 (72.68)	56.52 (69.57)	57.96 (71.86)	62.01 (77.97)	64.38 (81.30)	68.47 (86.54)
T7	Untreated control	-	92.00 (9.61)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S.Em ±		0.16	0.96	1.04	1.33	1.19	1.30	1.51	1.73	2.58
	C.D. at 5%		0.49	3.03	3.29	4.20	3.74	4.10	4.75	5.45	8.14

*Figures in parenthesis are square root ($\sqrt{}$ x+.5) transformation value of population.

** Figures in parenthesis are retransformed percent value.

Table 3. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against thrips in cotton (2013)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of aphids days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	56.33 (7.54)	36.98 (36.19)	40.60 (42.35)	37.64 (37.29)	35.98 (34.52)	45.92 (51.60)	50.02 (58.71)	48.39 (55.91)	46.93 (53.36)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	56.67 (7.65)*	50.62 (49.75)**	53.01 (63.80)	55.80 (68.40)	52.11 (62.29)	57.37 (70.93)	62.79 (79.09)	66.41 (83.99)	69.78 (88.06)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	55.00 (7.45)	52.84 (63.51)	55.34 (67.66)	57.19 (70.64)	53.85 (65.20)	63.99 (80.77)	67.89 (85.84)	72.41 (90.87)	74.57 (92.92)
T_4	Dinotefuran 20% SG @25 g.ai./ha	125	57.0 (7.58)	41.85 (44.52)	44.89 (49.80)	42.49 (45.63)	39.74 (40.88)	52.06 (62.20)	57.20 (70.66)	53.94 (65.35)	51.46 (61.18)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	56.66 (7.56)	44.71 (49.50)	46.55 (52.70)	48.62 (56.30)	45.56 (50.98)	50.46 (59.48)	55.74 (68.32)	58.43 (72.59)	55.30 (67.60)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	55.00 (7.45)	48.10 (55.40)	52.13 (62.32)	53.21 (64.14)	51.28 (60.87)	57.13 (70.54)	58.67 (72.97)	60.17 (75.26)	64.96 (82.09)
T_7	Untreated control	-	55.00 (7.44)	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00
	S. Em $\pm$		0.13	0.93	1.00	1.05	0.94	1.08	1.45	1.50	1.87
	C.D. at 5%		0.41	2.95	3.20	3.32	2.97	3.41	4.60	4.72	5.88

*Figures in parenthesis are square root ($\sqrt{}$ x+.5) transformation value of population.

** Figures in parenthesis are retransformed percent value.

Table 4. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against thrips in cotton (2014)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of aphids days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	58.67 (7.69)	38.21 (38.25)	42.22 (45.16)	41.18 (43.35)	38.03 (37.96)	45.44 (50.76)	48.73 (56.50)	50.60 (59.71)	48.12 (55.44)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	57.67 (7.63)*	50.96 (60.33)**	54.17 (65.73)	57.30 (70.81)	52.39 (62.75)	60.67 (76.00)	64.17 (81.02)	64.17 (85.75)	70.77 (89.15)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	56.67 (7.56)	54.56 (66.38)	56.57 (69.65)	59.43 (74.14)	53.23 (64.17)	63.29 (79.80)	67.13 (84.90)	71.04 (89.44)	73.00 (91.45)
T_4	Dinotefuran 20% SG @25 g.ai./ha	125	60.33 (7.80)	42.92 (46.37)	46.01 (51.77)	43.36 (47.14)	41.20 (43.38)	50.93 (60.27)	54.58 (66.41)	58.48 (72.66)	53.21 (64.13)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	58.67 (7.69)	46.23 (52.15)	48.31 (55.76)	50.39 (59.35)	45.43 (50.75)	51.59 (61.41)	55.97 (68.68)	59.15 (73.71)	54.89 (66.91)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	57.33 (7.60)	50.73 (59.94)	53.03 (63.84)	55.22 (67.46)	51.94 (62.00)	58.01 (71.94)	59.33 (73.99)	61.61 (77.39)	65.98 (83.43)
T_7	Untreated control	-	56.33 (7.53)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S.Em $\pm$		0.13	0.97	0.89	1.14	0.95	1.28	1.43	1.69	1.88
	C.D. at 5%		0.39	3.04	2.82	3.58	3.00	4.04	4.52	5.33	5.91

*Figures in parenthesis are square root ($\surd$ x+.5) transformation value of population.

** Figures in parenthesis are retransformed percent value.

Table 5. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against Jassids in cotton (2013)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of aphids days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	45.33 (6.77)	41.97 (44.73)	43.97 (48.20)	48.39 (55.91)	45.78 (51.36)	45.08 (50.14)	47.73 (54.75)	51.06 (60.49)	49.22 (57.34)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	46.67 (6.86)*	50.55 (59.62)**	56.03 (68.77)	59.56 (74.33)	56.40 (69.38)	58.38 (72.51)	62.27 (78.36)	66.23 (83.75)	72.17 (90.63)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	48.33 (6.99)	52.78 (63.41)	58.26 (72.33)	61.96 (77.91)	58.99 (73.47)	61.07 (76.60)	64.92 (82.03)	69.51 (87.75)	77.12 (95.03)
T_4	Dinotefuran 20% SG @25 g.ai./ha	125	44.67 (6.72)	42.45 (45.56)	45.18 (50.31)	43.72 (47.76)	40.14 (41.56)	49.78 (58.30)	56.00 (68.73)	53.33 (64.33)	51.35 (60.99)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	50.00 (7.11)	45.35 (50.61)	48.56 (56.20)	53.11 (63.96)	50.06 (58.79)	50.85 (60.15)	57.06 (70.44)	60.29 (75.43)	58.30 (72.39)
T_6	Imidacloprid 17.8% SL@ 22.25 g.ai./ha	125	48.67 (7.01)	50.38 (59.34)	52.78 (63.41)	55.79 (68.39)	52.44 (62.85)	56.89 (70.16)	59.97 (74.96)	62.91 (79.26)	66.12 (83.61)
T_7	Untreated control	-	49.33 (7.05)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S.Em $\pm$		0.12	0.94	1.07	1.25	1.14	1.20	1.41	1.56	2.05
	C.D. at 5%		0.38	2.98	3.40	3.94	3.51	3.80	4.45	4.92	6.95

*Figures in parenthesis are square root ($\surd$ x+.5) transformation value of population.

** Figures in parenthesis are retransformed percent value.

Table 6. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against Jassids in cotton (2014)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of aphids days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	49.00 (7.03)	40.96 (42.97)	42.88 (46.30)	47.25 (53.92)	44.17 (48.56)	46.02 (51.77)	48.55 (56.19)	50.37 (59.31)	47.79 (54.87)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	51.67 (7.22)*	51.87 (61.87)**	56.67 (69.80)	61.31 (76.96)	57.73 (71.50)	60.29 (75.44)	63.89 (80.63)	67.90 (85.85)	72.98 (91.43)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	52.33 (7.27)	53.59 (64.78)	58.54 (72.76)	62.35 (78.43)	60.01 (75.02)	62.66 (78.91)	66.60 (84.23)	71.39 (89.81)	75.97 (94.12)
T_4	Dinotefuran 20% SG @25 g.ai./ha	125	52.00 (7.24)	44.40 (48.96)	48.32 (55.78)	49.37 (57.60)	46.61 (52.80)	49.87 (58.45)	52.05 (62.18)	53.92 (65.32)	50.63 (59.77)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	48.67 (7.01)	46.12 (51.96)	48.68 (56.40)	52.75 (63.37)	51.20 (60.74)	52.13 (62.31)	56.11 (68.92)	60.91 (76.36)	58.06 (72.01)
T_6	Imidacloprid 17.8% SL@ 22.25 g.ai./ha	125	48.00 (6.96)	51.16 (60.66)	53.64 (64.85)	57.69 (71.42)	53.96 (65.38)	57.63 (71.34)	60.81 (76.22)	63.80 (80.51)	66.80 (84.48)
T_7	Untreated control	-	50.00 (7.10)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S.Em $\pm$		0.11	0.97	1.09	1.25	1.18	1.27	1.46	1.74	2.12
	C.D. at 5%		0.36	3.05	3.43	3.95	3.72	4.00	4.60	5.47	6.69

*Figures in parenthesis are square root ($\sqrt{}$ x+.5) transformation value of population.
** Figures in parenthesis are retransformed percent value.

Table 7. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against whitefly in cotton (2013)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of aphids days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	38.33 (6.23)	43.07 (46.64)	45.20 (50.35)	47.24 (53.90)	43.97 (48.20)	45.26 (50.46)	48.64 (56.34)	50.70 (59.88)	64.29 (52.25)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	40.00 (6.36)*	55.40 (67.75)**	57.96 (71.86)	62.09 (78.09)	58.89 (73.30)	62.46 (78.63)	63.83 (80.55)	67.84 (85.78)	72.66 (91.12)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	42.67 (6.57)	57.78 (71.58)	60.66 (76.00)	64.01 (80.79)	60.98 (76.47)	64.62 (81.63)	68.71 (86.81)	71.09 (89.50)	74.70 (93.04)
T_4	Dinotefuran 20% SG @25 g.ai./ha	125	39.99 (6.31)	43.51 (47.40)	47.47 (54.31)	49.43 (57.70)	46.35 (52.36)	50.06 (58.78)	51.68 (61.55)	53.08 (63.92)	47.85 (54.97)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	40.67 (6.42)	44.67 (49.40)	48.82 (56.65)	52.24 (62.51)	50.63 (59.76)	52.45 (62.86)	54.82 (66.88)	57.63 (71.34)	56.51 (69.56)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	39.33 (6.31)	53.58 (64.76)	57.06 (70.43)	60.30 (75.45)	58.76 (73.10)	60.84 (76.26)	62.43 (78.58)	64.30 (81.20)	66.80 (84.48)
T_7	Untreated control	-	40.33 (6.39)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S. Em $\pm$		0.1	1.02	1.15	1.36	1.22	1.37	1.50	1.51	2.03
	C.D. at 5%		0.31	3.22	3.62	4.29	3.84	4.31	4.72	4.74	6.40

*Figures in parenthesis are square root ($\sqrt{}$ x+.5) transformation value of population.
** Figures in parenthesis are retransformed percent value.

Table 8. Efficacy of Dinotefuran 4% + Acephate 50% (54%) SG against whitefly in cotton (2014)

S.No.	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Mean reduction (%) in population of whitefly days after spray								
			First spray					Second spray			
			PTP	1 days	3 days	7 days	10 days	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	41.33 (6.47)	42.62 (45.90)	44.72 (49.52)	47.37 (54.12)	43.80 (47.90)	48.84 (56.68)	49.85 (58.42)	50.95 (60.31)	45.77 (51.35)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	40.00 (6.36)*	56.15 (68.98)**	57.75 (71.53)	62.34 (78.45)	59.45 (74.16)	62.28 (78.37)	65.05 (82.20)	70.73 (89.11)	74.22 (92.61)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	39.67 (6.34)	57.69 (71.43)	60.91 (76.36)	63.62 (80.26)	61.69 (77.51)	65.45 (82.74)	67.39 (85.22)	72.58 (91.04)	78.61 (96.10)
T_4	Dinotefuran 20% SG @ 25 g.ai./ha	125	42.00 (6.52)	44.05 (48.35)	46.78 (53.10)	48.56 (56.20)	45.95 (51.65)	49.23 (57.36)	50.58 (59.67)	51.76 (61.68)	48.66 (56.37)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	42.33 (6.54)	45.12 (50.21)	49.27 (57.42)	52.60 (63.14)	50.56 (59.65)	51.81 (61.77)	54.10 (64.61)	58.26 (72.32)	57.05 (70.42)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	40.67 (6.42)	53.14 (64.01)	55.93 (68.62)	59.63 (74.43)	57.72 (71.48)	59.08 (73.60)	62.10 (77.97)	65.46 (82.76)	71.88 (90.33)
T_7	Untreated control	-	41.00 (6.44)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S. Em $\pm$		0.11	1.10	1.13	1.33	1.18	1.52	1.51	1.90	1.90
	C.D. at 5%		0.35	3.41	3.55	4.20	3.71	4.80	4.79	5.94	5.97

* Figures in parenthesis are square root ($\surd$ x+.5) transformation value of population.
** Figures in parenthesis are retransformed percent value.

Table 9. Effect of Dinotefuran 4% + Acephate 50% (54%) SG on natural enemies present in cotton ecosystem at 1, 3, 7 & 10 days after spraying during 2013

S. No	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Population of Cocinella days after spray					Population of Menochillus days after spray				
			PTP	1 days	3 days	7 days	10 days	PTP	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	8.00 (2.91)	2.74 (7.00)	2.68 (6.67)	2.80 (7.33)	2.86 (7.67)	9.00 (3.08)	2.97 (8.33)	2.91 (8.00)	2.97 (8.33)	3.03 (8.67)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	7.00 (2.74)*	2.61 (6.33)**	2.61 (6.33)	2.68 (6.67)	2.74 (7.00)	8.67 (3.03)	2.92 (8.00)	2.86 (7.67)	2.91 (8.00)	3.03 (8.67)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	7.33 (2.80)	2.67 (6.67)	2.61 (6.33)	2.67 (6.67)	2.74 (7.00)	8.67 (3.03)	2.92 (8.00)	2.85 (7.68)	2.92 (8.00)	2.97 (8.33)
T_4	Dinotefuran 20% SG @ 25 g.ai./ha	125	7.67 (2.86)	2.74 (7.00)	2.68 (6.67)	2.74 (7.00)	2.80 (7.33)	8.00 (2.92)	2.86 (7.67)	2.80 (7.33)	2.86 (7.67)	2.97 (8.33)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	7.00 (2.74)	2.61 (6.33)	2.61 (6.34)	2.68 (6.67)	2.74 (7.00)	8.33 (2.97)	2.86 (7.67)	2.80 (7.33)	2.86 (7.67)	2.92 (8.00)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	6.67 (2.68)	2.68 (6.67)	2.61 (6.33)	2.68 (6.67)	2.74 (7.00)	8.67 (3.03)	2.97 (8.33)	2.91 (8.00)	2.97 (8.33)	2.97 (8.33)
T_7	Untreated control	-	7.67 (2.86)	2.91 (8.00)	2.86 (7.67)	2.86 (7.67)	2.91 (8.00)	8.67 (3.03)	3.08 (9.00)	3.08 (9.00)	3.03 (8.67)	3.08 (9.00)
	S. Em $\pm$		0.25	0.28	0.25	0.26	0.24	0.30	0.32	0.27	0.36	0.35
	C.D. at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

*Figures in parenthesis are square root ($\sqrt{}$ x+.5) transformation value of population.

** Figures in parenthesis are retransformed percent value.

Table 10. Effect of Dinotefuran 4% + Acephate 50% (54%) SG on natural enemies present in cotton ecosystem at 1, 3, 7 & 10 days after spraying during 2014

S. No	Treatments (g.ai./ha)	Formulation dose (ml or g/ha)	Population of Cocinella days after spray					Population of Menochillus days after spray				
			PTP	1 days	3 days	7 days	10 days	PTP	1 days	3 days	7 days	10 days
T_1	Dinotefuran 4% + Acephate 50% (54%) SG @ 12+225 g.ai./ha	439	7.00 (2.74)	2.68 (6.67)	2.68 (6.67)	2.80 (7.33)	2.86 (7.67)	8.67 (3.03)	2.97 (8.33)	2.91 (8.00)	2.97 (8.33)	3.03 (8.67)
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	8.00 (2.92)*	2.78 (7.33)**	2.86 (7.33)	2.86 (7.67)	2.86 (7.67)	9.33 (3.13)	2.97 (8.33)	3.03 (8.66)	2.91 (8.00)	3.03 (8.67)
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	7.67 (2.86)	2.68 (6.67)	2.60 (6.31)	2.74 (7.00)	2.80 (7.33)	9.00 (3.08)	2.92 (8.00)	2.97 (8.33)	2.92 (8.00)	3.03 (8.67)
T_4	Dinotefuran 20% SG @ 25 g.ai./ha	125	7.33 (2.80)	2.74 (7.00)	2.68 (6.67)	2.74 (7.00)	2.80 (7.33)	8.67 (3.03)	2.92 (8.00)	2.97 (8.33)	2.92 (8.00)	2.97 (8.33)
T_5	Acephate 75% SP @ 300 g.ai./ha	400	7.00 (2.74)	2.61 (6.33)	2.61 (6.33)	2.67 (6.67)	2.74 (7.00)	9.00 (3.08)	2.97 (8.33)	2.97 (8.33)	3.03 (8.67)	3.03 (8.67)
T_6	Imidacloprid 17.8% SL @ 22.25 g.ai./ha	125	7.00 (2.74)	2.68 (6.67)	2.61 (6.33)	2.68 (6.67)	2.74 (7.00)	9.33 (3.13)	2.97 (8.33)	2.91 (8.00)	3.03 (8.67)	3.08 (9.00)
T_7	Untreated control	-	8.33 (2.97)	2.91 (8.00)	2.86 (7.67)	2.91 (8.00)	2.91 (8.00)	9.67 (3.19)	3.13 (9.33)	3.08 (9.00)	3.18 (9.67)	3.08 (9.00)
	S. Em ±		0.16	0.21	0.16	0.17	0.15	0.16	0.17	0.15	0.17	0.16
	C.D. at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

*Figures in parenthesis are square root ($\sqrt{}$ x+.5) transformation value of population.

** Figures in parenthesis are retransformed percent value.

Table 11. Effect of Dinotefuran 4% + Acephate 50% (54%) SG on yield of seed cotton during *kharif* 2013 and 2014

S.No.	Treatments (g.a.i./ha)	Formulation dosage (ml or g/ha)	Seed cotton yield (q/ha)	
			2013	2014
T_1	Dinotefuran 4% + Acephate 50% (54%) SG@ 12+225 g.ai./ha	439	21.80	22.90
T_2	Dinotefuran 4% + Acephate 50% (54%) SG @ 18+250 g.ai./ha	496	27.80	27.20
T_3	Dinotefuran 4% + Acephate 50% (54%) SG @ 22+275 g.ai./ha	550	29.75	28.65
T_4	Dinotefuran 20% SG @ 25 g.ai./ha	125	23.90	22.70
T_5	Acephate 75% SP @ 300 g.ai./ha	400	24.15	23.80
T_6	Imidacloprid 17.8% SL@ 22.25 g.ai./ha	125	26.30	26.70
T_7	Untreated control	-	19.35	18.40
	S.Em±		1.06	1.11
	C.D. at 5%		3.26	3.43

sucking pests of Bt cotton. *Indian Journal of Entomology*; **76**:12-18.

Henderson, C.F. and Tilton, E.W. 1952. Tests with acaricides against the brown wheat mite. *Journal of Economic Entomology,* **48**: 157-161.

Kadam, D. B. Kadam, D. R. Umate, S. M. Lekurwale, R. S. 2014. Bioefficacy of newer neonicotenoids against sucking insect pests of Bt cotton. *International Journal of Plant Protection*, **7**: 415-419

Manjunath, T.M. 2004. Bt cotton in india: The technology wins as the controversy wanes. *http://www.Monsanto.co.uk/news/ukshowlib.html?wid=8478*

Patil 1998. Developing IPM schedule. Proceeding of seminar on IPM. Special issue. ICPA. Mumbai. pp. 101-110.

Patil, B.C., S.B. Patil, S.S. Vdikeri and B.M. Khadi. 2003. Effect of Imidacloprid seed treatment on growth, yield, seedling vigor and biophysical parameters in cotton (*Gossypium spp*) genotypes. In: Proceeding of World Cotton Research Conference 3, Cape Town. South Africa, 9-13 March 2003.

Patil, B.K., Rote, N.B. and Mehta, N.P. 1986. Resurgence of sucking pests by the use of synthetic pyrethriods on cotton. In. proceedings of *National Symposium on Resurgence of Sucking Pests*, Tamil Nadu Agri. Univ., Coimbatore, July 7-8.

Sreenivas, A. G. Hanchinal, S. G. Sushila Nadagoud Bheemanna, M. Naganagoud, A. Patil, N. B. 2015. Management of sucking insect pest complex of Bt cotton by using dinotefuran - a 3rd generation neonicotinoid molecule. *Journal of Cotton Research and Development*; **29**: 90-93.