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Evaluation of new molecule Pyriproxyfen 10 EC through foliar application against major sucking insect pests of cotton in north west Rajasthan

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ABSTRACT : The present investigations were undertaken for 2 years at Agricultural Research Station, Sriganganagar, Rajasthan to evaluate the efficacy of new molecule Pyriproxyfen 10 EC against sucking insect pests *viz.,* whitefly (*Bemisia tabaci* Gennadius), leafhopper (*Amrasca biguttula biguttula* Ishida) and thrips (*Scirtothrips dorsalis* Hood) on cotton during *kharif* 2010 and 2011 in comparison with conventional insecticide *viz.,* thiomethoxam 25 WG. The experiments were laid out in randomized block design with 8 treatments including untreated check, replicated 3 times. The studies revealed that the maximum reduction (56.07 %) in whitefly population was offered by Pyriproxyfen 10 EC @ 1000 ml/ha in comparison of standard check thiomethoxam 25 WG @ 200 g/ha (44.46%). In case of leaf hopper, the maximum reduction percentage (44.94 %) was recorded in thiomethoxam and followed by Pyriproxyfen. Maximum reduction in the population of thrips (56.98%) in the plot treated with Pyriproxyfen followed by thiomethoxam (48.52%). The maximum reduction in the natural enemies *viz.,* crysopids, coccinellids and spiders were recorded in treated with thiomethoxam (70.55%) as compared to tested insecticide. The plots treated with Pyriproxyfen 10 EC @ 500 ml/ha yielded highest seed cotton (24.58 q/ha) followed by seed cotton yield (23.55 q/ha) in the plot receiving Pyriproxyfen 10 EC @ 1000 ml/ha though the differences between the two were non significant.

Key words : Cotton, natural enemies, Pyriproxyfen 10 EC, seed cotton, sucking insect pests

Cotton (*Gossypium* sp.) is most important commercial crop known as "King of Fibre" and primarily grown during kharif season. Cotton is a primer cash crop of India providing 65 – 70 per cent raw material to the textile industry. Transgenic cotton introduced in 2002 was widely accepted by Indian farmers that effectively control boll worms but sucking pests problem remained as such in *Bt* and non *Bt* till now (Sree Rekha *et al.,* 2012). The productivity is still lower as compared to countries like China, USA and Pakistan. Thus, there is a great scope for further increase in its yield/unit area and improvement in quality fibre.

Insect pest attack is one of the most important limiting factors in the successful cultivation of this crop. About 1326 species of insects have been reported on cotton worldwide, out of them the whitefly (*Bemisia tabaci* Gennadius), leafhopper (*Amrasca biguttula biguttula* Ishida) and thrips (*Scirtothrips dorsalis* Hood) are widely distributed polyphagous pest in tropical and sub tropical regions of India (Puri *et al.,* 1998). Besides causing direct damage, these pests act as vector of cotton leaf curl virus and other diseases which are major constraint for cotton cultivation. To manage these insect pests, various methods like cultural, mechanical, physical, biological and chemical are used as components of integrated pest management. Among them, the chemical control is most popular weapon because of it gives faster results. However, due to high pest incidence levels, the cotton crop is subjected to increased pesticide applications, which have detrimental effects on the existing parasitic and predatory fauna. The

present investigations were, therefore, undertaken to evaluate the efficacy of new molecule against sucking pests over the conventional insecticides.

MATERIALS AND METHODS

The experiments were conducted at the Agricultural Research Station, Sriganganagar, (Rajasthan) during *kharif* 2010 and 2011. Pyriproxyfen 10 EC was evaluated @ 300, 500, 1000 and 2000 ml/ha for the sucking insect pest like whitefly (*Bemisia tabaci* Genn.), leafhopper (*Amrasca biguttula biguttula* Ishida) and thrips (*Scirtothrips dorsalis* Hood) on cotton during kharif 2010 and 2011. This was compared with Pyriproxyfen 5 (%) + Fenpropathin 15 EC @ 500 g/ha, Pyriproxyfen 5 (%) + Fenpropathin 15 EC @ 750 ml/ha and Thiamethoxam 25 WG @ 200 g/ ha (as foliar spray) as standards, which are recommended insecticide for the control of sucking pests. Besides this untreated control was also kept. Eight treatments including control were applied in randomized block design with three replications. The cotton variety RS 2013 was raised in 25 sq. m plots with 67.5 cm row to row and 30 cm plant to plant distance. Spraying was started at ET basis. The insecticides were applied thrice at 12 days interval depending upon climatic conditions with high volume knapsack sprayer. Observations on sucking pests population *viz.,* whitefly, leaf hopper and thrips were recorded one day before and after 3, 7 and 10 days of each application on 3 leaves selected from top, middle and bottom of 10 randomly selected plants in each plot. Observations were also taken on natural enemies (predators and parasites), 10 plants/replication were randomly selected and tagged for recording the population of crysopids, coccinellids and spiders at 3, 7 and 10 days after each application. Seed cotton yield was also recorded at picking time. Data recorded were subjected to statistical analysis.

RESULTS AND DISCUSSION

The data on population of sucking pests recorded in cotton (*kharif* 2010 and 2011) just before spray has it summarized in Table 1. The results presented in Table 1 revealed that sucking pests population ranged from 27.20 to 31.95 for whitefly, 42.8 to 37.58 for thrips and 14.65 to 12.25 for leaf hopper/3 leaves and differences with in experimental area were found non significant indicating a uniform population in all the treatments before insecticidal application.

The pooled data of 2 years on the efficacy

Table 1. Pre treatment population of sucking pests in cotton (*Kharif* 2010 and 2011)

S. No.	Name of treatment	Doseg/ ml /ha	Mean population (number) (before spray)					
			Whitefly/ 3 leaves		Thrips/ 3 leaves		Leaf hopper/ 3 leaves	
			2010	2011	2010	2011	2010	2011
1.	Pyriproxyfen 10 EC	300	24.80	22.40	39.30	37.30	4.8	4.5
2.	Pyriproxyfen 10 EC	500	23.50	23.80	41.85	39.27	5.6	5.6
3.	Pyriproxyfen 10 EC	1000	25.40	20.90	38.50	38.40	4.9	6.1
4.	Pyriproxyfen 10 EC	2000	22.90	22.67	37.18	37.44	6.3	5.1
5.	Pyriproxyfen (5%) + Fenpropathin 15 EC	500	27.60	23.20	42.40	41.33	4.7	6.2
6.	Pyriproxyfen (5%) + Fenpropathin 15 EC	750	20.89	25.17	37.80	42.67	5.2	4.9
7.	Thiamethoxam 25 WG	200	28.04	21.90	39.95	40.61	6.4	6.1
8.	Control	—-	23.95	23.70	40.65	39.91	4.6	6.0
	CD (p = 0.05)	NS	NS	NS	NS	NS	NS	NS

Table 2. Evaluation of new molecule Pyriproxyfen 10 EC against sucking insect pest (leafhopper, whitefly and thrips) on cotton (2010 and 2011)

Name of treatment	Doses g/ml/ha	Per cent reduction of sucking insect pest over control *kharif*, 2010 and 2011											
		Whitefly*				Leaf hoppers*				Thrips*			
		3 DAS	7 DAS	10 DAS	**Mean**	3 DAS	7 DAS	10 DAS	**Mean**	3 DAS	7 DAS	10 DAS	**Mean**
1. Pyriproxyfen 10 EC	300	28.04	37.50	30.53	**32.02**	18.15	23.25	16.16	**19.18**	33.15	61.11	30.71	**41.65**
		(31.95)**	(37.76)	(33.52)	**(34.41)**	(25.25)	(28.86)	(23.73)	**(25.94)**	(35.18)	(52.59)	(33.65)	**(40.47)**
2. Pyriproxyfen 10 EC	500	33.81	54.34	68.50	**52.21**	33.20	47.56	39.30	**40.02**	49.10	56.66	36.06	**47.27**
		(35.55)	(47.47)	(55.86)	**(46.29)**	(35.18)	(43.62)	(38.82)	**(39.20)**	(44.48)	(48.85)	(36.87)	**(43.40)**
3. Pyriproxyfen 10 EC	1000	37.15	62.85	68.22	**56.07**	41.27	45.43	40.43	**42.37**	50.03	59.11	61.80	**56.98**
		(37.46)	(52.48)	(53.67)	**(47.87)**	(39.99)	(42.36)	(39.41)	**(40.58)**	(45.00)	(50.24)	(51.83)	**(49.02)**
4. Pyriproxyfen 10 EC	2000	32.86	56.88	57.53	**49.09**	38.04	42.61	42.68	**41.11**	52.32	52.99	39.20	**48.17**
		(35.00)	(48.91)	(49.31)	**(44.40)**	(38.06)	(40.74)	(40.8)	**(39.86)**	(46.32)	(46.72)	(38.72)	**(43.92)**
5. Pyriproxyfen (5 %) +	500	30.98	41.83	43.30	**38.70**	16.05	23.05	16.44	**18.51**	35.33	40.05	50.18	**41.85**
Fenpropathin 15 EC		(33.83)	(40.28)	(41.15)	**(37.97)**	(23.58)	(28.66)	(23.89)	**(25.37)**	(36.45)	(39.23)	(45.11)	**(40.26)**
6. Pyriproxyfen (5 %) +	750	33.85	45.69	42.96	**40.83**	28.20	33.83	23.71	**28.58**	41.36	45.18	54.16	**46.09**
Fenpropathin 15 EC		(35.55)	(42.53)	(40.98)	**(39.68)**	(32.08)	(35.55)	(29.13)	**(32.25)**	(39.93)	(42.25)	(47.41)	**(43.29)**
7. Thiomethoxam 25 WG	200	40.78	51.56	41.04	**44.46**	55.31	48.55	31.46	**44.94**	53.89	49.71	41.96	**48.52**
		(39.70)	(45.92)	(39.82)	(42.25)	(48.04)	(44.2)	(33.83)	**(42.02)**	(47.24)	(44.83)	(40.40)	**(44.15)**
CD (p = 0.05)		4.30	5.8	5.27		4.31	6.24	4.29		5.29	4.60	8.20	

* Pooled mean of two year (2010 and 2011).

** Figure in parenthesis are arc sine transformation.

of new molecule Pyriproxyfen 10 EC against the control of sucking insect pests in cotton during 2010 and 2011 depicted in Table 2 clearly revealed that the maximum reduction (56.07 %) in whitefly population was offered by Pyriproxyfen 10 EC @ 1000 ml/ha followed by Pyriproxyfen 10 EC @ 500 ml/ha (52.2 %) in comparison of standard check Thiomethoxam 25 WG @ 200 g/ha (44.46 %). Similar findings were reported by Farman Ullah *et al.,* (2006), who reported the maximum reduction in population of whitefly was recorded in treatment of Tamaron 600 SL (methamidophos).

In case of leaf hopper, the maximum mean reduction per cent (44.94 %) was recorded in standard check thiomethoxam 25 WG @ 200 g/ha and followed by Pyriproxyfen 10 EC applied @ 1000 ml/ha (42.37 %). The treatment of Pyriproxyfen 10 EC @ 500 ml/ha (40.02%) and Pyriproxyfen 10 EC @ 2000 ml/ha (41.11%) were observed *at par*. Kolhe *et al.,* (2009) reported that Imidacloprid (0.008 and 0.01 %) and Acetamiprid (0.006 %) were most effective against leafhopper. Kumar *et al.,* (1999) found efficacy of Acetamiprid 10 g a.i. /ha against cotton leaf hopper up to 10 DAS. The present finding confirm these reports. Regarding thrips, the maximum mean reduction was observed in the plot treated with Pyriproxyfen 10 EC @ 1000 ml/ha (56.98%) followed by standard check Thiomethoxam 25 WG @ 200 g/ha (48.52%).

Singh, Vichiter *et al.,* (2012) reported the maximum reduction in population of thrips in case of treatment of Spinetoram 12 SC (42.4 %) @ 56 g a.i./ha. Dahiphode and Sarkate (2003) found minimum thrips count in Acetamiprid 20 g a.i./ha as compared to methyl oxydemetone. Srinivasan *et al.,* (2004) reported that foliar spray of thiomethoxam 25 WG recorded less sucking pests population on cotton as compared to imidacloprid 70 WS 10 g a.i./kg seed treatment. The present findings are in line with the above results.

Effect on natural enemies : Pooled analysis of two years indicated that the maximum reduction in natural enemies was recorded in thiomethoxam 25 WG @ 200 g/ha (70.55 %) as compared to tested insecticide. Among the insecticidal treatments, minimum natural enemies population reduction was observed in the treatments of Pyriproxyfen 10 EC @ 300 ml/ha (24.65 %) followed by Pyriproxyfen 10 EC @ 500 ml/ha (28.47 %) and Pyriproxyfen 10 EC @ 1000 ml/ha (32.89 %).

Table 3. Effect of Pyriproxyfen 10 EC on population of natural enemies and seed cotton yield of cotton crop (2010 and 2011)

S. No.	Name of treatment	Doses g/ml /ha	Per cent reduction of natural enemies (DAS)				**Mean of seed cotton yield (q/ha)**
			3	7	10	**Mean**	
1.	Pyriproxyfen 10 EC	300	20.70 (27.06) **	24.2 (29.47)	29.05 (32.52)	**24.65 (29.68)**	**21.53**
2.	Pyriproxyfen 10 EC	500	24.25 (29.53)	27.6 (31.69)	33.56 (35.37)	**28.47 (32.19)**	**24.58**
3.	Pyriproxyfen 10 EC	1000	29.18 (32.71)	35.2 (36.39)	34.30 (35.85)	**32.89 (34.98)**	**23.55**
4.	Pyriproxyfen 10 EC	2000	36.30 (37.05)	43.6 (41.32)	35.70 (36.69)	**38.53 (38.35)**	**23.10**
5.	Pyriproxyfen (5 %) + Fenpropathin 15 EC	500	39.75 (39.06)	37.1 (37.52)	24.86 (29.93)	**33.90 (35.50)**	**22.00**
6.	Pyriproxyfen (5 %) + Fenpropathin 15 EC	750	46.6 (43.05)	42.1 (40.45)	36.95 (37.41)	**41.88 (40.30)**	**23.46**
7.	Thiomethoxam 25 WG	200	68.95 (56.1)	71.17 (57.8)	70.55 (57.10)	**70.55 (57.10)**	**22.53**
8.	Control	-	-	-	-	**-**	**20.86**
	CD (p=0.05)		4.80	7.30	6.54	**6.46**	**1.75**
	CV (%)		7.88	10.07	10.27	**9.17**	**8.87**

* Pooled mean of two year (2010 and 2011)

** Figure in parenthesis are arc sine transformation.

Yield : The pooled analysis of 2 years trials (Table 3) showed that in all the insecticidal treatments are effective to produce higher seed cotton yield as compared to untreated check. Among all the treatments Pyriproxyfen 10 EC @ 500 ml/ha recorded significantly higher yield (24.58 q/ha) than other treatments followed by Pyriproxyfen 10 EC @ 1000 ml/ha (23.55 qt/ha) which was next best to above the treatments. Least seed cotton yield was recorded in untreated plot (20.86 q/ha). The present study gets support from the findings by Kolhe *et al.,* (2009) who reported that crop sprayed with Acetamiprid (0.006 %) gave the maximum crop yield (213.15 kg/ha). The highest seed cotton yield in Acetamiprid 10 to 15 g a.i. /ha was also reported by Dandale *et al.,* (2001), Dahiphode and Sarkate (2003) and Srinivasan *et al.,* (2004).

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