Research Paper :

Evaluation of new promising molecules against fruit borers in okra

D.N. DHANALAKSHMI AND C.P. MALLAPUR

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See end of the article for authors' affiliations

Correspondence to :
C.P. MALLAPUR
Department of Agricultural Entomology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

SUMMARY

Investigations were carried out during *Kharif* 2005-06 at Main Agricultural Research Station, Dharwad to evaluate the newer molecules against fruit borers on okra. The results revealed that emamectin benzoate 5 SG @ 0.2 g/ l was the most superior treatment by recording the least per cent fruit damage (7.82%) and resulted in highest good fruit yield (47.02 q/ha). The next effective treatments included spinosad 45 SC @ 0.1 ml/l (9.19% damage with 45.94 q/ha yield) and indoxacarb 14.5 SC @ 0.3 ml/l (10.74% damage with 43.03 q/ha yield). The maximum net returns were obtained in emamectin banzoate (Rs.10586/ha) and spinosad (Rs.10188/ha). Among different newer molecules, emamectin benzoate, spinsoad and acetamiprid proved quite safe to natural enemies. Imidacloprid 200SL @ 0.5 ml/l, fenazaquin 10EC @ 1.0 ml/l and oxydemeton methyl 25EC @ 1.5 ml/l were slightly toxic while, indoxacarb was relatively more toxic.

Key words :
New molecules, Fruit borers, Okra

Amongst the cultivated fruit vegetables grown in the country, okra [*Abelmoschus esculentus* (L.) Moench] is one of the important crops. Insect pests are the major constraints in the higher productivity of okra. The fruit borers *viz., Earias vitella* (Fab.), *Earias insulana* (Boisd.) and *Helicoverpa armigera* (Hub.) are known to cause severe damage (88-100% fruit damage) to the crop (Bheemanna *et al.*, 2005). For the management of fruit borers, farmers use several insecticides indiscriminately, which has lead to development of resistance, resurgence of pests and problem of residual toxicity. To overcome these problems, identification of safe molecules with better insecticidal properties, lower mammalian toxicity, safety to natural enemies etc., which fit well in the IPM concept is need of the hour.

Keeping this in view, field experiments were undertaken to generate information on the efficacy of newer molecules in suppressing fruit borer population and to know their influence on the occurrence of natural enemies.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* 2005-06 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. The experiment was laid out in Randomized Block Design with eight treatments replicated thrice involving six new molecules along with one standard chemical check and an untreated control (Table 1). The okra hybrid, Rasi-5 was sown at a spacing of 90´30cm over a plot size of 4.0x3.6m and the crop was raised by following all the recommended packages except insecticidal interventions. Two sprays were imposed on need basis.

Fruit damage was recorded at each picking by observing healthy and damaged fruits. Good fruit yield was recorded during each picking. Observations on the predator population was recorded after seven days of spray to know the influence of new molecules on natural enemies fauna. The cost benefit ratio was worked out for each treatment.

RESULTS AND DISCUSSION

Among different new molecules, emamectin benzoate recorded the least fruit borer damage (8.48%) during first set of picking and was found at par with spinosad (9.86%) (Table 1). The next best treatment was indoxacarb (11.03%). On the contrary, significantly high fruit damage was recorded in fenazaquin (29.36%), which was as ineffective as oxydemeton methyl (25.18%), acetamiprid (23.69%) and imidacloprid (23.39%). In the untreated plots, the fruit damage was to the tune of 35.56 per cent. A similar trend in the fruit damage was observed during second set of picking also. The per cent

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fruit damage ranged from 7.16 in emamectin benzoate to 26.73 in case of fenazaquin. However, in the untreated control plots, the fruit damage was recorded at 42.13 per cent.

The higher efficacy of emamectin benzoate in reducing the fruit borer damage is in accordance with Bheemanna *et al.* (2005) in okra and Udikeri *et al.* (2004) in cotton. The effectiveness of spinosad and indoxacarb are in confirmation with Udikeri *et al.* (2004). The efficacy of indoxacarb is in agreement with Dhawan and Simwat (2000).

Effect on natural enemies:

Among different treatments, emamectin benzoate, acetamiprid and spinosad spared good number of coccinellid grubs (0.80, 0.83 and 0.80 grubs/pl, respectively), spiders (0.90, 0.90 and 0.80 spiders/pl) and *Chrysoperla* (0.90, 0.83 and 0.80 grubs/pl) proving their safety to natural enemies at par with untreated control (0.93 coccinellid grubs, 1.00 spiders and 0.90 *Chrysoperla* grubs/pl). However, imidacloprid, oxydemeton methyl and fenazaquin were found to be slightly toxic to predatory population whereas, indoxacarb recorded significantly lowest predatory population (0.60 coccinellid grubs, 0.60 spiders and 0.60 *Chrysoperla* grubs/pl). The safety of emamectin benzoate, spinosad and acetamiprid to natural enemies observed in the present investigation is in confirmation with Udikeri *et al.* (2004). The moderate toxicity of imidacloprid and oxydemeton methyl is in accordance with Katole and Patil (2000) and Kadam *et al.* (2005). The toxic nature of indoxacarb to predators has been well documented by Udikeri *et al.* (2004).

Table 1: Influence of new molecules on fruit borers and natural enemies in okra ecosystem

Sr. No.	Treatments	Per cent fruit damage*			Predators (No./pl)		
		I set	II set	Mean	Coccinellid grubs	Spiders	*Chrysoperla* grubs
1.	Acetamiprid 20 SP @ 0.2 g/l	23.69c	21.68c	22.18	0.83a	0.80ab	0.80a
2.	Spinosad 45 SC @ 0.1ml/l	9.86ab	8.53ab	9.19	0.80ab	0.90a	0.83a
3.	Emamectin benzoate 5 SG @ 0.2g/l	8.48a	7.16a	7.82	0.80ab	0.90a	0.90a
4.	Fenazaquin 10 EC @ 1.0 ml/l	29.36d	26.73d	25.53	0.50bc	0.50bcd	0.60a
5.	Imidacloprid 200 SL @ 0.5ml/l	23.39c	22.73c	23.06	0.60b	0.60bcd	0.60b
6.	Indoxacarb 14.5 SC @ 0.3 ml/l	11.03b	10.46b	10.74	0.20c	0.26d	0.23c
7.	Oxydemeton methyl 25 EC @ 1.5ml/l	25.18c	24.53c	24.85	0.50bc	0.50cd	0.48b
8.	Untreated control	35.56e	42.13e	38.84	0.93a	1.00a	0.90a
S. E. ±		0.84	0.89	-	0.048	0.045	0.044
C.D. (P=0.05)		2.53	2.72	-	0.15	0.14	0.13
C.V. (%)		5.87	6.73	-	7.8	7.51	7.05

*Each set of picking is average of four pickings
Means followed by same alphabet do not differ significantly by DMRT (P=0.05)
Statistical analysis was made for arc sine transformed values

Table 2 : Influence of new molecules on good fruit yield and cost effectiveness

Sr. No.	Treatments	Good fruit yield (q/ha)	Increase in yield over control (q/ha)	% increase in yield over control	Cost of pest control (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	IBC ratio
1.	Acetamiprid 20 SP @ 0.2 g/l	39.02cd	12.06	44.73	880	7236	6356	7.2 :1.0
2.	Spinosad 45 SC @ 0.1ml/l	45.94ab	18.98	70.40	1200	11388	10188	8.5:1.0
3.	Emamectin benzoate 5 SG @ 0.2g/l	47.02a	20.06	74.41	1450	12036	10586	7.3:1.0
4.	Fenazaquin 10 EC @ 1.0 ml/l	34.16e	7.20	26.30	2200	4320	2120	0.9:1.0
5.	Imidacloprid 200 SL @ 0.5ml/l	39.46cd	12.50	46.36	1400	7500	6100	4.3:1.0
6.	Indoxacarb 14.5 SC @ 0.3 ml/l	43.03av	17.02	63.13	1375	10212	8837	6.4:1.0
7.	Oxydemeton methyl 25 EC @ 1.5 ml/l	36.14de	9.18	34.05	868	5508	4640	5.3:1.0
8.	Untreated control	26.96f	-	-	-	-	-	-

Means followed by same alphabet do not differ significantly by DMRT (P=0.05)

Yield and cost effectiveness:

Among the various new molecules evaluated, emamectin benzoate recorded maximum good fruit yield (47.03 q/ha) followed by spinosad (45.94 q/ha) and indoxacarb (43.03 q/ha) (Table 2). In the remaining treatments, the fruit yield ranged from 39.46 q/ha in imidacloprid to 26.96 q/ha in untreated control. The higher yield obtained in emamectin benzoate is in agreement with Bheemanna *et al.* (2005) and Suganya Kanna *et al.* (2005). The superiority of emamectin benzoate, spinosad and indoxacarb are in line with Udikeri *et al.* (2004).

With respect to net returns, the maximum returns was obtained in emamectin benzoate (Rs.10586/ha) and spinosad (Rs.10188/ha) treatments. The next best treatment was indoxacarb (Rs.8837/ha) followed by acetamiprid (Rs.6356/ha), imidacloprid (Rs.6100/ha) and oxydemeton methyl (Rs.4640/ha). The least net return was recorded in fenazaquin (Rs.2120/ha).

When the cost effectiveness of different new molecules was considered, spinosad treatment recorded highest IBC ratio (8.5:1.0) followed by emamectin benzoate (7.3:1.0), acetamiprid (7.2:1.0) and indoxacarb (6.4:1.0) (Table 2). Fenazaquin recorded the least IBC ratio (0.90:1.0) due to its poor efficacy against fruit borers. There are no previous reports to compare the cost effectiveness of these new molecules.

Authors' affiliations:

D.N. DHANALAKSHMI, Department of Agricultural Entomology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

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