EFFICACY OF INSECTICIDES AGAINST SHOOT AND FRUIT BORER *EARIAS VITELLA* IN OKRA

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ABSTRACT

The efficacy of ten insecticides against the shoot and fruit borer *Erias vitella* on okra was assessed in the field at Research Farm, IAS, BHU, Varanasi during kharif, 2018. Indoxacarb 14.5% SC @ 72.5 g *a.i.* ha^{-1} led to the lowest infestation of shoot (6.30 and 5.37%) and fruit (3.25 and 3.73%) after first and second spray. Highest reduction (61.22 and 74.81%) was significantly observed in the plants treated with indoxacarb 14.5% SC @ 72.5 g *a.i.* ha^{-1} followed by indoxacarb 14.5% +acetamiprid 7.7% SC @72.5+38.5 g *a.i.* ha^{-1} (51.36 and 69.09%). Indoxacarb 14.5% SC @ 72.5 g *a.i* ha^{-1} and indoxacarb14.5% + acetamiprid 7.7% SC @ 72.5+38.5 g *a.i.* ha^{-1} treated plots were the best and gave highest yield.

Key words: Okra, shoot and fruit borer, newer insecticides, management, yield, indoxacarb, acetamiprid, chlarpyriphos, fenpropathrin, cypermethrin, fruit, shoot damage, increments in yield, efficacy

Earias vitella are the most dreadful pest causing serious loss in okra (Suman et al., 1984). *Earias* spp. are distinguished from other pests of okra by their marked tendency for stem boring. Severe attack, results in the wilting of top leaves and collapsing of the main stem. The larvae also bore into the flower buds, flowers and fruits of the crop. A serious decline in production of okra due to this pest has been reported (Kumar and Urs, 1988; Janu and Kumar, 2022; Singh and Brar, 1994). *Earias* spp. can be controlled by synthetic chemicals to some extent, but the indiscriminate use has generated many problems (Janu and Kumar, 2022; Naik et al., 2022; Mahapatro and Gupta, 1998). Recent advances are being directed towards the development of safer and more effective insecticides which are relatively safe to natural enemies and reduce insecticide load in the environment. Keeping in view, this study on "Management of shoot and fruit borer, *Earias vitelli* in Okra, *Abelmoschus esculentus* (L.) Moench), with newer insecticide molecules" was done.

MATERIALS AND METHODS

The experiment was conducted at the Vegetable Research Farm, IAS, BHU, Varanasi during kharif, 2018. The experiment to study the 'Management of shoot and fruit borer, *E. vittella* in okra with newer insecticide molecules' laid out from a uniform size plot 3 m x 1.8 m and replicated thrice okra variety Kashi Mohini (VRO-3) was sown in well-prepared field. The experimental design was RBD. All the insecticide formulations were obtained from M\s Gharda Chemicals Ltd, Mumbai, except for some standards which are procured locally. The treatments were started applying five weeks after sowing when moderate infestation was observed and in total three insecticidal applications were given during the crop growth. The first spray was given during the vegetative stage when shoot infestations were severe on okra. At this time no fruit borer infestation was observed. In the second spray shoot and fruit infestation was observed while in the third spray, only fruit infestation was observed. Pre-treatment observations on the okra shoot and fruit borer was recorded one day before spraying, while post- treatment observations were taken 7 and 14 days after the application of the treatments. Observations recorded on five randomly selected tagged plants/ plot. Fruit infestation and shoot infestation were worked out. The data thus obtained was transformed to square root values and subjected to ANOVA and significance of treatments evaluated.

RESULTS AND DISCUSSION

After the first spray, indoxacarb14.5% SC@ 72.5 g *a.i.* ha^{-1}, indoxacarb 14.5 + acetamiprid 7.7 % SC@ 72.5+38.5 g *a.i* ha^{-1}, indoxacarb14.5% +acetamiprid 7.7%SC@ 58+30.8g *a.i* ha^{-1} and chlorpyriphos 50 EC @ 600 g *a.i* ha^{-1} were the most effective in reducing

Table 1. Efficacy of insecticides on shoot and fruit infestation by *E. vitela* in okra (2018)

Treatment	% shoot infestation								% fruit infestation								Fruit yield q/ ha
	I Spray				II Spray				I Spray				II Spray				
	1 DBS	7 DAS	14 DAS	Overall mean	1 DBS	7 DAS	14 DAS	Overall mean	1 DBS	7 DAS	14 DAS	Overall mean	1 DBS	7 DAS	14 DAS	Overall mean	
Chlorpyriphos 50% +Cypermethrin 5% EC@ 375+37.5g *a.i* ha^{-1}	11.32 (3.36)	9.71 (3.12)	11.38 (3.37)	10.55 (3.25)	12.84 (3.58)	9.93 (3.15)	5.25 (2.29)	7.59 (2.75)	12.70 (3.70)	8.75 (2.95)	8.25 (2.87)	8.50 (2.92)	14.90 (3.98)	8.73 (3.11)	8.24 (2.87)	8.49 (2.91)	83.71
Chlorpyriphos 50% +Cypermethrin 5% EC@500+50g *a.i* ha^{-1}	11.78 (3.43)	7.89 (2.81)	11.42 (3.38)	9.66 (3.11)	11.34 (3.37)	5.78 (2.40)	7.25 (2.69)	6.52 (2.55)	13.14 (3.76)	7.09 (2.66)	6.99 (2.64)	7.04 (2.65)	14.12 (3.88)	6.44 (2.72)	6.44 (2.72)	6.44 (2.54)	87.34
Chlorpyriphos 50% EC@600g *a.i* ha^{-1}	12.08 (3.48)	6.23 (2.50)	9.04 (3.01)	7.64 (2.76)	12.82 (3.58)	7.50 (2.74)	6.25 (2.50)	6.88 (2.62)	12.47 (3.67)	6.67 (2.58)	6.22 (2.49)	6.45 (2.54)	14.90 (3.98)	5.60 (2.57)	5.60 (2.57)	5.60 (2.37)	93.96
Cypermethrin 10% EC@70	10.45 (3.23)	10.02 (3.17)	14.32 (3.78)	12.17 (3.49)	10.02 (3.17)	6.43 (2.54)	6.20 (2.49)	6.32 (2.51)	12.62 (3.69)	9.22 (3.03)	8.50 (2.91)	8.86 (2.98)	14.12 (3.88)	10.20 (3.19)	10.25 (3.20)	10.23 (3.20)	80.82
Indoxacarb14.5% +acetamiprid 7.7%SC@58+30.8g *a.i* ha^{-1}	11.05 (3.32)	5.02 (2.24)	8.41 (2.90)	6.72 (2.59)	10.18 (3.19)	5.11 (2.26)	5.50 (2.35)	5.31 (2.30)	14.05 (3.88)	7.25 (2.69)	6.01 (2.45)	6.63 (2.57)	14.90 (3.98)	4.74 (2.39)	4.74 (2.39)	4.74 (2.18)	95.53
Indoxacarb14.5% +acetamiprid 7.7%SC@72.5+38.5g *a.i* ha^{-1}	12.40 (3.52)	5.78 (2.40)	8.90 (2.98)	7.34 (2.71)	9.32 (3.05)	5.00 (2.24)	4.65 (2.16)	4.83 (2.20)	12.89 (3.72)	6.50 (2.55)	5.25 (2.29)	5.88 (2.42)	14.12 (3.88)	3.43 (2.10)	3.43 (2.10)	3.43 (1.85)	108.34
Indoxacarb14.5% SC@72.5g *a.i* ha^{-1}	11.04 (3.32)	4.98 (2.23)	7.62 (2.76)	6.30 (2.51)	8.95 (2.99)	4.11 (2.03)	3.25 (1.80)	3.68 (1.92)	13.73 (3.83)	5.50 (2.34)	5.24 (2.28)	5.37 (2.32)	14.90 (3.98)	3.25 (1.80)	4.20 (2.04)	3.73 (1.93)	110.20
Acetamiprid 20%SP@38.5g *a.i* ha^{-1}	9.59 (3.10)	6.5 (2.55)	9.88 (3.14)	8.19 (2.86)	7.32 (2.71)	4.50 (2.12)	4.27 (2.07)	4.39 (2.09)	13.14 (3.76)	8.22 (2.86)	7.50 (2.73)	7.86 (2.80)	14.12 (3.88)	8.12 (3.02)	8.12 (3.02)	8.12 (2.85)	85.22
Fenpropathrin 30% EC@100g *a.i* ha^{-1}	10.21 (3.20)	6.98 (2.64)	10.42 (3.23)	8.70 (2.95)	14.85 (3.85)	8.25 (2.87)	8.85 (2.97)	8.55 (2.92)	13.84 (3.85)	8.20 (2.86)	7.70 (2.77)	7.95 (2.82)	14.90 (3.98)	7.13 (2.85)	7.25 (2.69)	7.19 (2.68)	86.64
Untreated (control)	10.44 (3.23)	14.82 (3.85)	17.54 (4.19)	16.18 (4.02)	18.7 (4.32)	19.02 (4.36)	20.95 (4.58)	19.99 (4.47)	18.50 (4.30)	19.04 (4.36)	20.22 (4.49)	19.63 (4.43)	14.12 (3.88)	21.64 (4.65)	22.04 (4.69)	21.84 (4.67)	74.71
SE(m) ±	0.24	0.01	0.04	-	0.00	0.02	0.01	-	0.30	0.50	0.70	-	0.34	0.29	0.49	-	
C.D. (p=0.05)	--	0.04	0.12	-	0.01	0.05	0.04	-	0.04	1.50	2.08	-	1.03	0.85	1.30	-	

DBS = Day before spray DAS = Days after spray shoot damage with a reduction of 63.57, 62.22, 61.35 and 59.56%, respectively. These insecticides were significantly more effective than, chlorpyriphos 50% + cypermethrin 5% EC @ 500+50g *a.i* ha^{-1}, fenpropathrin 30% EC @ 100 g *a.i* ha^{-1}, acetamiprid 20 % SP @ 38.5 g *a.i* ha^{-1}, chlorpyriphos 50% + cypermethrin 5% EC @ 375+37.5 g *a.i* ha^{-1} and cypermethrin 10% EC @ 70g *a.i* ha^{-1}, which had a reduction in shoot damage of 49.45%, 47.56%, 45.55%, 45.47% and 39.86%, respectively. All treatments were significantly more effective than the control. The data analysis showed that the group of newer insecticides including chlorpyriphos 50% + cypermethrin 5% EC @ 375+37.5 g *a.i* ha^{-1}, cypermethrin 10% EC @ 70g *a.i* ha^{-1}, acetamiprid 20% SP@ 38.5 g *a.i* ha^{-1}, fenpropathrin 30% EC@ 100 g *a.i* ha^{-1} and chlorpyrifos 50% + cypermethrin 5% EC @ 500+50g *a.i* ha^{-1} led to the lowest % reduction. Indoxacarb14.5% SC@ 72.5 g *a.i.* ha^{-1}, indoxacarb 14.5 + acetamiprid 7.7% SC@ 72.5+38.5 g *a.i* ha^{-1}, indoxacarb14.5% +acetamiprid 7.7%SC@ 58+30.8g *a.i* ha^{-1} and chlorpyriphos 50 EC @600 g *a.i* ha^{-1} were the most effective (Table 1).

Fenpropathrin 30% EC@ 100 g *a.i* ha^{-1}, acetamiprid 20%SP@ 38.5 g *a.i* ha^{-1}, chlorpyrifos 50% + cypermethrin 5% EC @ 375+37.5 g *a.i* ha^{-1} and cypermethrin 10% EC @ 70g *a.i* ha^{-1} led to lowest % reduction of fruit infestation after the first spray (Table 1). These treatments were found significantly superior over the control. Indoxacarb 14.5% SC @ 72.5 g *a.i.* ha^{-1} with reduction of 63.08% in infestation was significantly superior. After second spray, indoxacarb 14.5% SC @ 72.5 g *a.i.* ha^{-1} resulted in 74.81% reduction in infestation and thus significantly superior. The treatment, cypermethrin 10% EC @ 70g *a.i* ha^{-1} was found to be less effective. All the treatments were found significantly superior over the control. The present findings are agreement with those of Kamble et al. (2014) who reported indoxacarb 14.5 SC + acetamiprid 7.7 SC @ 400 ml/ ha, profenophos 40 EC + cypermethrin 4EC @1000 ml/ ha and chlorpyriphos 50 EC + cypermethrin 5 EC @1000 ml/ ha found to be the most effective in reducing the fruit infestation. Janu and Kumar (2022) found that indoxacarb 14.5SC and cypermethrin 25%EC are effective. Naidu and Kumar (2019) observed minimum % shoot and fruit infestation in indoxacarb followed by cypermethrin. Sowjanya and Kumar (2023) also observed that indoxacarb 14.5% SC is the best. However, the results of the present study were different from those of Naik et al. (2022) on cypermethrin@25%EC and indoxacarb @14.5% SC. Manikanta and Kumar (2022) also observed that cypermethin 25% EC is superior. Waghmode et al. (2020) found pyriproxyfen 5% EC + fenpropathrin 15% EC @ 1 ml/ ℓ as significantly effective. Sharma and Kumar (2024) reported that best and the most economic treatment was profenophos 50 EC + cypermethrin 25 EC followed by cypermethrin 25EC + neem oil 3%. Pandey et al. (2023) reported that cypermethin 25% EC was least effective in brinjal.

All the insecticidal treatments gave significantly higher yields (Table 1). Among the treatments indoxacarb 14.5% SC @ 72.5 g *a.i* ha and indoxacarb14.5% + acetamiprid 7.7% SC @ 72.5+38.5 g *a.i* ha were the best and most effective. The results of the present study were supported by Kamble et al. (2014) on indoxacarb 14.5 SC+acetamiprid 7.7 SC followed by profenophos 40 EC+cypermethrin 4 EC (114.52 q/ ha) and chlorpyriphos 50 EC+cypermethrin 5 EC (112.70 q/ ha). The highest yield was recorded in profenophos 50 EC + cypermethrin 25 EC (Sharma and Kumar, 2024). Dhaka (2016) and Maurya et al. (2014) reported that indoxacarb-treated plots produced higher yields. Janu and Kumar (2022) found that the best and most economical treatment was indoxacarb 14.5 SC followed by cypermethrin 25%EC.

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AUTHOR CONTRIBUTION STATEMENT

S V S Raju, S Ramesh Babu and B S Meena conceived and designed experiments. B S Meena performed experiments. B S Meena and K R SHARMA analyzed data. B S Meena and K Kumawat wrote the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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