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EVALUATION OF INSECT GROWTH REGULATORS AGAINST LEAFHOPPERS AND WHITEFLIES IN BT COTTON

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ABSTRACT

Studies were conducted to evaluate efficacy of insect growth regulators against leafhoppers *Amrasca (Sundapteryx) biguttula,* and whiteflies *Bemisia tabaci* (Gennadius) on cotton at the Department of Entomology, Dr. PDKV, Akola during 2019-2020. Overall four sprays were given out and the data obtained revealed that buprofezin 25%SC was found promising against leafhopper population. However, this treatment was found statistically similar to pyriproxyfen 10%EC and buprofezin 25%SC + NSKE 5%. The application of pyriproxyfen 10%EC, pyriproxyfen 10%EC + NSKE 5% and buprofezin 25%SC proved statistically equal in reducing whiteflies population. The treatments were found to be safe to the natural enemy activity. The highest seed cotton yield was obtained in the plots sprayed with buprofezin 25%SC (13.40 q/ha).

Key words: Cotton, *Amrasca (sundapteryx) biguttula*, *Bemisia tabaci*, insect growth regulators, lady bird beetle, chrysopids, natural enemies

Among the various causes of low productivity in *Bt* cotton, the incidence of insect pests is of major concern. For last few decades boll worms attack on cotton was a serious problem but with the introduction of Bt cotton this problem has been solved to some extent and a significant change in cropping scheme in the cotton growing areas has been observed (Ahsan and Altaf, 2009). But the problem of sucking pests has remained unsolved still. The pests of major significance in Bt cotton are the leafhoppers *Amrasca (Sundapteryx) biguttula* (Ishida) and whiteflies *Bemisia tabaci* (Gennadius). These still make the cotton IPM rely on insecticides, which aggravate problems due to failures in many cotton growing tracts of India. The indiscriminate use of insecticides has led to problems like insecticides resistance, pest resurgence and environmental pollution besides upsetting the natural ecosystem. Contrary to the problems associated with the use of insecticides, the advantages of insect growth regulators (IGR's) make them highly desirable in IPM, as these do not persist due to their rapid biodegradation. In addition, they exhibit low toxicity for non-target organisms (Zibaee et al., 2011). Buprofezin is an IGR that inhibits chitin synthesis in several homopteran pests, including whiteflies (De Cock et al., 1990). Pyriproxyfen is a juvenile hormone mimic affecting the hormonal balance in insects and resulting in strong suppression of embryogenesis and adult formation (Ishaaya and Horowitz, 1992). The unique mode of action of these compounds, together with their selectivity against target insect pests and relative safety to beneficial insects and other organisms, presents an opportunity for their effective integration in IPM strategies. These minimize the threat of insecticides resistance (Denholm et al., 1998). Keeping these in view, the present study evaluates some IGRs along with insecticides against *A (S.) biguttula* and *B. tabaci* in Bt cotton.

MATERIALS AND METHODS

Field experiment was conducted in the field of Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during kharif 2019-20. The experiment was laid out in randomized block design with three replications and eight treatments. The Bt cotton (Ajeet-155 BG II) was sown on 3rd July 2019 by dibbling with spacing 90 x 60 cm. The treatments included viz., buprofezin 25%SC, pyriproxyfen 10%EC, diflubenzuron 25%WP, NSKE 5%, buprofezin 25%SC+ NSKE 5%, pyriproxyfen 10%EC+ NSKE 5% and diflubenzuron 25%WP+ NSKE%. The data were collected on the incidence of *A (S.) biguttula* and *B. tabaci* at an interval of 3, 7 and 14 days after each spraying. Similarly, data were also collected on the natural enemies, along with seed cotton yield at harvest.

Table 1. Effect of IGR's on cotton pests and natural enemies

Sl. No.	Treatments and concentration	No. of leafhoppers/ leaf				Mean	No. of whiteflies/ leaf				Mean	Mean counts of predators (No/ plant)			Seed cotton yield (q/ ha)
		1 DBS	3 DAS	7 DAS	14 DAS		1 DBS	3 DAS	7 DAS	14 DAS		LLB	Chry-sopids	Spiders	
1	Buprofezin 25%SC (0.05%)	1.12 (1.06)	0.78 (0.87)	0.82 (0.90)	1.22 (1.10)	0.94 (0.96)	1.28 (1.13)	1.07 (1.00)	1.06 (1.00)	1.84 (1.33)	1.32 (1.11)	1.17 (1.12)	1.00 (0.99)	1.29 (1.13)	13.40
2	Pyriproxyfen 10%EC (0.02%)	1.23 (1.11)	0.91 (0.95)	0.94 (0.96)	1.33 (1.14)	1.06 (1.02)	1.16 (1.08)	0.73 (0.84)	0.79 (0.87)	1.38 (1.16)	0.97 (0.96)	1.12 (1.09)	0.95 (0.97)	1.24 (1.12)	12.39
3	Diflubenzuron 25%WP (0.015%)	1.31 (1.14)	1.87 (1.35)	1.93 (1.38)	2.41 (1.54)	2.07 (1.42)	1.26 (1.12)	2.20 (1.46)	2.26 (1.48)	2.95 (1.70)	2.47 (1.55)	1.02 (1.06)	0.83 (0.90)	1.11 (1.07)	9.77
4	NSKE 5%	1.87 (1.37)	1.19 (1.08)	1.22 (1.09)	1.86 (1.35)	1.42 (1.17)	1.47 (1.21)	1.52 (1.20)	1.51 (1.20)	2.22 (1.47)	1.75 (1.29)	1.35 (1.25)	1.42 (1.18)	1.45 (1.20)	11.09
5	Buprofezin 25%SC (0.05 %) + NSKE (5%)	1.19 (1.09)	1.11 (1.05)	0.94 (0.96)	1.57 (1.24)	1.21 (1.08)	1.53 (1.24)	1.21 (1.08)	1.20 (1.06)	1.87 (1.34)	1.43 (1.16)	1.32 (1.21)	1.39 (1.17)	1.41 (1.19)	11.79
6	Pyriproxyfen 10% EC (0.02 %) + NSKE (5%)	0.96 (0.98)	1.09 (1.04)	1.22 (1.09)	1.72 (1.30)	1.34 (1.14)	1.03 (1.01)	0.88 (0.92)	0.87 (0.91)	1.46 (1.20)	1.07 (1.01)	1.27 (1.10)	1.28 (1.12)	1.39 (1.18)	11.37
7	Diflubenzuron 25% WP (0.015 %) + NSKE (+ 5%)	1.52 (1.23)	1.46 (1.20)	1.58 (1.24)	2.13 (1.45)	1.72 (1.30)	1.18 (1.09)	1.92 (1.36)	1.88 (1.35)	2.61 (1.60)	2.14 (1.44)	1.19 (1.09)	1.14 (1.05)	1.34 (1.16)	10.70
8	Untreated control	1.34 (1.16)	2.23 (1.48)	2.43 (1.54)	2.78 (1.66)	2.48 (1.56)	1.31 (1.14)	2.61 (1.59)	2.68 (1.62)	3.14 (1.75)	2.81 (1.65)	1.48 (1.22)	1.59 (1.25)	1.53 (1.24)	7.12
	SE (m) ±		0.05	0.05	0.06	0.05						0.05	0.07	0.04	0.56
	CD @ 5%		0.17	0.17	0.19	0.18						-	-	-	1.72

Note: Figures in parentheses are corresponding square root transformation, LLB: lady bird beetle, DBS: day before spray, DAS: day after spraying

RESULTS AND DISCUSSION

The data on the efficacy of IGR's on the incidence of *A (S.) biguttula* after four sprays revealed same trend of efficacy at 3, 7 and 14 days after spray; cumulative mean data showed that buprofezin 25%SC led to minimum number of leafhoppers (0.94/ leaf), statistically on par with pyriproxyfen 10%EC (1.06/ leaf) and buprofezin 25%SC+ NSKE 5% (1.21/ leaf). The treatment of pyriproxyfen 10%EC + NSKE 5%, NSKE 5% and diflubenzuron 25%WP + NSKE 5% proved moderately effective, while diflubenzuron 25%WP was found at par with untreated control (2.48/ leaf) (Table 1). The effectiveness of buprofezin against leafhoppers finds support in the research carried out by earlier workers like Kalyan et al. (2017) and Naik et al. (2017). Similar results were also obtained by Halappa and Patil (2014). Ambarish et al. (2017) and Choudhary et al. (2015) reported the effectiveness of pyriproxyfen 10%EC against leafhoppers in cotton.

Against *B. tabaci*, at three days after spray the treatments viz., pyriproxyfen 10%EC, pyriproxyfen 10%EC+ NSKE 5% and buprofezin 25%SC emerged as the most effective; buprofezin 25%SC+ NSKE 5% and NSKE 5% and diflubenzuron 25%WP+ NSKE 5% were the next best; and diflubenzuron 25%WP proved comparatively less effective. At seven and fourteen days after treatment similar trend of efficacy was observed. These results on *B. tabaci* agree with those of earlier workers- Sahito et al. (2015) on pyriproxyfen 10EC against *B. tabaci*; and those of Thumar et al. (2018) and Kumar et al. (2016). Kalyan et al. (2017) reported maximum reduction with buprofezin 25SC. Similar results were also obtained by Das and Isalam (2014) with buprofezin 40SC @ 2 ml/ l against *B. tabaci* on brinjal.

The data on the natural enemies viz; ladybird beetle, chrysopids and spiders obtained at different intervals indicated non-significant differences among the treatments**.** However, numerically a greater number of natural enemies were recorded in untreated control plots. The results revealed that all the treatments were found less detrimental to the predatory fauna. These results are in accordance with those of Gogi et al. (2006) and Naik et al. (2017) that buprofezin appeared safe to predators. Similarly, Ananthi et al. (2017) reported that, the neem seed kernel extract 5% protected the natural enemies like spiders and coccinellids as against imidacloprid spray in chilli ecosystem. As regards yield, buprofezin 25%SC was found to be the most promising treatment with seed cotton yield of 13.40 q/ ha (Table 1); this treatment was found at par with pyriproxyfen 10%EC (12.39 q/ ha) and buprofezin 25%SC + NSKE 5% (11.09 q/ ha). These results find support from those of Nemade et al. (2017) and Kalyan et al. (2017) on seed cotton yield with buprofezin 25SC. However, Choudhary et al. (2015) reported that pyriproxyfen 10EC at different doses proved better than commercial check acetamiprid 20SP @ 20g a.i./ ha and difenthiuron 50WP @ 300g a.i./ ha in harvesting higher yields. Hole et al. (2015) recorded seed cotton yield of 12.31 q/ ha in treatment with NSKE 5%.

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