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BIO EFFICACY OF NC-129 (20% WP) AGAINST COTTON WHITEFLY

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ABSTRACT

The bio efficacy of NC-129 (20% WP) at 250, 375, 500, 625 g/ha along with Acetamiprid 20% SP at 100 g/ha and Imidacloprid 17.8% SL at 125 ml/ha was evaluated against whitefly in 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 whitefly was brought below ETL with two spray during *kharif* 2013 and 2014 with different dosages of the new chemicals. Among different treatments tested, NC-129 (20% WP) at 625 g/ha caused maximum reduction in population of whitefly with 72.42, 95.99 ; 71.44 and 96.73 percent at 15 days after first and second spray during *kharif* 2013 and 2014, respectively. It was at par with NC-129 (20% WP) at 500 g/ha. Significantly highest seed cotton yield of 26.80 q/ha (2013) and 24.60 q/ha (2014) was harvested with higher dosage of NC-129 (20% WP) at 625 g/ha followed by the dosage at 500 g/ha.

Key words: Bio efficacy, seed yield and cotton, whitefly

INTRODUCTION

Cotton is an important fibre crop and is grown extensively in all parts of the country. 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. whitefly, Bemisia tabaci (Gennadius), leafhopper, Amrasca biguttula biguttula (Ishida), aphid, Aphis gossypii (Glover) and thrips, Thrips tabaci (Linnman) cause severe damage to the crop at early stage of 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 but resulted in resurgence of sucking pests viz., aphids, leafhopper, thrips and whitefly (Patil et al., 1986). Cotton growers 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 our modern farming, which may not be dispensed off due to their being efficient 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 NC-129 (20% WP) for its efficacy against whitefly of cotton.

MATERIALS AND METHODS

The bio-efficacy of NC-129 (20% WP) at 250, 375, 500, 625 g/ha along with Acetamiprid 20% SP at 100 g/ha and Imidacloprid 17.8% SL at 125 ml/ha was evaluated against 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 Hybrid-8 was sown on 30 May and 15 June during 2013 and 2014 respectively. Sowing was done in plots each measuring 4.5 x 4.5 sq. m. with row to row and plant to plant spicing of 90 cm x 90 cm. Each treatment was applied two times at an interval of fifteen days.

The observation on the population of whitefly was recorded on three top and two middle leaves per plant (5 leaves/plant) on five plants selected randomly. The observation was recorded one day before and at 1, 3, 5, 10 and 15 days after each spray and mean reduction in population was calculated at 1, 3, 5, 10 and 15 days after each spray.

The experimental data was analyzed for 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 whitefly after treatment

Tb = Number of whitefly before treatment

Ca = Number of whitefly untreated check after treatment

Cb = Number of whitefly in untreated check before treatment

The effect of NC-129 (20% WP**)** 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 *Menochilus* at regular interval 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 whitefly at 1, 3, 5, 10 and 15 days after first and second spray have been presented in Table 1 and 2. The data reveals that all the treatments were found significantly superior to untreated control. The highest mean reduction in the population of whitefly was recorded in case of two sprays of NC-129 (20% WP) at 625 g/ha which caused 67.95, 75.70, 87.16, 82.25 and 72.42; 72.34, 75.93, 80.34, 85.35 and 95.99; 74.42, 78.84, 85.97 , 80.39 and 71.44; 77.18, 82.44, 81.68, 88.93 and 96.73 per cent reduction in mean population of whitefly at 1, 3, 5, 10 and 15 days after first and second spray during *kharif* 2013 and 2014, respectively.

Spray of NC-129 (20% WP) at 500 g/ha was found at par to above treatment which caused 69.96, 74.29, 87.97, 76.40 and 71.24; 75.54, 80.72, 83.30, 87.78 and 95.39; 71.93, 79.72, 87.32, 78.96 and 73.45; 77.55, 84.76, 90.21, 91.76 and 96.39 per cent reduction in the population of whitefly at 1, 3, 5, 10 and 15 days after first and second spray during *kharif* 2013 and 2014, respectively.

Imidacloprid 17.8% SL at 125 ml/ha followed the above treatments which caused 54.60, 72.53, 77.67, 75.64 and 70.63; 70.94, 75.46, 78.34, 81.66 and 79.28; 55.87, 65.32, 72.70, 76.87 and 70.39; 62.11, 70.67, 76.88, 81.52 and 78.75 per cent reduction in whitefly population at 1, 3, 5, 10 and 15 days after first and second spray during *kharif* 2013 and 2014, respectively. It was followed by Acetamiprid 20% SP at 100 g/ha. The remaining treatments were found moderately effective.

The findings confirm with the results of 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. Efficacy of acetamiprid against sucking pests has been documented by brar and naveen (2005) wherein the chemical was effective against whitefly. similar report were also made by Vastard (2003).

The data recorded on the population of grub and adults of *Coccinella* spp., *Chrysoperla carnea* 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 NC-129 (20% WP) at 250, 375, 500 and 625 g/ha and along with other treatments did not cause significant adverse effects on the common natural enemies present in cotton eco-system (Table 3).

The data presented in table 3 revealed that all the treatments yielded significantly higher over untreated control. The seed cotton yield among different treatments ranged from 18.65 to 24.80 and 18.80 to 24.60 q/ha against 16.40 and 16.10 q/ha in untreated control during *kharif* 2013 and 2014, respectively. The highest seed cotton yield of 24.80 and 24.60 q/ha was recorded in case of spray of NC-129 (20% WP) at 625 g/ha during *kharif* 2013 and 2014, respectively. It was at par to spray of NC-129 (20% WP) at 500 g/ha which yielded 24.50 and 24.20 q/ha during *kharif* 2013 and 2014, respectively. It was followed by Imidacloprid 17.8% SL at 125 ml/ha with 22.20 and 22.75 q/ha yield during *kharif* 2013 and 2014, respectively. It was followed by Acetamiprid 20 SP at 100 g/ha and NC-129 (20% WP) at 375 g/ha and was at par to each other. Even the lowest dose of NC-129 (20% WP) at 250 g/ha was found superior to untreated control.

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Table 1. Bioefficacy of NC-129 (20% WP) against whitefly, *Bemisia tabaci* in cotton during *kharif*, 2013

S.No.	Treatments (g.a.i./ha)	Formulation dosage ml or g/ha	PTP / five plants	Mean reduction (%) in whitefly population days after spray									
				First spray					Second spray				
				1 DAS	3 DAS	5 DAS	10 DAS	15 DAS	1 DAS	3 DAS	5 DAS	10 DAS	15 DAS
1	NC-129 (20% WP) at 50 g.a.i./ha	250	50.00 (7.10)*	43.80 (47.90)**	47.41 (54.20)	48.97 (56.91)	45.77 (51.34)	44.71 (49.50)	45.91 (51.58)	48.09 (55.39)	52.55 (63.02)	49.29 (57.46)	47.07 (53.60)
2	NC-129 (20% WP) at 75 g.a.i./ha	375	48.67 (7.01)	47.09 (53.65)	48.94 (56.86)	51.31 (60.93)	47.99 (55.21)	46.49 (52.60)	50.90 (60.23)	54.49 (66.26)	57.20 (70.65)	54.29 (65.93)	51.70 (61.58)
3	NC-129 (20% WP) at 100 g.a.i./ha	500	51.33 (7.20)	56.76 (69.96)	59.53 (74.29)	69.71 (87.97)	60.93 (76.40)	57.57 (71.24)	60.36 (75.54)	63.96 (80.72)	65.88 (83.30)	69.54 (87.78)	77.60 (95.39)
4	NC-129 (20% WP) at 125 g.a.i./ha	625	48.67 (7.01)	55.52 (67.95)	60.46 (75.70)	69.00 (87.16)	65.08 (82.25)	58.32 (72.42)	58.27 (72.34)	60.62 (75.93)	63.68 (80.34)	67.49 (85.35)	78.44 (95.99)
5	Acetamiprid 20% SP at 20 g.a.i./ha	100	49.67 (7.08)	45.23 (50.40)	49.46 (57.75)	52.13 (62.31)	50.54 (59.61)	48.86 (56.72)	50.30 (59.21)	52.78 (63.41)	58.78 (73.13)	57.65 (71.37)	55.81 (68.42)
6	Imidacloprid 17.8% SL at 25 g.a.i./ha	125	50.33 (7.13)	47.64 (54.60)	58.39 (72.53)	61.80 (77.67)	60.43 (75.64)	57.18 (70.63)	57.38 (70.94)	60.30 (75.46)	62.27 (78.34)	64.65 (81.66)	62.93 (79.28)
7	Untreated control		50.67 (7.15)	-	-	-	-	-	-	-	-	-	-
	S. Em±		0.14	1.24	1.40	1.96	1.21	1.08	1.16	1.30	1.40	1.51	2.15
	C.D. at 5%		NS	3.90	4.42	6.19	3.83	3.41	3.66	4.11	4.41	4.76	6.78

*Figures in parenthesis are square root ($\sqrt{x+0.5}$) transformation value of population.
**Figures in parenthesis are retransformed per cent value.
PTP = Pre treatment population.

Table 2. Bioefficacy of NC-129 (20% WP) against whitefly, *Bemisia tabaci* in cotton during *kharif*, 2014

S.No.	Treatments (g.a.i./ha)	Formulation dosage ml or g/ha	PTP / five plants	Mean reduction (%) in whitefly population days after spray									
				First spray					Second spray				
				1 DAS	3 DAS	5 DAS	10 DAS	15 DAS	1 DAS	3 DAS	5 DAS	10 DAS	15 DAS
1	NC-129 (20% WP) at 50 g.a.i./ha	250	51.33 (7.20)*	43.11 (46.70)**	43.95 (48.17)	47.29 (53.98)	49.34 (57.54)	45.21 (50.36)	44.89 (49.80)	46.35 (52.35)	52.01 (62.11)	49.78 (58.31)	47.44 (54.25)
2	NC-129 (20% WP) at 75 g.a.i./ha	375	49.67 (7.08)	48.63 (56.31)	53.88 (65.25)	57.03 (70.39)	59.72 (74.57)	49.73 (58.22)	50.14 (58.92)	55.06 (67.20)	56.50 (69.54)	54.65 (66.52)	52.84 (63.51)
3	NC-129 (20% WP) at 100 g.a.i./ha	500	50.00 (7.11)	58.01 (71.93)	63.23 (79.72)	69.14 (87.32)	62.70 (78.96)	58.98 (73.45)	61.72 (77.55)	67.02 (84.76)	71.77 (90.21)	73.32 (91.76)	79.05 (96.39)
4	NC-129 (20% WP) at 125 g.a.i./ha	625	49.33 (7.06)	59.62 (74.42)	62.61 (78.84)	68.01 (85.97)	63.72 (80.39)	57.69 (71.44)	61.46 (77.18)	65.23 (82.44)	64.65 (81.68)	70.56 (88.93)	79.58 (96.73)
5	Acetamiprid 20% SP at 20 g.a.i./ha	100	52.67 (7.29)	46.38 (52.40)	51.26 (60.85)	52.58 (63.07)	49.72 (58.20)	47.50 (54.36)	49.84 (58.41)	50.95 (60.31)	54.07 (65.57)	55.80 (68.41)	57.56 (71.22)
6	Imidacloprid 17.8% SL at 25 g.a.i./ha	125	50.33 (7.13)	48.37 (55.87)	53.92 (65.32)	58.50 (72.70)	61.25 (76.87)	57.03 (70.39)	52.01 (62.11)	57.21 (70.67)	61.26 (76.88)	64.54 (81.52)	62.55 (78.75)
7	Untreated control	1000	49.33 (7.05)	-	-	-	-	-	-	-	-	-	-
	S. Em±		0.13	1.05	1.21	1.47	1.30	1.13	1.14	1.43	1.63	1.90	1.46
	C.D. at 5%		NS	3.30	3.81	4.63	4.10	3.56	3.60	4.52	5.15	6.00	4.59

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

**Figures in parenthesis are retransformed per cent value.

PTP = Pre treatment population.

Table 3 . Effect of NC-129 (20% WP) on common natural enemies and yield of seed cotton during *kharif* 2013 and 2014

S. No.	Treatments (g.a.i./ha)	Formulation dosage ml or g/ha	Natural enemies population/5 plant (2013-14)						Seed cotton yield (q/ha)	
			Coccinella spp.		*Chrysoperla cornea*		*Menochilus*			
			Grub	Adult	Grub	Adult	Grub	Adult	2013	2014
1	NC-129 (20% WP) at 50 g.a.i./ha	250	1.84 (1.53)	1.87 (1.54)	1.92 (1.56)	1.96 (1.57)	1.95 (1.56)	1.96 (1.57)	18.65	18.80
2	NC-129 (20% WP) at 75 g.a.i./ha	375	1.80 (1.52)	1.90 (1.55)	1.87 (1.54)	1.90 (1.55)	1.97 (1.57)	2.00 (1.58)	19.90	21.25
3	NC-129 (20% WP) at 100 g.a.i./ha	500	1.97 (1.57)	2.00 (1.58)	1.75 (1.50)	1.97 (1.57)	1.94 (1.56)	1.95 (1.57)	24.50	24.20
4	NC-129 (20% WP) at125 g.a.i./ha	625	1.85 (1.53)	1.90 (1.55)	1.78 (1.51)	1.94 (1.56)	2.00 (1.58)	1.91 (1.55)	24.80	24.60
5	Acetamiprid 20% SP at 20 g.a.i./ha	100	1.79 (1.51)	1.88 (1.54)	1.76 (1.50)	1.86 (1.54)	1.92 (1.56)	2.00 (1.58)	20.40	21.40
6	Imidacloprid 17.8% SL at 25 g.a.i./ha	125	1.90 (1.55)	1.97 (1.57)	1.94 (1.56)	2.00 (1.58)	1.88 (1.54)	1.95 (1.57)	22.20	22.75
7	Untreated control	1000	1.88 (1.54)	1.84 (1.53)	1.87 (1.54)	2.00 (1.58)	1.98 (1.57)	1.93 (1.56)	16.40	16.10
	S.Em±		0.024	0.020	0.020	0.022	0.025	0.022	0.72	0.86
	C.D. at 5%		NS	NS	NS	NS	NS	NS	2.21	2.65

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

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