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EFFICACY OF INSECT GROWTH REGULATORS AGAINST APHIDS AND THRIPS ON *BT* COTTON

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ABSTRACT

Eight insecticidal treatments (including insect growth regulators) were evaluated against aphids (*Aphis gossypii* Glover) and thrips (*Thrips tabaci* Lindeman) in Bt cotton. The results revealed that buprofezin 25%SC proved effective in minimizing the *A. gossypii*. However, it was found at par with pyriproxyfen 10%EC. Buprofezin 25%SC also led to minimum number of *T. tabaci* and was found at par with pyriproxyfen 10%EC, buprofezin 25%SC+ NSKE 5%, pyriproxyfen 10%EC+ NSKE 5% and NSKE 5%. No deleterious effect of these were observed on the natural enemies. Maximum seed cotton yield was obtained with buprofezin 25%SC and it proved to be the economically viable with ICBR of 1: 6.6.

Key words: *Aphis gossypii*, *Thrips tabaci*, Bt cotton, insect growth regulators, buprofezin, pyriproxyfen, NSKE, yield, incremental cost benefit ratio, chrysopids, spiders

Cotton (*Gossypium spp*) is one of the most important commercial cash crops. Damage inflicted by sucking insect pests is one of the major constraints in attaining high production of seed cotton. The avoidable yield loss due to major sucking pests of *Bt* cotton was 33.73% (Ghelani et al. 2014). The use of insecticides to counter this results in environmental problems (Moreira et al., 1996). Alternative ecofriendly methods with greater selectivity and less toxicity to non-target organisms can overcome such problems (Faria, 2009). Insect growth regulators (IGR's) have a role to play in such alternatives as these provide hormonal control that are related to moulting, metamorphosis and reproduction (Tunaz and Uygun, 2004). Since its potential discovery, credited to the "paper factor" related by Slama and Williams (1965), IGR's have been commercialized at an industrial level and widely used in pest control. Keeping these in view, the present study evaluates the efficacy of some of these IGRs against aphids (*Aphis gossypii* Glover) and thrips (*Thrips tabaci* Lindeman) on Bt cotton.

MATERIALS AND METHODS

The present study was conducted at the experimental farm of Department of Agricultural Entomology, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola during kharif 2019-20. The trial was laid out in a randomized block design (RBD) with eight treatments including control, each replicated thrice. The *Bt* Cotton (Ajeet-155 BG II) was dibbled at 90x 60 cm spacing. All recommended package and practices were followed, with four treatment sprays applied at 15 days interval. The data on the incidence of *A. gossypii* and *T. tabaci* were collected 24 hr pretreatment and 3, 7 and 14 days of post-treatment. The treatments included 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 5%. Similarly, data were also collected on the natural enemies and seed cotton yield. The data obtained were subjected to appropriate transformations before statistical analysis to test the level of significance as per Gomez and Gomez (1984). Incremental cost benefit ratio was worked out to find out the cost effective treatment.

RESULTS AND DISCUSSION

The data in Table 1 pertaining to effect of IGR's against *A. gossypii* after four sprays revealed more or less same trend of efficacy at 3, 7 and 14 days after spray; cumulative mean data showed that buprofezin 25%SC was superior against *A. gossypii* (4.94/ leaf). This treatment was at par with pyriproxyfen 10%EC (6.19/ leaf). The treatment of NSKE 5% showed moderate effect, whereas, diflubenzuron 25%WP + NSKE 5% and diflubenzuron 25%WP were the least effective. These findings are in agreement with those of Shivaray et al. (2021) on the effectiveness of pyriproxyfen 10%EC and buprofezin 25%SC; and those of Sahar (2019) under laboratory and field experiments. Thumar et al. (2018) observed pyriproxyfen 10% EC @ 1000 ml/ ha as effective, whereas, Choudhary and Singh (2015) found three sprays of pyriproxyfen at 10 days interval as effective. Hole et al. (2015) and Karkar et al. (2014) obtained significant reduction with application of NSKE 5%.

Table 1. Effect of insecticides (IGRs) against *A. gossypii, T. tabaci* and predators on *Bt* cotton

S. No	Treatments	No. of aphids/ leaf					No. of thrips/ leaf					Occurrence of predators (No/ plant)			Seed cotton yield (q/ ha)	Value of increased yield over control (Rs./ ha)	Net gain over control	ICBR
		1 DBS	3 DAS	7 DAS	14 DAS	Mean	1 DBS	3 DAS	7 DAS	14 DAS	Mean	LLB	Chrysopid	Spiders				
1.	Buprofezin 25%SC (0.05%) @ 1000 ml/ha	12.59 (3.54)	3.52 (1.78)	4.27 (1.93)	7.03 (2.39)	4.94 (2.03)	7.79 (2.79)	4.82 (2.18)	4.17 (2.02)	4.79 (2.17)	4.60 (2.12)	1.17 (1.12)	1.00 (0.99)	1.29 (1.13)	13.40	34540	29972	1:6.6
2.	Pyriproxyfen 10%EC (0.02%) @ 1000 ml/ha	12.25 (3.50)	5.73 (2.30)	5.03 (2.14)	7.81 (2.59)	6.19 (2.34)	8.27 (2.87)	5.87 (2.40)	4.99 (2.20)	5.45 (2.32)	5.44 (2.31)	1.12 (1.09)	0.95 (0.97)	1.24 (1.12)	12.39	28985	21745	1:3.0
3.	Diflubenzuron 25%WP (0.015%) @ 300 g/ha	21.78 (4.66)	10.56 (3.20)	10.98 (3.25)	12.93 (3.40)	11.49 (3.28)	9.29 (3.04)	8.83 (2.95)	9.57 (3.06)	9.88 (3.11)	9.43 (3.04)	1.02 (1.06)	0.83 (0.90)	1.11 (1.07)	9.77	19690	12394	1:1.7
4.	NSKE 5% @ 25 kg/ha	13.63 (3.69)	8.30 (2.83)	7.00 (2.58)	9.35 (2.93)	8.22 (2.78)	8.11 (2.84)	6.46 (2.52)	6.04 (2.45)	6.56 (2.55)	6.35 (2.51)	1.35 (1.25)	1.42 (1.18)	1.45 (1.20)	11.09	14575	11535	1:3.8
5.	Buprofezin 25%SC (0.05 %) + NSKE (5%)	13.78 (3.71)	6.64 (2.49)	5.34 (2.22)	8.36 (2.73)	6.78 (2.48)	6.97 (2.64)	5.66 (2.37)	5.06 (2.24)	5.77 (2.40)	5.50 (2.34)	1.32 (1.21)	1.39 (1.17)	1.41 (1.19)	11.79	25685	20117	1:3.6
6.	Pyriproxyfen 10% EC (0.02 %) + NSKE (5%)	13.20 (3.63)	8.05 (2.77)	6.35 (2.45)	8.70 (2.79)	7.70 (2.67)	7.86 (2.80)	6.09 (2.46)	5.49 (2.33)	6.09 (2.45)	5.89 (2.41)	1.27 (1.10)	1.28 (1.12)	1.39 (1.18)	11.37	23375	15135	1:1.8
7.	Diflubenzuron 25% WP (0.015 %) + NSKE (5%)	16.85 (4.10)	10.99 (3.25)	10.50 (3.18)	11.42 (3.22)	10.97 (3.22)	8.73 (2.95)	8.30 (2.87)	8.28 (2.85)	8.46 (2.89)	8.35 (2.87)	1.19 (1.09)	1.14 (1.05)	1.34 (1.16)	10.70	21835	13539	1:1.6
8.	Untreated control	12.84 (3.58)	14.10 (3.68)	14.90 (3.75)	14.00 (3.59)	14.33 (3.67)	10.23 (3.20)	14.89 (3.85)	16.70 (4.08)	17.48 (4.17)	16.36 (4.03)	1.48 (1.22)	1.59 (1.25)	1.53 (1.24)	7.12	-	-	1:6.6
	SE (m) ±	NS	0.14	0.13	0.16	0.14	NS	0.13	0.13	0.13	0.13	0.05	0.07	0.04	0.56			
	CD (p=0.05)	-	0.42	0.40	0.49	0.43		0.40	0.39	0.40	0.40	-	-	-	1.72			

Figures in parentheses square root transformed values; LLB: lady bird beetle; DAS: day after spraying; DBS: day before spray; No. of sprays- 4; Cost of insecticides: Buprofezin 25%SC @ 632/ 1000 ml; Pyriproxyfen 10%EC @ 1300/ 1000 ml; Diflubenzuron 25%WP @ 1314/ 300 gm; NSKE @ 250/ 25 kg; Labour and sprayer charges =2040 Rs/ ha; price of seed cotton Rs. 5500/ q

The cumulative means also led the observation that buprofezin 25%SC is superior against *T. tabaci* (4.60/ leaf) found at par with pyriproxyfen 10%EC, buprofezin 25%SC + NSKE 5%, pyriproxyfen 10%EC + NSKE 5% and NSKE 5% (5.44, 5.50, 5.89 and 6.35 thrips/ leaf, respectively). These results are in tune with those of Shivaray et al. (2021) with pyriproxyfen 10%EC and buprofezin 25%SC. Binu and Bhede (2019) reported buprofezin 25%SC as effective. Thumar et al. (2018), Ambarish et al. (2017) and Zafar et al. (2017) also obtained similar results with pyriproxyfen. The natural enemies revealed non-significant differences among the treatments, and proved less detrimental to spiders, chrysopids and coccinellids. This observation corroborates with those of Adhikari et al. (2019), Binu and Bhede (2019) and Naik et al. (2017) with buprofezin on predators. Sahar (2019) classified buprofezin and pyriproxyfen as harmless on coccinellids. Ananthi et al. (2017) found the neem seed kernel extract 5% protecting the natural enemies like spiders and coccinellids against imidacloprid in chilli.

Maximum seed cotton yield was obtained with buprofezin 25%SC (13.40 q/ ha), at par with pyriproxyfen 10%EC (12.39 q/ ha) and buprofezin 25%SC + NSKE 5% (11.09 q/ ha). Also, buprofezin 25%SC was the most economically viable with maximum ICBR (1:6.6). These results finds support from Shivaray et al. (2021) on the effectiveness of pyriproxyfen 10%EC and buprofezin 25%SC giving higher seed cotton yield. Thumar et al. (2018) harvested maximum seed cotton yield with pyriproxyfen 10%EC, while Nemade et al. (2017) obtained this with buprofezin 25SC. Kalyan et al. (2017) also reported the cost effectiveness of buprofezin 25SC, while Hole et al. (2015) harvested the satisfactory yield with NSKE 5%.

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