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Bioefficacy of Pyriproxyfen (10 EC) against *Bemisia tabaci* (Gennadius) in cotton

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ABSTRACT : Whitefly, *Bemisia tabaci* is highly polyphagous in nature and causes direct and indirect damage by feeding on leaves as well acting virus vector. In view of its significant damage potential, a few insecticides were evaluated against the whitefly under field conditions for 2 years at CCS Haryana Agricultural University, Hisar. The efficacy of pyriproxyfen 10 EC alongwith thiomethoxam 25 WG and imidacloprid 17.8 SL was evaluated against *B. tabaci*, on cotton during *kharif,* 2018 and 2019 crop season. The study revealed that pyriproxifen 10 EC @ 125 and 100 g a.i./ha had significantly lower population of whitefly in comparison to other treatments (imidacloprid 17.8 SL and thiomethoxam 25 WG). Maximum incremental cost (7.58 and 8.75) was observed in pyriproxifen 10 EC @ 100g a.i./ha during 2018 and 2019, respectively which was significantly higher than rest of the treatments.

Key words: Bioefficacy, cotton, incremental cost, population, pyriproxyfen, whitefly

Cotton *(Gossypium* spp.*)* also known as 'White Gold' and a major commercial crop. India is the only country where all four cultivated species (*G. hirsutum, G. barbadense, G. arboreum and G. herbaceum*) are grown on commercial scale. In cotton across the world about 1326 species of insects have been reported, out of which whitefly (*Bemisia tabaci* Gennadius), leafhopper (*Amrasca biguttula bigutulla* Ishida) and thrips (*Scirtothrips dorsalis* Hood) are widely distributed polyphagous pest in tropical and sub tropical regions of India (Puri *et al.*, 1998). *B. tabaci* belongs to family Aleyrodidae of Hemiptera order was first observed in the late 1920s and early 1930s by (Misra and Lamba, 1929) in northern India. Whitefly is a cosmopolitan pest of several crops, including cotton and vegetables. This pest causes damage directly by sucking cell sap. In heavy infestation, it has the potential to remove significant amounts of phloem sap resulting in the reduction of plant vigour and honeydew excreted by the insect which interfere in normal photosynthesis with growth of sooty mould. Cotton leaf curl virus disease is also transmitted through the whitefly, which causes significant yield losses if it occurs in the early stages of crop growth (Duffus, 1987). The population build up of this pest largely depends upon abiotic factors. Temperature and humidity play a significant role in population build up of this pest (Mehra and Rolania, 2017; Rolania *et al.*, 2018). Intercropping of cotton with sesame, pigeonpea, pearl millet and sorghum increase the natural parasitization of whitefly in the field (Devi *et al.*, 2020). For management of whitefly, a number of insecticides have been recommended. Frequent and indiscriminate use of these insecticides, tolerance to these insecticides starts appearing in the insects. Pyriproxifen 10 EC is one such biorational and has proved effective against whitefly (Crowder *et al.*, 2006), green house whitefly (*Trialeurodes vaporariorum*), cotton leafworm (Nasr *et al.*, 2010) and tomato leafminer (*Tuta absoluta*) (Tome *et al.*, 2012). Therefore, pyriproxifen 10 EC, imidacloprid (17.8% SL) and thiamethoxam (25 WG) were evaluated on cotton for management of *B. tabaci*.

MATERIALS AND METHODS

The two year field experiments were conducted at Research area of CCS Haryana Agricultural University, Hisar during *kharif*, 2018 and 2019. The bio efficacy of pyriproxifen 10 EC @ 50, 100 and 125g a.i./ha was evaluated against whitefly and compared with thiamethoxam 25 WG @ 50g a.i./ha and imidacloprid 17.8 SL @ 25g a.i./ha. The experiment consist of six treatments and each treatment had four replications having a plot size of 24 sq. m. each in a randomized block design with row to row spacing of 67.5 cm. and plant to plant spacing was 30 cm. The sowing of cotton variety, H 1098i was done on May 19, 2018 and May 20, 2019. All agronomic practices were followed to raise a healthy crop. The crop was sprayed when population of the above pest crossed economic threshold (6 adults/leaf). The plots were sprayed with different concentrations of the insecticides with the help of knapsack sprayer using 500 water/ha. Observations on the insect population before and after spray were recorded by counting the number of adult on five randomly selected plants/plot taking three leaves from upper, middle and lower canopy of the cotton plant. The crop was harvested at maturity and yield/plot was recorded. Thereafter, yield q/ha was worked out. The population data were subjected to square root transformation before processing for analysis of variance.

RESULTS AND DISCUSSION

Efficacy of pyriproxifen 10 EC data of both the year on population of whitefly, *B. tabaci* in cotton, before spray and after spray at different intervals and seed cotton yield in different treatment are presented in Table 1. Before spray, the population of *B. tabaci* ranged from 10.71 to 11.29 and 10.75 to12.09 adults/leaf during 2018 and 2019, respectively. The data revealed that population of whitefly in different treatments did not differ significantly.

During 2018, population of whitefly was significantly lower (4.79 adults/leaf) in pyriproxifen 10 EC @ 125g a.i./ha treated plot which was found *at par* with pyriproxifen 10 EC @ 100g a.i./ha (4.92 adult /leaf) followed by pyriproxifen 10 EC @ 50g a.i./ha and imidacloprid 17.8 SL @ 25 g a.i./ha (5.08 adults/leaf) after one day of spray. After 3 day of spray, pyriproxifen 10 EC @ 125g a.i./ha had significantly lower population (4.17 adults/leaf) of whitefly adult in comparison to control (without spray) 10.96 adults/leaf. After 5th and 10th days of spray, the minimum whitefly population (3.33 & 2.67 adults/leaf, respectively) was recorded in pyriproxifen 10 EC @ 125g a.i./ha which was *at par* with pyriproxifen 10 EC @ 100g a.i./ha (3.58 and 2.71 adults/ leaf, respectively). Other treatments had significantly lower population of whitefly in comparison to control and were *at par* with each other.

During 2019 after one day of spray, all treatments were found significantly superior over control. Minimum whitefly population (5.75 adults/leaf) was recorded in pyriproxifen 10 EC @ 125g a.i./ha which was *at par* with pyriproxifen 10 EC @ 100g a.i./ha (5.83 adults/ leaf). Similar trend was observed after 3rd, 5th and 10th days of spray.

Seed cotton yield: During 2018, highest seed cotton yield of 27.98 and 27.37 q/ha was recorded in pyriproxifen 10 EC @ 125 and 100g a.i./ha treated plots, respectively which was *at par* with each other and had significant difference with (25.86 q/ha) imidacloprid 17.8 SL @ 25 g a.i./ha and (25.54 q/ha) thiamethoxam 25 WG @ 25 g a.i./ha. Similarly, during 2019 crop season, maximum seed cotton yield 28.52 and 27.97 q/ha was recorded in pyriproxifen 10 EC @ 125 and 100g a.i./ha treated plots, respectively which was *at par* with each other and had significant difference with other treatments. Chandi and Kumar (2016) reported 90.4 and 95.4 per cent reduction in whitefly nymphs over control in pyriproxyfen 10 EC @ 50 and 60 g a.i./ha, respectively after 7 days of spray on cotton crop. Seed cotton yield in

Table 1: Effect of different insecticides on adult population of whitefly, *Bemisia tabaci* during, 2018 and 2019 (pooled of two spray)

S. No.	Treatment	Dose (g a.i. /ha)	Population of whitefly (adult) / leaf 2018					Seed cotton yield (q/ha)	ICBC	Population of whitefly (adult)/leaf 2019					Seed cotton yield (q/ha)	ICBC
			Before spray	1 DAS	3 DAS	5 DAS	10 DAS			Before spray	1 DAS	3 DAS	5 DAS	10 DAS		
1	Pyriproxifen 10 EC	50	10.71 (3.43)	5.08 (2.47)	4.75 (2.40)	4.25 (2.29)	5.17 (2.47)	25.07	**6.31**	10.75 (3.43)	6.17 (2.68)	4.83 (2.14)	3.25 (2.06)	4.17 (2.27)	26.30	**7.08**
2	Pyriproxifen 10 EC	100	11.29 (3.51)	4.92 (2.43)	4.25 (2.29)	3.58 (2.14)	2.71 (1.93)	27.37	**7.58**	11.42 (3.52)	5.83 (2.61)	4.25 (2.29)	2.00 (1.73)	1.34 (1.52)	27.97	**8.75**
3	Pyriproxifen 10 EC	125	11.21 (3.49)	4.79 (2.41)	4.17 (2.27)	3.33 (2.08)	2.67 (1.91)	27.98	**7.20**	11.67 (3.55)	5.75 (2.60)	3.75 (2.18)	1.67 (1.63)	1.17 (1.46)	28.52	**8.71**
4	Thiamethoxam 25 WG	50	10.75 (3.43)	5.08 (2.47)	4.92 (2.43)	6.04 (2.65)	6.25 (2.69)	24.54	**7.16**	11.17 (3.48)	6.25 (2.69)	5.42 (2.53)	4.83 (2.41)	4.84 (2.42)	26.00	**8.26**
5	Imidacloprid 17.8 SL	25	10.75 (3.43)	5.67 (2.58)	5.29 (2.50)	6.00 (2.64)	6.26 (2.69)	24.30	**7.53**	11.08 (3.47)	6.67 (2.77)	5.67 (2.58)	4.50 (2.34)	5.17 (2.48)	25.89	**8.40**
6	Control (without spray)	-	10.92 (3.45)	10.38 (3.37)	10.96 (3.46)	11.46 (3.53)	11.50 (3.54)	22.54	-	12.09 (3.62)	11.00 (3.46)	11.33 (3.51)	10.75 (3.42)	11.25 (3.49)	24.03	-
	CD (p = 0.05)	(NS)	(0.17)	(0.20)	(0.13)	(0.15)	1.22		(NS)	(0.21)	(0.22)	(0.25)	(0.25)	1.28		

*Figures in parentheses are √(n+1) transformed values. DAS- Days After Spray

pyriproxyfen @ 50 and 60 g a.i./ha (24.7 and 24.8 q / ha) was also higher in comparison to all other treatments. Kumar and Singh (2016) also observed maximum reduction in whiteflies and thrips population in pyriproxyfen 10 EC @ 1000 ml/ha treated plot. Kamble *et al.*, (2021) reported that the application of pyriproxyfen 10 EC, pyriproxyfen 10 EC + NSKE (5%) and buprofezin 25 SC proved statistically equal in reducing whiteflies population on cotton at Akola. Navi *et al.*, (2021) reported significant reduction in whitefly population (0.33/3leaves) in pyriproxyfen 10 EC @ 200 g ai/ha (93.42%) treated plots at 14 days after second spray and which was found to be *at par* with pyriproxyfen 10 EC 125g a.i./ ha (90.64%). Khattak *et al.*, (2004) also reported that imidacloprid gave significant reduction in the whitefly populations after 24, 72 and 120 hours of application.

CONCLUSION

Pyriproxifen 10 EC @ 100 and 125g a.i./ha had significantly lower population of whitefly adult in comparison to imidacloprid 17.8 SL @ 25g a.i./ha and thiamethoxam 25 WG @ 25g a.i./ha during both the years. Maximum seed cotton yield was observed in pyriproxifen 10 EC @ 125 g a.i./ha which had non significant difference with pyriproxifen 10 EC @ 100 g a.i./ha. Maximum incremental benefit was obtained in pyriproxifen 10 EC @ 100 g a.i./ha.

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