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FIELD EFFICACY OF INSECTICIDES AGAINST OKRA SHOOT AND FRUIT BORER *EARIAS VITELLA* (F.)

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ABSTRACT

A field experiment was carried out during kharif 2018 and 2019 to evaluate the efficacy of insecticides against okra shoot and fruit borer *Earias vitella* (F.). Out of nine insecticides, profenophos 50EC @ 500g a.i./ ha at fortnightly interval was found to the best giving maximum protection (2.55% shoot and 5.69% fruit damage) followed by spinosad 45SC @ 50g a.i./ ha and thiamethoxam 25WG @ 25g a.i./ ha. Amongst the botanicals used, Yam Bean Seed Extract- YBSE (5%) was found to be better. Application of profenophos 50EC (@ 500 g a.i./ha) led to maximum fruit yield (152.9 q/ ha) while the neem oil 3% yielded the least (131.1 q/ ha). Among the plant products, YBSE (5%) yielded maximum (136.2 q/ ha). The benefit-cost ratio was at its maximum (12.78:1) with profenophos 50EC, and it was closely followed by acetamiprid 20SP (11.57:1) and thiamethoxam 25WG (10.11:1).

Key words: *Earias vitella*, spinosad, thiamethoxam, acetamiprid, deltamethrin, profenophos, neem oil, yam bean seed extract, neem seed kernel extract, benefit cost ratio, shoot damage, fruit damage

Okra (*Abelmoschus esculentus* L.) is an important vegetable crop (Singh et al., 2008), and in India, it is grown extensively during kharif and summer seasons (Raghuraman and Birth, 2011). Similar to other vegetable crops, okra is also ravaged by an array of biotic and abiotic factors. Out of biotic constraints insect pests are the most crucial, and according to Srinivasa and Rajendran (2003) nearly, 72 insect species have been recorded on okra. Besides, it also harbours insect vectors that transmit many diseases (Showkat et al., 2010). Among these, the shoot and fruit borer *Earias vitella* (F.) is the most prominent and it adversely affects yield, and loss varies up to 35% (Krishnaiah, 1980) while Bhawan (1984) recorded 76% yield loss. Although, several non-chemical control strategies are developed under IPM, still farmers trust on synthetic insecticides because of their rapid response. The indiscriminate use of non-recommended insecticides in under or over doses is known, with the regular use of conventional insecticides causing development of insecticide resistance (Kranthi et al., 2002), pest resurgence, secondary pest outbreaks and pesticide residue problems. In addition, it also affects beneficial insects, animals and human. Hence, there is always a need to assess the efficacy of insecticides. Therefore, the present study to evaluate the efficacy of few synthetic and botanicals insecticides against *E. vitella* in okra.

MATERIALS AND METHODS

Field experiment was conducted at the Research Farm of T C A Dholi, Muzaffarpur (Bihar) during kharif, 2018 and 2019. The experiment was laid out in randomized block design with nine treatments and three replications. Kashi Pragati okra variety was grown following all the recommended package of practices. The insecticides evaluated include: T_1 - Spinosad 45SC @ 50 g a.i./ ha, T_2 - Thiamethoxam 25WG @ 25 g a.i./ ha, T_3 - Acetamiprid 20SP @ 20 g a.i. /ha, T_4 - Deltamethrin 2.8EC @ 15 g a.i./ ha, T_5 - Profenophos 50EC @ 500 g a.i./ ha, T_6 - Neem oil 3%, T_7 - NSKE 5%, T_8 - Yam bean seed extract (5%) and T_9 - Untreated control. The crop was sown on 13th June 2018 and 15th June 2019 in a plot size of 3x 2 m with a row spacing of 50x 20 cm. All the treatments were applied thrice at fortnightly intervals starting after one month of sowing. The mean % shoot and fruit infestation (weight basis) was recorded a day before spraying and 7 days after each spray. The extent of shoot infestation was determined by formula of Rakshith and Kumar (2017). After picking infested and healthy fruits were sorted out and weight of infested as well as total harvested fruits was recorded, from which % fruit damage was worked out as per Sujayanand et al. (2014). Yield data was recorded on the basis of healthy fruits at each picking. The additional yield over untreated control was also calculated for

Table 1. Efficacy of synthetic and some biorational insecticides against *E. vittella* on okra (Pooled data, 2018 and 2019, kharif)

Treatments	Mean % shoot damage at 1 DBS	Mean % shoot damage at 7 days after each spray			Cumulative mean	Mean % fruit damage at 1 DBS	Mean % fruit damage at 7 days after each spray			Cumulative mean
		1st spray	2nd spray	3rd spray			1st spray	2nd spray	3rd spray	
T_1 – Spinosad (45 SC) @ 50g a.i./ ha	4.50 (12.22)	2.84 (9.68)	3.69 (11.07)	1.13 (6.05)	2.94 (9.86)	5.22 (13.15)	-	5.54 (13.59)	8.57 (17.00)	6.64 (14.91)
T_2 – Thiamethoxam (25 WG) @ 25g a.i./ ha	4.39 (12.09)	3.28 (10.43)	3.97 (11.47)	1.37 (6.71)	3.32 (10.48)	5.21 (13.18)	-	6.52 (14.78)	9.66 (18.09)	7.46 (15.84)
T_3 – Acetamiprid (20 SP) @ 20g a.i./ ha	4.28 (11.93)	3.65 (11.00)	4.44 (12.15)	1.65 (7.38)	3.73 (11.13)	5.18 (13.14)	-	7.09 (15.43)	10.28 (18.66)	7.95 (16.36)
T_4 – Deltamethrin (2.8 EC) @ 15g a.i./ha	4.65 (12.43)	3.92 (11.39)	5.83 (13.90)	1.97 (8.05)	4.44 (12.13)	5.08 (13.02)	-	9.01 (17.44)	11.22 (18.55)	9.05 (17.49)
T_5 – Profenophos (50 EC) @ 500g a.i./ ha	4.37 (12.05)	2.54 (9.15)	3.05 (10.05)	1.05 (5.85)	2.55 (9.17)	5.21 (13.19)	-	4.59 (12.35)	7.25 (15.57)	5.69 (13.78)
T_6 – Neem oil 3%	4.53 (12.27)	4.79 (12.63)	8.10 (16.53)	2.31 (8.74)	5.76 (13.88)	4.98 (12.88)	-	12.84 (20.98)	22.67 (28.41)	15.34 (23.03)
T_7 – NSKE 5%	4.26 (11.90)	4.45 (12.16)	7.43 (15.80)	2.25 (8.62)	5.35 (13.36)	5.10 (13.05)	-	12.05 (20.30)	21.55 (27.67)	14.59 (22.44)
T_8 – YBSE 5%	4.55 (12.31)	4.21 (11.83)	7.02 (15.35)	2.14 (8.41)	5.07 (13.00)	5.33 (13.33)	-	11.48 (19.77)	20.65 (26.96)	14.03 (21.96)
T_9 – Untreated control	4.34 (12.02)	8.37 (16.80)	10.42 (18.82)	2.86 (9.74)	8.42 (16.86)	5.16 (13.11)	-	14.14 (22.07)	29.73 (33.02)	18.62 (25.54)
S.Em (±)	(0.30)	(0.32)	(0.47)	(0.37)	(0.36)	(0.39)	-	(0.51)	(0.80)	(0.58)
CD (p=0.05)	N/S	(0.96)	(1.43)	(1.11)	(1.09)	N/S	-	(1.55)	(2.41)	(1.76)
CV (%)	8.45	9.04	11.25	9.63	9.77	10.10	-	9.97	11.47	10.31

DBS – Days before spray; #Figures in parentheses the values of angular transformation; NSKE-neem seed kernel extract; YBSE-yam bean seed extract assessing the yield performance. Ultimately, the benefit cost ratio (BCR) was calculated on the basis of prevailing market price of okra, insecticides and spraying cost.

RESULTS AND DISCUSSION

The data in Table 1 reveals that on cumulative mean basis the shoot damage ranged from 2.55 to 8.42% with minimum in profenophos 50EC and maximum in untreated control. Out of botanicals used, YBSE (5%) was found to eb the most effective (5.07%) which was statistically at par with NSKE 5% (5.35%) and neem oil 3% (5.76%). Katti and Surpur (2015) evaluated the efficacy of flubendiamide 480SC against *E. vitella* at different doses and concluded that flubendiamide 480SC @ 60 g a.i./ ha was found superior, followed by flubendiamide 480SC @ 48 g a.i/ ha at Raichur, Karnataka. Rahman et al. (2013) found the least shoot damage in Ecofuran (5G) treated plot, while it was 17.29% to 19.78% with neem leaf extract. On cumulative mean basis, the fruit damage was minimum (5.69%) in profenophos 50EC @ 500 g a.i./ ha with respect to untreated control (18.62%). Among the plant products, YBSE 5% was the most promising (14.03%) and was statistically on par with NSKE 5% and neem oil 3%. Misra et al. (2002) and Ghosh et al. (2012) found profenophos 50EC is effective. The present findings are also in accordance with the findings of Birth and Raghuraman (2011) on spinosad 45SC; Verma (2018), Kodandaram et al. (2017), Chowdary et al. (2010) and Tripathi and Maurya (2011) corroborate with the present results.

The data given in Fig. 1 reveal that three rounds of profenophos 50EC (@ 500 g a.i./ ha) gave maximum fruit yield (152.9 q/ ha). Among the plant products, YBSE 5% was the best (136.2 q/ ha). These data are in agreement with those of Chowdhary et al. (2010) on rynaxypar 20 SC, followed by spinosad 45 SC. However, Gadekar et al. (2016) observed maximum yield with thiamethoxam (0.005%) followed by acetamiprid and acephate. The reports of Lal and Sinha (2005), Singh et al. (2008), Birth and Raghuraman (2011), Raghuraman and Birth (2011), Sarkar and Roy (2015) and Kalmath and Mahantesh (2016) also broadly corroborate with the present results. The benefit-cost ratios, when computed revealed that it was maxiumum (12.78:1) in case of profenophos 50EC closely followed by acetamiprid 20SP (11.57:1). Gadekar et al. (2016) also reported that acetamiprid registered the highest B: C ratio (47.67) followed by thiamethoxam and acephate. In contrast, Sakthivel et al. (2007) observed that NSKE gave maximum B: C ratio among the botanicals.

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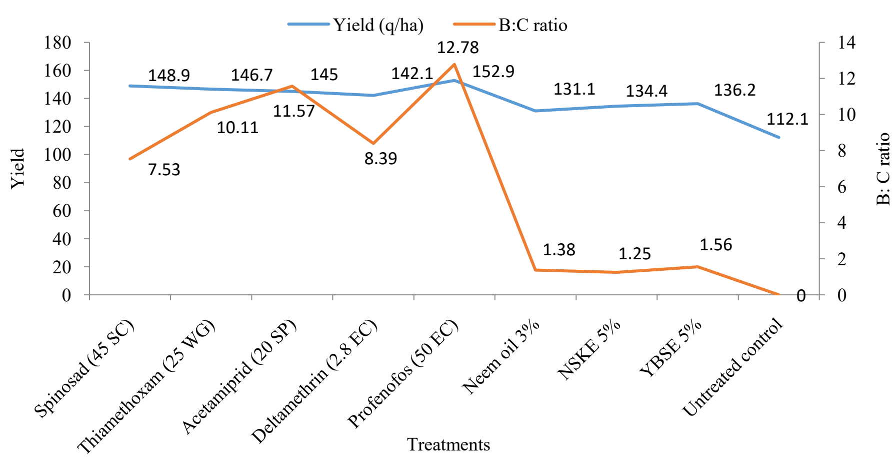

Fig. 1. Yield and economics of synthetic and biorational insecticides in okra (Pooled data, 2018 and 2019, kharif)

Selling price of okra: Rs. 1250.00/ q, Cost of insecticides viz. spinosad (45% SC) = Rs. 23571/ litre, thiamethoxam (25% WG) = 5600/ kg, acetamiprid (20% SP) = Rs. 2500/ litre, deltamethrin (2.8% EC) = Rs. 2280/ litre, profenofos (50% EC) = Rs. 930/ litre, neem oil (3%) = Rs. 400/ litre, and yam bean seeds extract (YBSE) 5% = Rs. 300/ kg, neem seed kernel extract (NSKE) 5% = Rs. 320/ litre, respectively. No. of labourers per ha/ spray = 3, (for 3 sprays 9 labours/ ha) = Rs. 2772/-, wages of each labour = Rs. 308/ day.

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