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Evaluation of pyriproxifen 10 EC against sucking insect pests of cotton

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ABSTRACT : An investigation was conducted to evaluate the bioefficacy of pyriproxifen 10 EC against sucking insect pests of cotton. At 125g a.i./ha pyriproxifen exhibited very good protection of the crop against sucking pests in both the years(2009-2010 and 2010-2011). The population of leafhoppers, aphids, whitefly and thrips was brought below ETL with 3 sprays of pyriproxifen at 10 days interval at different doses(75,100 and 125 g a.i./ha.).Significant highest seed cotton yield (1331 and 1327 kg/ha) was picked by pyriproxifen @ 125 g a.i./ha during both the years, proving it better than commercial check acetamiprid 20 SP @ 20g a.i./ha and difenthiuron 50 WP @ 300g a.i./ha.

Key words; Aphids, cotton, leafhoppers, pyriproxifen, thrips,whitefly

The increasing problem of pest resistance to pesticides and environmental pollution due to large scale use of broad spectrum synthetic pesticides necessicitated the use of effective and bio degradable pesticides**.** Further, new generation insecticides of neonicotinoides group *viz..,* imidacloprid, thiamethoxam and acetamiprid etc have gained importance and are widely used in cotton. For better management of sucking pests in cotton, intervention with newer compounds particularly biorationals is essential. (Richardson and Lagos, 2007). Pyriproxifen 10 EC is one of such biorational and has been proved effective against whitefly (Crowder *et al.*, 2006), California red scale(Eliahu *et al.*, 2007), green house whitefly (*Trialeurodes vaporariorum*), cotton leafworm (Nasr *et al.*, 2010) and tomato leafminer (*Tuta absoluta*) (Tome *et al.*, 2012). Pyriproxifen 10EC,with lower mammalian toxicity, has been evaluated for its efficacy against sucking insect pests of cotton.

MATERIALS AND METHODS

The present study was carried out under All India Co ordinated Cotton Improvement Project at College of Agriculture, Indore during *kharif,* 2009-2010 and 2010-2011 under rainfed conditions, in medium black soil. The experiment was planned in randomized block design, replicated 4 times with 6 treatments in homogenous block with respect to fertility. Pyriproxifen 10 EC was used at 3 dosage *i.e.* 75,100 and 125 g a.i. /ha in comparison with acetamiprid 20 SP (20 g a.i./ha.), difenthiuron 50 WP (300 g a.i./ha.) and untreated control. The insecticides were sprayed at 10 days interval. The cotton hybrid bunny (NCS 145 *Bt*) was sown with a spacing of 60×60 cm in a plot size of 6.0×5.2 m. Test chemicals alongwith standard checks were spayed at early stage of infestation *i.e.* 2 to 5 insects / leaf.

Observations on incidence of thirps (*Thrips tabaci* Lind), Aphids (*Aphis gossypii* Glover), leafhopper(*Amrasca bigutulla bigutulla* Ishida) and whitefly *(Bemisia tabaci* Genn.) were made a day before and 10 days after third last spray. Sucking pests of cotton require many sprays to make their population below ETL. Hence, last observation was considered to observe the effectiveness of insecticides. In each plot 5 plants and 5 leaves / plant (2 lower,2 middle and 1 upper) were randomly selected for observations. In each year, 4 blanket sprays were given to manage the bollworms in all treatments. The seed cotton yield was obtained from each plot and converted into kg/ha. Impact of these chemicals on predators (*Coccinellids*) activity was also recorded at 10 days after last spray. The data on each parameter have been subjected to statistical

analysis.

RESULTS AND DISCUSSION

Leafhoppers and aphid population : During 2009-2010, pre treatment count of leafhoppers was homogenous and ranged between 41.21 and 44.68/5 leaves (Table 1). All the treatments were significantly superior over control and after 10 days of third spray pyriproxifen@125 g a.i./ha recorded significantly lower leaf hoppers population (9.84) and found *at par* with pyriproxifen @ 100 g a.i./ha (10.12) and standard check acetamiprid @ 20 g. ai/ha (11.64). Rest of the treatments were *at par* with each other but differed significantly with untreated control (42.56). There was uniform distribution of leaf hoppers population during 2010-2011 which ranged from 43.86 to 45.38/5 leaves. Conclusively after 10 days of last spray significantly superior insect response was observed in all the treatments and standard checks compared to untreated control. Pyriproxifen @ 125g a.i./ha exhibited least population (12.53) followed by standard check acetamiprid @ 20 g a.i./ha (12.82). These treatments exhibited non significant difference with each other but were significantly better than untreated control.

Population range of aphids (Table 1) was uniform in all the treatments including untreated control before imposing the insecticides. During 2009-2010 all the treatments including standard checks were significantly superior to untreated control in reducing the aphid population, but were found *at par* with each other. Minimum aphid population was noted in acetamiprid @ 20 g a.i./ha (21.48) During 2010-2011, acetamiprid @ 20 g a.i/ha proved more effective with least aphid population (14.42) and *at par* with difenthiuron @300 g a.i./ ha (14.92), pyriproxifen @ 125 g a.i./ha (64.31 %) and pyriproxifen @100 g a.i./ha (61%). During both the years pyriproxifen@125 g a.i./ ha gave better performance but was *at par* with standard checks.

Whitefly and thrips population : The whitefly population was also uniform before application of treatments ranging from 36.09 to 37.38/ 5 leaves (Table 2). During 2009-2010 the highest dose of pyriproxifen @ 125 g a.i./ha reduced significantly maximum whitefly population (8.16,) and found *at par* with lower dose of pyriproxifen @ 100 g a.i./ha (8.32) and pyriproxifen @75 g a.i. /ha (10.45). Both the standard checks exhibited similar performance in reducing the whitefly population but were significantly superior to untreated control (41.39).

During 2010-2011 the highest dose of pyriproxifen @125 g a.i./ha significantly reduced maximum whitefly population (9.14) and exhibited *at par* performance with pyriproxifen @100 g. ai/ha(9.56). Rest of the treatments including standard checks significantly reduced the whitefly population compared to untreated control (46.48). In controlling the whitefly population during both the years maximum population reduction was observed in pyriproxifen @125 g a.i./ha (80.31%) and pyriproxifen @100 g a.i./ha (79.66%). The pre treatment thrips population (Table 2) was noticed uniform during both the years. During 2009-2010, thrips population ranged between 65.50 to 67.92 / 5 leaves. After 10 days of last spray all the treatments significantly reduced the thrips population over untreated control. The lowest population was counted again with pyriproxifen @125 g a.i. /ha(15.68) though *at par* with other treatments. Repeatedly during 2010-2011, the lowest thirps population was counted with pyriproxifen @125 g a.i./ ha (13.06), found *at par* with other 2 doses and differed significantly from standard checks and untreated control. The maximum population reduction of thrips was noticed in pyriproxifen @125 g a.i./ ha (77.35%) and pyriproxifen @100 g a.i./ ha (76.70%).

During both the seasons, comparatively higher population of *coccinellids* (adults and grubs) was observed at the end of last spray (Table 3) in untreated control ,which was *at par* with all the three doses of pyriproxifen after the imposition of treatments and remained same throughout, indicating its biosafety to natural enemies.

Table 1. Evaluation of Pyriproxifen10 EC against leafhoppers and aphids of cotton during 2009-2010 and 2010-2011

Treatments	Doses g. a.i./ha	Leaf hoppers population					Aphid population				
		2009-2010		2010-2011			2009-2010		2010-2011		
		Pre treatment counts	10DAS after 3rd spray	Pre treat ment counts	10DAS after 3rd spray	**Mean reduction (%)**	Pre treatment counts	10DAS after 3rd spray	Pre treat ment counts	10DAS after 3rd spray	**Mean reduction (%)**
Pyriproxifen 10 EC	75	41.34*(6.47)	12.64(3.62)	45.24(6.76)	14.64(3.89)	**67.41**	64.50(8.06)	24.84(5.03)	58.64(7.6)	18.45(4.35)	**61.67**
Pyriproxifen10 EC	100	41.21(6.46)	10.12(3.25)	44.35(6.70)	13.12(3.69)	**72.22**	64.54(8.06)	23.12(4.85)	57.82(7.63)	16.64(4.13)	**64.95**
Pyriproxifen10 EC	125	41.30(6.46)	9.84(3.21)	43.86(6.66)	12.53(3.61)	**73.26**	65.00(8.09)	22.75(4.82)	56.94(7.58)	15.23(3.96)	**66.85**
Acetamiprid 20SP	20	42.38(6.55)	11.64(3.48)	44.95(6.74)	12.82(3.65)	**70.79**	64.84(8.08)	21.48(4.69)	58.12(7.66)	14.42(3.86)	**68.66**
Difenthiuron 50WP	300	42.00(6.52)	11.92(3.52)	45.38(6.77)	13.72(3.76)	**69.37**	65.25(8.11)	22.26(4.76)	56.78(7.57)	14.92(3.92)	**67.54**
Control	-	44.68(6.72)	42.56(6.56)	45.18(6.76)	41.28(6.46)	**0.00**	66.25(8.17)	74.35(8.65)	57.64(7.62)	42.67(6.57)	**0.00**
SEm±		-	0.100	-	0.094		-	0.130	-	0.114	
CD (p=0.05)		NS	0.300	NS	0.283		NS	0.392	NS	0.345	
CV (%)		-	5.06	-	4.49		-	4.76	-	5.12	

Note:- *Figures in parentheses are square root transformation, DAS= Days after spray

Table 2: Evaluation of Pyriproxifen10 EC against whitefly and thrips of cotton during 2009-2010 and 2010-2011

Treatments	Doses g. ai./ha	Whitfly population					Thrips population				
		2009-2010		2010-2011			2009-2010		2010-2011		
		Pre treatment counts	10DAS after 3rd spray	Pre treat ment counts	10DAS after 3rd spray	**Mean reduction (%)**	Pre treatment counts	10DAS after 3rd spray	Pre treat ment counts	10DAS after 3rd spray	**Mean reduction (%)**
Pyriproxifen 10 EC	75	*36.75 (6.10)	10.45(3.31)	42.40(6.55)	11.64(3.48)	**74.85**	65.75(8.14)	18.23(4.32)	62.64(7.95)	15.45(3.99)	**73.48**
Pyriproxifen10 EC	100	37.69(6.18)	8.32(2.96)	41.84(6.51)	9.56(3.17)	**79.66**	66.00(8.15)	16.24(4.09)	60.26(7.79)	13.36(3.72)	**76.70**
Pyriproxifen10 EC	125	36.65(6.09)	8.16(2.94)	41.25(6.46)	9.14(3.10)	**80.31**	66.25(8.17)	15.68(4.02)	61.50(7.87)	13.06(3.68)	**77.35**
Acetamiprid 20SP	20	36.92(6.12)	11.54(3.47)	42.54(6.56)	11.52(3.47)	**73.67**	66.13(8.16)	17.32(4.22)	60.54(7.81)	16.64(4.13)	**73.21**
Difenthiuron 50WP	300	36.09(6.05)	11.76(3.49)	40.76(6.42)	12.26(3.57)	**72.60**	65.50(8.12)	17.57(4.24)	62.13(7.91)	16.12(4.07)	**73.44**
Control	-	37.38(6.15)	41.39(6.47)	40.90(6.43)	46.48(6.85)	**0.00**	67.92(8.27)	65.30(8.11)	61.68(7.89)	61.50(7.87)	**0.00**
SEm		-	0.124	-	0.109		-	0.128	-	0.135	
CD (p=0.05)		NS	0.373	NS	0.328		NS	0.385	NS	0.406	
CV (%)		-	6.57	-	5.52		-	5.28	-	5.88	

Note:- *Figures in parentheses are square root transformation, DAS= Days after spray

Table 3. Population of natural enemies and seed cotton yield following different treatments

Treatments	Dose	Coccinellids/plant			(Yield kg/ha)		
	g a.i./ha	2009-2010	2010-2011	**Mean**	2009-2010	2010-2011	Mean
Pyriproxifen 10 EC	75	0.81	1.38	**1.09**	1104.00	1095.00	**1099.5**
Pyriproxifen10 EC	100	0.88	1.34	**1.11**	1258.00	1318.00	**1288**
Pyriproxifen10 EC	125	0.76	1.43	**1.09**	1331.00	1327.00	**1329**
Acetamiprid 20 SP	20	0.68	1.26	**0.97**	1225.00	1168.00	**1196.5**
Difenthiuron 50 WP	300	0.62	1.22	**0.92**	1181.00	1145.00	**1163**
Control	-	0.94	1.52	**1.23**	988.00	937.00	**962.5**
SEm ±		0.05	0.06		32.00	33.00	
CD (p=0.05)		0.14	0.18		95.00	99.00	
CV (%)		10.55	7.51		5.34	5.610	

There was no significant difference among treatments regarding seed cotton yield. Among the three tested doses of pyriproxifen, higher dose of pyriproxifen (125 g a.i./ha) registered higher seed cotton yield of 1331 and 1318 kg/ha during 2009-2010 and 2010-2011, respectively (Table 3). Thus coupled with better efficacy against sucking insect pests, pyriproxifen exhibited better yield of seed cotton.

Pyriproxifen has been proved effective against aphids whitefly and a number of sap sucking pests (Qureshi *et al.*, 2009). The present findings are in the agreement of Eliahu *et al.,* (2007) and Ghanim and Kontsedalov (2007) who reported high effectiveness of pyriproxifen against whitefly.

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