

Bioefficacy of new molecule fipronil 5% SC against sucking pest complex in Bt cotton

S. B. PATIL, S. S. UDIKERI, P. V. MATTI, G. S. GURUPRASAD, R. B. HIREKURUBAR,
H. M. SHAILA AND N. B. VANDAL

Agricultural Research Station, Dharwad - 580 007, Karnataka, India.

E mail: patilsb_ent@yahoo.com

(Received : June, 2009)

Abstract : The efficacy of fipronil 5% SC @ 800 g/ha, fipronil 40% + imidacloprid 200 SL @ 200 ml/ha, acetamiprid 20SP @ 100 g/ha and triazophos 40 EC @ 1500 ml/ha (standard checks) was evaluated against sucking pests of cotton, at ARS, Dharwad. All the insecticides were found to give effective control of leafhoppers, aphids and thrips. Fipronil 5% SC @ 800 g/ha registered least number of thrips (8.47 / 3 leaves) and found to be on par with acetamiprid 20 SP @ 100 g/ha, (7.80 / 3 leaves). Fipronil 40% + imidacloprid 40% - 80 WG and was next best and imidacloprid 200 SL. Significantly highest seed cotton yield of 27.23 q/ha (2007) and 27.50 q/ha (2008) was harvested with higher dosage of fipronil 5% SC @ 800 g/ha respectively proving them to be on par with acetamiprid 20 SP.

Key words : Fipronil 5% SC, acetamiprid 20 SP, Fipronil 40% + imidacloprid 200SL, sucking pest complex

Introduction

Cotton is an important commercial crop unanimously designated as king of fibre crops and is prone to pest attack at various stages of crop growth. Cotton production system in the country illustrates well, the ecological and environmental problems associated with intensive use of synthetic insecticides. The introduction of synthetic pyrethroids, though brought desirable control of bollworms, resulted in resurgence of sucking pests viz, aphids, leafhoppers, thrips and whitefly that have also been reported in cotton system due to excessive use of synthetic pyrethroids (Ajri *et al.*, 1986, Patil *et al.*, 1986). Many insect pests are of economic importance and do cause considerable yield loss 57-80 per cent. 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 which reflected on the reliability of efficacy of these insecticides. To overcome these associated problems, discovery of novel molecules are essential. New molecules are effective at lower doses and have least exposure in the environment.

Fipronil (Regent®) belongs to a new class of insecticides fiproles and was found to be efficient compared to pyrethroid, OP and carbamate insecticides (Patil *et al.*, 2004). In the present investigation, fipronil has been evaluated for its effectiveness against sucking pests of cotton as a sole compound as well as a combination of product with imidacloprid 200SL.

Material and methods

Field experiments were carried out under All India Co-ordinated Cotton Improvement Project (AICCIP) during kharif 2007 and 2008 at ARS Dharwad farm in medium deep black cotton soil under rainfed conditions. The experiments were configured with eight treatments which were replicated four times. Cotton hybrid RCH-2Bt was sown in a plot size of 5.4x5.4 sq.m with a spacing of 90x60 cm. The crop was raised following all standard agronomical practices. The treatments were imposed as and when sucking pests crossed ETL viz, 2 nymphs of jassids, or 10 nymphs/adults of thrips or aphids per leaf.

The populations of sucking pests viz., thrips, aphids and leafhoppers were recorded from randomly selected ten plants. Observations were subjected to statistical analysis to assess the impact of new molecules on pest incidence. Seed cotton yield was harvested from each treatment and finally expressed in quintal/ha.

Results and discussion

A day before the imposition of treatment, population of sucking pest was quite uniform and above the economic threshold level. Five days after the spray, thrip, leafhopper and aphid populations reduced considerably and registered 7.91, 1.40 and 5.64 per three leaves respectively in the plots sprayed with fipronil 5% SC @ 800g/ha which was statistically on par with standard check acetamiprid 20SP @ 100 ml/ha (7.95, 1.18 and 6.00/3 leaves). Significantly higher seed cotton yield of 27.23q/ha was obtained from fipronil 5% SC @ 800 g/ha and comparable to acetamiprid 20 SP, the standard check (27.60 q/ha) and imidacloprid 200SL (26.70 q/ha). On the contrary the untreated check registered significantly lowest seed cotton yield (21.25 q/ha). The next best treatment was fipronil 40% + Imidacloprid 40% - 80 WG and statistically on par with another standard check imidacloprid 200 SL (Table 1).

During 2008-09 also, prior to the application of insecticides, population of all sucking pests complex was quite uniform and also above ETL (Table 2). However, fipronil 5% SC @ 800 g/ha registered significantly least number of thrips, leafhopper and aphids (9.03, 1.85 and 1.27 / 3 leaves respectively) and was found to be equally effective as that of standard check, acetamiprid 20 SP (7.66, 1.65 and 1.15 / 3 leaves) (Table 2). The seed cotton yield was significantly highest in fipronil 5 SC (27.50q/ha) and acetamiprid 20SP (27.65 q/ha) sprayed plots both being statistically on par. The combination product of fipronil + imidacloprid could also give better yields (25.26 q/ha).

Pooled observations of 2007-08 and 2008-09 revealed that significantly lower thrip, leafhopper and aphid populations were noticed in fipronil 5% SC (Regent®) @ 800 g/ha treatment (8.47, 1.62 and 3.45 / 3 leaves, respectively) which was found to be quite effective and par with standard check, acetamiprid (Pride 20SP®) @ 100 g/ha (7.80, 1.21 and 3.57 / 3 leaves, respectively) (Table 3).

Table 1. Performance of new insecticide formulations against sucking pest complex

2007-08									
Treatments	Dosage (ml or g/ ha)	No. of thrips / 3 leaves		No. of leafhopper /3 leaves		No. of aphids/ 3 leaves		No. of Predators/ plant*	Yield (q/ha)
		Day before spray	5 Days after spray	Day before spray	5 Days after spray	Before spray	5 Days after spray		
T ₁ -Fipronil 40%+Imidacloprid 40%-80 WG	100 ml/ha	39.86 (6.12)	09.36d (3.16)	7.25 (2.69)	2.15b (1.78)	44.03 (6.73)	10.64bc (3.40)	0.37 (1.18)	26.07a
T ₂ -Fipronil 5% SC (Regent)	800 g/ha (6.54)	41.78 (2.96)	07.91d (2.86)	7.20 (1.54)	1.40bc (6.85)	43.97 (2.57)	05.64c (1.15)	0.40	27.23a
T ₃ -Imidacloprid 200 SL (Cconfidor)	200 ml/ha	45.78 (6.84)	24.38b (4.78)	7.28 (2.87)	1.23bc (1.49)	43.98 (6.70)	09.02bc (3.13)	0.41 (1.19)	26.70a
T ₄ -Acetamiprid 20 SP (Pride) (Std Check)	100 g/ha	43.13 (6.64)	07.95d (2.98)	6.60 (2.75)	0.78c (1.33)	43.52 (6.66)	06.00c (2.65)	0.40 (1.18)	27.60a
T ₅ -Triazophos 40 EC (Hostathion) (Std Check)	1500 ml/ha	45.03 (6.78)	15.53c (4.04)	7.26 (2.87)	2.52b (1.87)	46.29 (6.86)	14.69b (3.96)	0.36 (1.16)	24.55ab
T ₆ -Untreated check	..	49.62 (7.11)	52.31a (2.97)	7.80 (3.03)	8.22a (6.69)	43.82 (7.70)	58.32a (1.23)	0.51	21.25b
CV (%)		12.93	11.78	16.64	14.11	12.77	14.76	10.35	10.34
CD (P=0.05)		NS	0.75	NS	0.36	NS	0.35	NS	3.98
SEm ±		0.43	0.25	0.23	0.12	0.42	0.28	0.07	1.32

No. of sprays: Two Hybrid: Bunny Bt

Figures in parentheses are square root transformed values.

*Number of Coccinellids (grubs and adults) +grubs of *Chrysoperla carnea*

Table 2. Performance of new insecticide formulations against sucking pest complex

Table 2: Performance of new insecticide formulations against sucking pest complex									
Treatments	Dosage (ml or g/ ha)	2008-09						No. of Predators/ plant*	Seed cotton yield (q/ha)
		No. of thrips		No. of leafhopper		No. of aphids			
		/ 3 leaves		/ 3 leaves		/ 3 leaves			
		Day before spray	5 Days after spray	Day before spray	5 Days after spray	Before spray	5 Days after spray		
T ₁ -Fipronil 40%+Imidacloprid 40%-80 WG	100 ml/ha	32.10 (5.75)	10.24bc (3.10)	10.13 (3.34)	2.41c (1.85)	14.12 (3.76)	4.16c (2.27)	0.35 (1.16)	25.26ab
T ₂ -Fipronil 5% SC (Regent)	800 g/ha	30.35 (5.60)	9.03bc (3.16)	10.22 (3.35)	1.85c (1.69)	12.78 (3.71)	1.27d (1.50)	0.38 (1.14)	27.50a
T ₃ -Imidacloprid 200 SL (Cconfidor)	200 ml/ha	30.10 (5.58)	12.05b (3.61)	10.63 (3.41)	2.45c (1.86)	12.78 (3.71)	4.32c (2.30)	0.35 (1.16)	23.20bc
T ₄ -Acetamiprid 20 SP (Pride) (Std Check)	100 g/ha	30.88 (5.65)	7.66c (2.94)	9.67 (3.27)	1.65c (1.63)	13.02 (3.74)	1.15d (1.46)	0.32 (1.15)	27.65a
T ₅ -Triazophos 40 EC (Hostathion) (Std Check)	1500 ml/ha	32.81 (5.81)	12.43b (3.66)	10.53 (3.40)	3.80b (2.19)	12.41 (3.66)	7.92b (2.97)	0.30 (1.14)	19.60cd
T ₆ -Untreated check	..	38.16 (6.26)	44.65a (6.76)	13.83 (3.85)	13.76a (3.84)	14.45 (3.93)	17.00a (4.24)	0.48 (1.22)	17.16d
CV (%)		10.70	9.52	12.52	10.16	12.31	16.86	10.72	9.72
CD (P=0.05)		NS	0.56	NS	0.26	NS	0.62	NS	3.95
SEm±		0.30	0.18	0.21	0.11	0.23	0.20	0.06	1.31

No. of sprays: Two Hybrid: Bunny Bt

Figures in parentheses are square root transformed values.

*Number of coccinellids (grubs and adults) +grubs of *Chrysoperla carnea*

Table 3. Performance of new insecticide formulations against sucking pest complex

		Pooled							
Treatments	Dosage (ml or g/ ha)	No. of thrips /		No. of leaf		No. of aphids		No. of Predators/ plant*	Seed cotton yield (q/ha)
		3 leaves		hopper / 3 leaves		3 leaves			
		Day before spray	5 Days after spray	Day before spray	5 Days after spray	Before spray	5 Days after spray		
T ₁ -Fipronil 40%+Imidacloprid 40%-80 WG	100 ml/ha	35.98 (5.87)	9.80cd (3.28)	8.69 (3.02)	2.28bc (1.81)	29.07 (5.30)	7.40bc (2.89)	0.36 (1.16)	25.66ab
T ₂ -Fipronil 5% SC (Regent)	800 g/ha	36.06 (6.08)	8.47d (3.07)	8.71 (3.11)	1.62c (1.61)	28.37 (5.41)	3.45c (2.11)	0.39 (1.17)	27.36ab
T ₃ -Imidacloprid 200 SL (Cconfidor)	200 ml/ha	37.94 (6.24)	18.21b (4.27)	8.95 (3.15)	1.84bc (1.68)	28.38 (5.42)	6.67bc (2.76)	0.38 (1.18)	24.95ab
T ₄ -Acetamiprid 20 SP (Pride) (Std Check)	100 g/ha	37.00 (6.16)	7.80d (2.90)	8.13 (3.02)	1.21c (1.48)	28.27 (5.4)	3.57c (2.13)	0.36 (1.16)	27.62a
T ₅ -Triazophos 40 EC (Hostathion) (Std Check)	1500 ml/ha	38.92 (6.31)	13.98bc (3.87)	8.89 (3.14)	3.16b (2.04)	29.35 (5.51)	11.30b (3.31)	0.38 (1.15)	22.07bc
T ₆ -Untreated check	.	44.04 (6.71)	48.39a (7.02)	10.81 (3.42)	10.99a (3.42)	29.13 (5.48)	37.66a (6.21)	0.49 (1.22)	19.20c
CV (%)		11.90	11.41	11.51	12.29	12.09	16.72	10.52	13.62
CD (P=0.05)		NS	0.69	NS	0.36	NS	0.81	NS	5.02
SEm±		0.37	0.23	0.18	0.12	0.32	0.27	0.05	1.66

No. of sprays: Two Hybrid: Bunny Bt Figures in parentheses are Square root transformed values.

* Number of Coccinellids (grubs and adults) + grubs of *Chrysoperla carnea*

The seed cotton yield obtained from the different treatments of test chemicals was significantly higher compared to untreated control (19.20 q/ha). The higher dose of fipronil 50% SC @ 800 ml / ha registered 27.36 q / ha and was statistically comparable with standard check, acetamiprid (27.62 q / ha), fipronil 40 % + imidacloprid (25.66 q / ha) @ 100 ml / ha and Imidacloprid 200 SL @ 200 SL @ 200 ml / ha (24.95 q / ha) were next best options. Highest numbers of predators were observed in untreated control. Treatment with fipronil 5% SC @ 800 g/ha was found to be on par with untreated control with respect to predator population. As combi product also fipronil (fipronil 40 +imidacloprid 40%-80 WG) proved to be better in containing sucking pests of cotton. The combination product could be a better choice in managing imidacloprid resistant population.

The present findings are inline with the work of Brar and Naveen (2005) who reported bio efficacy of Acetamiprid (Pride 20 SP®), at the rate of 100, 150 and 200 g/ha, to be as

good as the recommended dosages of oxydemeton methyl (Metasystox 25EC) at 750 ml/ha, triazophos (Hostathion 40 EC) at 1500 ml/ha and ethion (Phosphite 50 EC) at 2000 ml/ha, in controlling whitefly, *Bemisia tabaci* and cotton jassid (*Amrasca biguttula*). Similarly, Singh *et al.* (2002) and Sinha *et al.* (2007) reported that Fipronil @ 50 g ai/ha at fortnightly interval was found to be the best treatment against the leafhopper. The reports on the bioefficacy of the nicotineoides molecules viz., Imidacloprid, Thiamethoxam and Acetamiprid in spray and seed dressing formulation against sucking pests of cotton and other crops has been well proved (Vastrad, 2003 : Patil *et al.*, 2004).

Thus the present findings on the efficacy of Fipronil 5% SC @ 800 g/ ha was in confirmity with proven results. These chemicals would be helpful in mitigating sucking pest problem, which are alarming in the present situation and could be included in IPM of either Bt cotton or conventional cotton as a promising component.

References

- Ajri, D.S., Mali, A.R., Shelake, S.S., Patil, C.S and Subedar, A.J 1986. A status paper on problem of whitefly, *Bemisia tabaci* (Gennadius) in cotton and other crops in western Maharashtra. *Proc. Sem Status whitefly Cotton* College of Agriculture, Pune., March 14. p.7
- Brar, D.S. and Naveen. Agarwal, 2005 Evaluation of efficacy of acetamiprid (Pride 20SP) against whitefly, *Bemisia tabaci* (Genn.) on American cotton. *J. Cott. Res. Dev.* 2005., 19: 281-283
- Patil B.V. and Rajanikanth, R., 2004. New class of insecticides, mode of action and their bio-efficacy. Paper presented in paper presented in *Int. Symp. Strat. Sust. Cotton Prod. A Global Vision.*, November 23-25. p.77-85.
- Patil, B.K., Rote, N.B and Mehta, N.P, 1986. Resurgence of sucking pests by the use of synthetic pyrethroids on cotton. In *Proc. Nation. Symp. Resurg. Suck.Pests*, Tamil Nadu Agri. Univ., Coimbatore, July 7-8.
- Singh, J., Simwat, G. S., Brar, K.S. and Sohi A. S 2002 Efficacy of acetamiprid (N125) against cotton jassid on American cotton. *Insect Environ.*, 8: 100-101
- Sinha, S.R., Rai.Singh. and Sharma, R. K, 2007 Management of insect pests of okra through insecticides and intercropping. *Ann. Pl. Prot. Sci.*, 2007; 15: 321-324
- Vastrad, A. S., 2003, Neonicotinoids current success and future outlook. *Pestology.*, 27:60-63.