

New Formulation of Acephate and Other Insecticides Against Sucking Pests in Cotton

Rishi Kumar, Dinesh Swami, Kishor Chand Kumhar and R S Bhawaria

Central Institute for Cotton Research, Regional station, Sirsa - 125 055, Haryana, India.
E mail: rishipareek70@yahoo.co.in

Sucking pests are known to cause losses upto 21.20% in Cotton crop (Dhawan *et al.*, 1988). Since the introduction of transgenic cotton, sucking pests have gained increasing significance for pest management and chemical control in this crop is mainly directed against this important group of pest complex. Neonicotinoids are the new generation systemic insecticides used as foliar sprays as well as for seed treatments in transgenic cotton. Being effective against sucking pests, the neonicotinoids are being used more frequently along with conventional insecticides such as acephate, triazophos, dimethoate and fipronil in cotton (Lorenz *et al* 2000, Scott *et al* 2000, Almand and Sweeden, 2001, Greene and Capps 2002, Ngo *et al* 2002, Long *et al.*, 2003, Vastrad, 2003), for the management of sucking pests in cotton. The present study was therefore, undertaken to determine the efficacy of these insecticides along with a new formulation of acephate *i.e.* Acephate 95% SG against the sucking pests in cotton in the light of fast developing insecticide resistance as a resistance management strategy and alternative to sucking pests' management in cotton.

Field experiments were conducted under All India Coordinated Cotton Improvement Project (AICCIP) during Kharif 2009 and 2010 at Experimental area of Central Institute for Cotton Research, Regional Station, Sirsa to study the efficacy of insecticides against sucking pests (leaf hopper, whitefly and thrips). The experiments involved eleven treatments replicated thrice in randomized block design (RBD) and carried out on susceptible Cotton variety *Ganganagar ageti*, sown in a plot size of 7.42 x 4.05 m, with spacing of 67.5 X 30 cm. The crop was raised following all standard agronomical practices. The treatments consisted of acephate 95%SG @ 562.5 g a.i./ha and @ 750 g a.i./ha; acephate 75 SP @ 562.5 g a.i./ha and @ 750 g a.i./ha; imidacloprid 200 SL @ 40 g a.i./ha; acetamiprid 20 SP @ 20 g a.i./ha; thiomethoxam @ 25 g a.i./ha; dimethoate @ 250 g a.i./ha; triazophos 40 SC @ 600 g/ha and fipronil 5% SC @ 40 g a.i./ha along with a control sprayed with water. The treatments were initiated after 75 days of sowing and three applications were given at 15 days interval.

Observations on sucking pests were recorded one day before application of insecticides (pre-treatment) and one and seven

days after application of insecticides (post-treatment). The observations were recorded on 5 randomly selected and tagged plants per plot (observed over time) and three leaves (top, middle and lower) were observed per plant. The per cent reduction in the population of sucking pests was also calculated. Data were subjected to analysis of variance using SAS (1987).

Pooled observation of 2009-10 and 2010-11 (Table 1) revealed that reduction of jassid population was highest (58.59%) in imidacloprid 200 SL @ 40 g a.i./ha followed by thiomethoxam @ 25 g a.i./ha (55.17%) and lowest per cent reduction (22.31%) was noticed in dimethoate @ 250 g a.i./ha. The number of jassids nymphs recorded per three leaves was 1.08 in imidacloprid 200 SL and 1.38 in Acephate 95 SG @ 750 g a.i./ha, significantly lower than the other treatments.

All tested insecticides also caused significant mortality of whitefly and acephate 95% SG @ 562.5 g a.i./ha was the best treatment with 49.78 % reduction followed by acephate 75% SP @ 750 g a.i./ha (46.83% reduction). Lowest reduction in whitefly population was reported in standard check, dimethoate @ 250 g/ha (21.19%). The lowest whitefly population recorded per three leaves was 3.40 in acetamiprid 20 SP followed by 4.13 in acephate 95% SG @ 562.5 g a.i./ha:

Maximum reduction in thrips population was recorded in plots treated with fipronil 5% SC @ 40 g a.i./ha (53.51%), which was significantly superior to other treatments *viz.*, dimethoate @ 250 g/ha (20.29%), standard check, triazophos 40 SC @ 600 g/ha (25.80%) and acetamiprid 20 SP @ 20 g/ha (28.09%). All treatments were significantly superior to control treatment. The lowest thrips population per three leaves recorded was 8.63 and 9.90 in fipronil and acephate 95% SG @ 562.5 g a.i./ha, respectively:

Acephate 75 SP is effective against all the sucking pests' complex of cotton and is already being recommended in areas where a low to medium level of resistance has been reported in leafhopper, hence, the new formulation of Acephate 95% SG applied @ 562.5 g ai/ha can be a good

Table 1. Efficacy of insecticide treatments against sucking pests of cotton (2009 and 2010 Pooled data).

Treatment	Dose a.i. g or ml/ha	Jassid nymphs/3 leaves			Whitefly adults/3 leaves			Thrips/3 leaves			Yield (q/ha) Seed Cotton
		Before spray	After spray	Per cent reduction	Before spray	After spray	Per cent reduction	Before spray	After spray	Per cent reduction	
Acephate 95% SG	562.5	3.10 (2.02)*	1.38 (1.54)	55.17	8.36 (3.06)	4.13 (2.26)	49.78	16.01 (4.12)	9.90 (3.30)	37.95	22.47
Acephate 95% SG	750	3.09 (2.02)	1.49 (1.58)	51.35	10.94 (3.45)	5.87 (2.62)	45.47	17.08 (4.25)	10.95 (3.46)	35.67	19.91
Acephate 75 SP	562.5	2.73 (1.93)	1.64 (1.62)	38.08	7.81 (2.97)	4.13 (2.26)	44.70	18.13 (4.37)	12.35 (3.65)	31.60	18.73
Acephate 75 SP	750	2.60 (1.90)	1.48 (1.57)	41.58	8.75 (3.12)	4.66 (2.38)	46.83	16.61 (4.20)	11.96 (3.60)	27.83	19.35
Imidacloprid 200SL (std)	40	2.65 (1.91)	1.08 (1.44)	58.59	7.50 (2.92)	4.72 (2.39)	35.40	18.43 (4.41)	12.40 (3.66)	32.70	22.45
Acetamiprid 20SP (std)	20	2.92 (1.98)	1.53 (1.59)	45.91	6.30 (2.70)	3.40 (2.10)	45.50	17.58 (4.31)	12.64 (3.69)	28.09	21.08
Thiomethoxam (std)	25	3.02 (2.00)	1.40 (1.55)	51.52	7.69 (2.95)	4.60 (2.37)	39.54	18.97 (4.47)	11.79 (3.58)	37.68	20.29
Dimethoate (std)	250	3.01 (2.00)	2.24 (1.80)	22.31	6.32 (2.70)	4.93 (2.44)	21.19	17.65 (4.32)	14.08 (3.88)	20.29	17.74
Triazophos 40 SC (std)	600	3.28 (2.07)	1.87 (1.69)	40.85	9.15 (3.19)	5.28 (2.50)	42.71	17.35 (4.28)	12.88 (3.73)	25.80	19.23
Fipronil 5% SC	40	2.76 (1.94)	1.85 (1.69)	29.89	7.84 (2.97)	4.74 (2.40)	39.23	18.68 (4.44)	8.67 (3.11)	53.51	18.96
Control with water	-	2.19 (1.79)	1.99 (1.73)	0.89	7.87 (2.98)	7.07 (2.84)	1.11	16.59 (4.19)	15.60 (4.07)	2.23	17.32
CD at 5%		0.088	0.120		0.100	0.118		0.136	0.116		0.34
SE±(m)		0.042	0.057		0.048	0.057		0.065	0.055		

* Figure in parenthesis are "x+1.0 transformed value"

alternative in sucking pests' management particularly the whitefly. At present, only triazophos and ethion are being recommended for managing whitefly in North Zone of India, and that too only during the later part of the season. If this pest is not managed properly at early stage it can cause higher losses in cotton yield. The neonicotinoids and fipronil 5% SC found effective against sucking pests in the present studies have also been reported effective by many earlier workers (Mustafa 1996; Hameed *et al.*, 1997; Prasanna, 2000; Dhawan and Simwat, 2002; Vastrad, 2003; Brar and Naveen, 2005 and Patil *et al.*, 2009).

The insecticidal interventions did not affect the predators activity during both years and there were no significant variations in predator populations among the treatments before and after the applications of insecticides.

All the treatments yielded significantly higher than control. The maximum yield (22.47 q/ha) was obtained in treatment

Acephate 95% SG @ 562 g a.i./ha followed by Imidacloprid (22.45 q/ha) in Table 1.

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