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BIOEFFICACY OF TOLFENPYRAD AGAINST JASSID AND WHITEFLY ON COTTON

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ABSTRACT

A field experiment was conducted at Agricultural Research Station– Banswara (Rajasthan) during *kharif*–2009 and 2010 to determine the relative efficacy of different doses of tolfenpyrad 15 EC against jassids and whiteflies on cotton along with other new molecules. Eight treatments *viz.* tolfenpyrad 15 EC @ 100 a.i./ha, tolfenpyrad 15 EC @125 a.i./ha, tolfenpyrad 15 EC @150 a.i./ha, tolfenpyrad 15 EC @ 300 a.i./ha (only for phytotoxicity), imidacloprid 17.8 SL @ 22.5 a.i./ha, acetamiprid 20 SP @ 20 a.i./ha, thiamethoxam 25 WG @ 25 a.i./ha and untreated control were evaluated. Tolfenpyrad 15 EC at doses of 100, 125 and 150 a.i./ha were effective in controlling the population of jassids and whiteflies on cotton. Among the doses tested, tolfenpyrad 15 EC @ 150 and 125 a.i./ha were superior to acetamiprid 20 SP, imidacloprid 17. 8 SL and thiamethoxam 25 WG in controlling population of the pests and gave significantly higher yield; besides, tolfenpyrad 15 EC @ 300 a.i./ha did not produce any phytotoxicity symptoms on the treated crop.

Key words: Bio–efficacy, new molecules, tolfenpyrad, sucking pests, cotton

INTRODUCTION

Cotton is an important fiber cum cash crop of our country, sustaining one of the country's largest organized industries – the textile industry, contributes nearly 30 per cent to foreign exchange earnings amounting to more than 10 billion dollars (Rao *et al*., 2007). India ranks 1st with respect to area under cotton (about one third area of total global area) and stands 2nd in total production after China, but the productivity is very low with 555 kg lint/ha as against world average of 794 kg lint/ha (Anonymous, 2010). The low productivity of cotton is due to several reasons; among these, losses due to sucking pests and bollworms are major constraints at different stages. Sucking pests like jassids, *Amrasca biguttula biguttula* Ishida and white flies, *Bemisia tabaci* (Genn.) are regular pests of cotton and the estimated loss due to sucking pests is 21.20 to 22.86 per cent (*Dhawan et al., 1988 and Satpute et al., 1990*) besides the qualitative losses caused. Over the years these pests developed tolerance to some commonly used insecticides, hence the recommended insecticides proved ineffective (Kalra *et al.*, 2001). Tolfenpyrad is a broad spectrum insecticide and has been use in vegetables, particularly cruciferous leafy vegetables, fruits and other high value produce since 2002. It acts mainly through inhibition of the mitochondrial electron transport system. Tolfenpyrad also provides contact activity against target pests on egg, larval, nymphal and adult stages and also exhibits antifeedant activity especially against lepidopteran insects (Anonymous, 1996). During the present study field efficacy of tolfenpyrad against jassids and white fly was tested for two seasons, *kharif* –2009 and 2010.

MATERIALS AND METHODS

The experiment was conducted at Agricultural Research Station, Borwat Farm (Banswara) Rajasthan during *kharif*–2009 and 2010 to evaluate the efficacy of different doses of tolfenpyrad 15 EC along with other new molecules. The trial was laid out in randomized block design (RBD) with eight treatments and three replications (Table 1). Cotton variety H–8 was sown in row to row and plant to plant distance of 90 x 45 cm in six–meter row–length. All recommended agronomic practices were followed as per package of practices except insecticidal sprays. Observations on pest incidence were recorded from five plants/plot, tagged and selected at random. The number of sucking pests namely, jassids (*Amrasca biguttula biguttula*) and whiteflies (*Bemisia tabaci)* were recorded from 3 leaves per plant, one day before spraying and on 3rd and 7th day after spray. The seed cotton yield was recorded plot wise at harvest and worked out as kg/ha. Observations on phytotoxicity symptoms *viz.,* leaf injury, wilting, vein clearing and necrosis (epinasty and hyponasty) were recorded up to 10 days after spray appli-

cation of tolfenpyrad 15 EC @ 300 a.i./ha. Observations were recorded on the basis of scores shown in Table 2.

Table 1. Treatment details of the trial with test chemicals and the dosage

S. No.	Treatment	Dose/ha (ml/g)
1	Tolfenpyrad 15 EC @ 100 a.i./ha	667 ml
2	Tolfenpyrad 15 EC @125 a.i./ha	833 ml
3	Tolfenpyrad 15 EC @150 a.i./ha	1000 ml
4	Tolfenpyrad 15 EC @ 300 a.i./ha	2000* ml
5	Imidacloprid 17.8 SL @ 22.5 a.i./ha	126 ml
6	Acetamiprid 20 SP @ 20 a.i./ha	100 g
7	Thiamethoxam 25 WG @25 a.i./ha	100 g
8	Control	–

* For Phytotoxicity studies only.

Table 2. Scores used for effect on crop health

Score	Per cent crop affected
0	No adverse effect
1	1–10
2	11–20
3	21–30
4	31–40
5	41–50
6	51–60
7	61–70
8	71–80
9	81–90
10	91–100

RESULTS AND DISCUSSION

The data presented in Table 3 reveal that the population of jassids ranged from 11.53 to 12.67/three leaves before spray. After 7 days of spray, the minimum number of jassid population was recorded in tolfenpyrad 15 EC @ 150 and 125 a.i./ha (1.39 and 1.40 jassids/three leaves, respectively), both being statistically at par, indicating effective control of the pest during 2009. Similarly, in the subsequent year (2010), the population of jassids was in the range of 15.80 to 17.60/three leaves before spray and in tolfenpyrad @ 150 *a.i.* and 125 *a.i.*/ha it was 1.32 and 1.60 jassids/three leaves, respectively after 7th days of spray; however, tolfenpyrad @ 125 a.i./ha was statistically at par in its efficacy with acetamiprid 20 SP @ 20 a.i./ha. From the Table 4 it can be observed that the population of whitefly was in the range of 30.80 to 32.53/ three leaves before spray and the treatments were statistically at par among themselves. During 2009, minimum number of whitefly population was recorded in treatment tolfenpyrad 15 EC @ 150 a.i./ha that was at par with tolfenpyrad 15 EC @125 a.i/ha (3.0 and 4.0 whiteflies/ three leaves; respectively) followed by imidacloprid 17.8

Table 3. Population of jassids in different treatments during 2009 and 2010

S. No.	Treatments	Number of jassids/three leaves					
		2009			2010		
		BS	3 DAS	7 DAS	BS	3 DAS	7 DAS
1	Tolfenpyrad 15 EC @ 100 a.i./ha	12.07 (3.61)*	3.80 (2.19)	3.60 (1.89)	17.20 (4.14)	5.20 (2.28)	4.00 (1.99)
2	Tolfenpyrad 15 EC @ 125 a.i./ha	12.07 (3.61)	2.60 (1.90)	2.00 (1.40)	17.60 (4.18)	3.80 (1.95)	2.60 (1.60)
3	Tolfenpyrad 15 EC @ 150 a.i./ha	11.53 (3.54)	2.40 (1.84)	2.00 (1.39)	16.80 (4.10)	3.20 (1.79)	1.80 (1.32)
4	Imidacloprid 17.8 SL @ 22.5 a.i./ha	12.13 (3.62)	3.20 (2.04)	3.20 (1.79)	17.40 (4.17)	4.80 (2.19)	4.20 (2.04)
5	Acetamiprid 20 SP @ 20 a.i./ha	11.60 (3.55)	4.13 (2.27)	4.00 (2.00)	16.20 (4.02)	4.20 (2.05)	3.40 (1.84)
6	Thiamethoxam 25 WG @ 25 a.i./ha	11.87 (3.59)	4.73 (2.38)	4.60 (2.13)	15.80 (3.97)	5.80 (2.40)	4.40 (2.10)
7	Control	12.67 (3.69)	13.67 (3.83)	14.27 (3.78)	16.40 (4.05)	19.60 (4.43)	24.40 (4.94)
F test		NS	S	S	NS	S	S
CD at 5%		–	0.23	0.34	–	0.25	0.37

BS= before spray, DAS= days after spray, NS – non significant, S– significant; * Figures in parenthesis are square root transformations.

SL @ 22.5 a.i/ha (4.60 whiteflies/three leaves) after 7 day of spray. During 2010, the population of whitefly was in the range of 26.20 to 28.60 per three leaves before spray being statistically at par among the treatments. Minimum number of whitefly population was recorded in tolfenpyrad 15 EC @ 150 a.i./ha that was at par with tolfenpyrad 15 EC @125 a.i/ha (2.60 whiteflies /three leaves) and followed by tolfenpyrad 15 EC @125 a.i/ha (4.80 whiteflies /three leaves), imidacloprid 17.8 SL @ 22.5 a.i/ha (5.0 whiteflies / three leaves), acetampiprid 20 SP (5.80 whiteflies /three leaves), thiamethoxam 25 WG (6.0 whiteflies /three leaves) and tolfenpyrad 15 EC @100 a.i/ha (6.40 whiteflies /three leaves). The efficacy happened to be statistically at par after 7 days among these treatments. The yield data (Table 5) reveal that tolfenpyrad 15 EC @ 150 a.i./ha gave maximum mean seed cotton yield (1521.0 kg/ha) as compared to the other treatments with the lowest yield in control (730.0 kg/ha).

The observations recorded for phytotoxicity symptoms (leaf injury, wilting, vein clearing, necrosis epinasty and hyponasty) on the crop due to application of tolfenpyrad 15 EC @ 300 a.i./ha up to 10 days after the spray showed no visible phytotoxic symptoms as per the scores shown in Table 2.

The present findings confirm the findings of Bajpai and Singh (2010) who reported tolfenpyrad 15 EC @ 150

Table 4. Population of whiteflies in different treatments during 2009 and 2010

S. No.	Treatments	Number of whiteflies/three leaves					
		2009			2010		
		BS	3 DAS	7 DAS	BS	3 DAS	7 DAS
1	Tolfenpyrad 15 EC @ 100 a.i./ha	32.20 (5.76)*	6.80 (2.78)	5.60 (2.36)	27.40 (5.23)	8.20 (2.86)	6.40 (2.50)
2	Tolfenpyrad 15 EC @ 125 a.i./ha	31.73 (5.72)	4.67 (2.38)	4.00 (1.99)	26.20 (5.12)	7.00 (2.64)	4.80 (2.18)
3	Tolfenpyrad 15 EC @ 150 a.i./ha	32.07 (5.75)	3.20 (2.04)	3.00 (1.72)	27.60 (5.25)	5.40 (2.32)	2.60 (1.61)
4	Imidacloprid 17.8 SL @ 22.5 a.i./ha	30.80 (5.64)	5.33 (2.51)	4.60 (2.14)	28.40 (5.33)	9.20 (3.03)	5.00 (2.23)
5	Acetamiprid 20 SP @ 20 a.i./ha	31.07 (5.66)	6.40 (2.71)	5.20 (2.28)	28.00 (5.29)	7.80 (2.79)	5.80 (2.40)
6	Thiamethoxam 25 WG @ 25 a.i./ha	32.53 (5.78)	7.80 (2.96)	6.00 (2.45)	28.60 (5.35)	9.00 (2.99)	6.00 (2.44)
7	Control	31.67 (5.71)	32.93 (5.82)	33.00 (5.74)	27.80 (5.27)	33.20 (5.76)	33.73 (5.81)
F test		NS	S	S	NS	S	S
CD at 5%		–	0.36	0.34	–	0.45	0.46

BS= before spray, DAS= days after spray, NS – non significant, S– significant, * Figures in parenthesis are square root transformations.

Table 5. Mean seed cotton yield (kg/ha) in different treatments (2009 & 2010)

S. No.	Treatments	Dose/ha	Seed cotton yield (kg/ha)			Avoidable yield losses (%)
			2009	2010	Mean	
1	Tolfenpyrad 15 EC	100 a.i.	1140	1029	1084.5	32.68
2	Tolfenpyrad 15 EC	125 a.i.	1437	1358	1397.5	47.76
3	Tolfenpyrad 15 EC	150 a.i.	1509	1533	1521.0	52.00
4	Imidacloprid 17.8 SL	22.5 a.i.	1109	1214	1161.5	37.15
5	Acetamiprid 20 SP	20 a.i.	1191	1008	1099.5	33.60
6	Thiamethoxam 25 WG	25 a.i.	1078	905	991.5	26.37
7	Control	–	647	813	730.0	–
	F test		S	S		
	CD at 5%		263	258		

a.i./ha to be very effective against sucking pests of okra. Saini *et al*. (2010) observed that tolfenpyrad at all the three doses was significantly superior to imidacloprid 17.8 SL and thiomethoxam 25 WG in suppressing the population of jassids on cotton.

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