Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(3): 169-172

Received: 23-03-2017
Accepted: 24-04-2017

Rahul Dhaker
Department of Entomology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

BS Rana
Department of Entomology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

IM Pinjara
Department of Entomology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

Ganesh S Purushan
Department of Entomology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

R Nagar
Department of Entomology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

Correspondence
R Nagar
Department of Entomology, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India

Bio-efficacy of synthetic insecticide and bio-pesticide for the management of shoot borer and fruit borers of okra

Rahul Dhaker, BS Rana, IM Pinjara, Ganesh S Purushan and R Nagar

Abstract
Bio-efficacy of five synthetic insecticides (Permethrin 25EC, Emamectin benzoate 5 SG, Fenpropathrin 30 EC, Pyriproxifen 5EC, Fenvalerate 20EC), one bio-agent (*Trichogramma chilonis* Ishii) and one bio-pesticide (Ha NPV) was evaluated against the shoot borer and fruit borers of okra. All the treatments were superior over control in terms of mean shoot damage and fruit damage. Among the synthetic chemical pesticides two applications of emamectin benzoate 5 SG (200g/ha) was most effective with mean shoot damage of 9.91 per cent, while the least effective treatment was fenvalerate 20 EC (375 ml/ha) with mean shoot damage of 19.11 per cent. Similarly, against fruit borers emamectin benzoate 5 SG (200g/ha) was most effective with 12.51 per cent fruit damage; whereas, the least effective treatment was permethrin 25 EC (500ml/ha) with mean fruit damage of 19.11 per cent. The bio- agent *Trichogramma chilonis* Ishii released at the rate of 1.0 lac per hectare followed by the bio-pesticide HaNPV [250 LE/ha] after 10 days was more effective than untreated control.

Keywords: Insecticide, bio-pesticide, Management, shoot, fruit borers, okra

Introduction
India is the second largest producer of vegetables in the world (surpassed only by China) accounting for about 10 per cent of the world production (ICAR, Anonymous 1997) [7]. Of the various reasons for low productivity, heavy damage inflicted by insect pests is a key limiting factor. Okra crop suffers damage by a number of insect pest *viz*., the jassids, *Amrasca biguttula biguttula* Ishida; the aphid, *Aphis gossypii* Glover; the fruit borers, *Earias insulana* Boisduval and *Earias vittella* Fab.; *Helicoverpa armigera* Hub.; whitefly, *Bemisia tabaci* Genn.; and red spider mite, *Tetranychus cinnabaris* that appears occasionally (Dadheech *et al*., 1977) [4]. Infestation by sucking insect pests hampers crop growth apart from transmitting pathogenic diseases (Dhaliwal *et al*., 1981 and Sheedi, 1980) [5, 14]. Among these pests fruit borer, *E. vittella* (Fab.) and jassid *A. biguttula biguttula* Ishida are major biotic constraints towards achieving the potential yield. Atwal and Singh (1990) [2] reported 59.79 per cent losses in yield of okra due to spotted bollworm and jassids. Similarly, Shah et al. (2001) [13] observed fruit damage to the extent of 91.58 per cent due to fruit borer alone. As okra is a high value crop, chemical control is generally practiced for higher gains. Indiscriminate use of pesticides has led to many problems like adverse effects on parasites, predators and pollinators; toxic residues causing health hazards; resurgence of pests; development of resistance in insects to insecticides and environmental pollution (Lal, 2001) [8]. Since okra is a fast growing crop and the harvesting of tender fruits is normally done at short intervals to cater to the needs of the consumer, extensive and indiscriminate use of these chemicals on okra gives the chance of contamination of fruits with pesticide residues. In order to avoid the adverse consequences of insecticides, it becomes necessary to evaluate safe and effective insecticides, alone and in combination, with botanicals, to develop a safe management schedule. Therefore, the present study was undertaken to evaluate the bio-efficacy of five synthetic insecticides, one bio-agent and one bio-pesticides against shoot borer and borers at the time of their incidence.

Materials and Methods
A field trial to evaluate the bio-efficacy of five synthetic insecticides, one bio-agent and one bio-pesticide against shoot borer and borers at the time of their incidence was conducted at the Agronomy Farm, Rajasthan College of Agriculture, MPUAT, Udaipur for during *kharif*, 2015.

The trial was laid out in randomized block design (RBD), with thrice replications, following all the agronomic practices and fertilizer application as per the package of practices recommended for the zone. The row to row and plant to plant distance was maintained as3.6m X 4.5m at 60cm row to row and 45cm and variety JKOH-7315. Bio-efficacy of five synthetic insecticides, one bio-agent and one bio-pesticide was evaluated against shoot borer and fruit borers at the time of their incidence as detailed out here under: Permethrin 25EC, Emamectin benzoate 5 SG, Fenpropathrin 30 EC, Pyriproxifen 5EC followed by Fenpropathrin 30 EC, Fenvalerate 20EC, *Trichogramma chilonis* Ishii at 10 days interval followed by Ha NPV, Untreated control. Observations on the fruit infestation were recorded 1 day before and 3, 6 and 9 days after each spray treatment coinciding with fruit picking. The data on percent infestation were analyzed using standard method described by Pradhan and Menon (1945) [10], and infestation expressed as a percentage of infested fruit out of the total.

$$\text{Infestation (\%)} = \frac{\text{Number of infested fruits}}{\text{Number of total fruits}} \text{ X } 100$$

Results and Discussion

The results on efficacy of chemical pesticides and bio-pesticide against okra shoot and fruit borer showed that all the treatments were superior over control in terms of mean shoot and fruit borer damage (Table 1). Among the synthetic chemical pesticides two applications of emamectin benzoate 5 SG (200g/ha) was found most effective with mean shoot damage of 9.91 per cent; while the least effective treatment was fenvalerate 20 EC (375 ml/ha) with mean shoot damage of 19.11 per cent. The bio- agent *Trichogramma chilonis* Ishii released at the rate of 1.0 lac per ha followed by the bio-pesticide HaNPV [@250 LE/ha] after 10 days was more effective than untreated control and recorded 15.26 per cent damage, while in the control the damage was 30.98 per cent. The finding of present investigation are similar to the work conducted by Raja et al. (1998) [12] who reported that release of *T. chilonis* in combination with, pesticides and neem showed a significant control of *E. vittella* on okra *i. e.* 49.73% decrease in pest damage. Aslam et al. (2004) [1] reported that nighaban 20 EC (fenpropathrin) and lorsban 40EC (chlorpyrifos) were the most effective for spotted bollworm and American bollworm, respectively. Singh et al. (2005) [15] reported maximum reduction in pest incidence and increase in yield (76.95 q/ha) in the plots treated with fenvalerate (0.15%) followed by NSKE (1.5%) (58.27q/ha) but they observed that maximum control over fruit and shoot damage and yield of okra in those plots where chemical control was applied alone.

The data presented in Table 2 showed that were three days after application, the best treatment was emamectin benzoate 5 SG (200g/ha) with minimum mean fruit damage of 14.72 per cent; while the least effective treatment was permethrin 25 EC (500 ml/ha) with maximum mean fruit damage of 20.50 per cent. Release of 1 lac *Trichogramma chilonis* Ishii at 10 days interval followed by HaNPV (250 LE) was less effective with the mean fruit, showed that all the treatments were superior over control in terms of mean fruit damage. Among the synthetic chemical pesticides two applications of emamectin benzoate 5 SG (200g/ha) was most effective with mean fruit damage of 12.51 per cent; while the least effective treatment was permethrin 25 EC (500ml/ha) with mean fruit damage of 19.11 per cent. The bio-agent *Trichogramma chilonis* Ishii released at 1.0 lac per hectare followed by the bio-pesticide HaNPV [@250 LE/ha] was more effective than control with the damage leing 20.56 per cent as compared to 32.74 per cent in control. Duraimurugan et al. (2007) [6] evaluated that the efficacy of emamectin 5 SG against the cotton bollworm, *H. armigera* on cotton and indicated that formulation of emamectin @ 11 g a.i. ha-1 was effective than other insecticides like profenofos 50 EC @ 750 g a.i. ha-1, lambda -cyhalothrin 5 EC @ 15 g a.i. ha-1, indoxacarb 14.5 SC @ 100 g a.i. ha-1 and spinosad 45 SC @ 60 g a.i. ha-1 in reducing the larval population and increasing the yield. Among all the insecticides, emamectin benzoate spray resulted in maximum reduction in borer infestation and highest fruit yield. Raghuraman et al. (2008) [11] reported that EC formulation of emamectin benzoate at the dose of 11 g a.i. ha-1 as effective in reducing the incidence of bollworm complex (*H. armigera, E. vittella* and *P. gossypiella*) and increasing the yield of cotton. Chowdary et al. (2010) [3] evaluated that the efficacy of some new insecticides like rynaxypyr 20 SC @ 20 g a.i. ha-1, spinosad @ 56 g a.i. ha-1, emamectin benzoate @ 15 g a.i. ha-1, flubendiamide @ 45 g a.i. ha-1 against okra fruit borer, *H. armigera* and found that, rynaxypyr 20 SC @ 20 g a.i.ha-1 was superior recording less larval population, lower fruit damage and higher fruit yield, followed by spinosad @ 56 g a.i. ha-1, emamectin benzoate @ 15 g a.i. ha-1 and flubendiamide @ 45 g a.i. ha-1. Murali baskaran et al. (2010) [9] studied the efficacy of emamectin benzoate 5% SG against *H. armigera* on cotton and reported that spraying of two rounds of application of emamectin benzoate 5% SG @ 220g ha-1, starting from 50 days after sowing, at fortnight intervals is effective in managing the *H. armigera*. Udikeri *et al*. (2011) [16] evaluated that the efficacy of emamectin benzoate 1 per cent ME against bollworm complex of cotton and found emamectin benzoate 1 per cent ME @ 22 g a.i. ha-1 to be effective in suppressing the larval population and increasing the yield.

Table 1: Bio-efficacy of synthetic insecticide, bio-agent and bio-pesticide against shoot infesting *Earias* spp. of okra during *kharif,* 2015

Treatments	PTDP	First spray			Second spray		
		Mean shoot damage (%)			Mean shoot damage (%)		
		3 DAS	6 DAS	9 DAS	3 DAS	6 DAS	9 DAS
Permethrin 25EC(500ml)	27.28 (21.23)	25.53 (18.58)	24.05 (16.90)	24.75 (18.09)	22.82 (15.66)	22.08 (14.60)	23.05 (15.58)
Emamectin benzoate 5 SG(200g)	26.75 (20.41)	22.21 (14.29)	20.20 (11.92)	22.53 (14.68)	20.07 (11.78)	18.35 (9.91)	19.88 (11.57)
Fenpropathrin 30 EC (340ml)	25.88 (19.23)	24.77 (17.56)	22.56 (14.72)	25.10 (18.00)	23.03 (15.31)	21.15 (13.07)	22.87 (15.10)
Pyriproxifen 5EC followed by Fenpropathrin 30 EC (750 ml)	25.66 (18.92)	23.64 (16.57)	21.71 (13.68)	24.44 (17.12)	21.94 (13.96)	20.51 (12.48)	21.93 (14.27)
Fenvalerate 20EC (375ml)	27.93 (21.98)	27.62 (21.50)	26.54 (19.97)	27.01 (20.62)	26.68 (20.16)	25.92 (19.11)	26.23 (19.53)

Trichogramma chilonis Ishii at 10 days interval followed by Ha NPV(1 lac +250 LE)	26.91 (20.49)	26.20 (19.50)	24.58 (17.32)	26.13 (19.39)	24.86 (17.67)	22.99 (15.26)	24.52 (17.43)
Untreated control	31.37 (27.21)	33.82 (30.98)	35.60 (33.88)	36.37 (35.16)	37.05 (36.30)	37.92 (37.77)	38.55 (38.83)
S. Em. (±)	0.80	0.77	0.73	0.82	0.83	0.77	0.81
C.D/ (P=0.05)	2.48	2.37	2.26	2.53	2.55	2.38	2.51

Figure in parentheses are retransformed percent values. DAS: Day after Spray
PTDP: Pre-treatment damage percent.

Table 2: Bio-efficacy of synthetic insecticide, bio-agent and bio-pesticide against fruit borers of okra during *kharif*, 2015

Treatments	PTDP	First spray			Second spray		
		Mean shoot damage (%)			Mean shoot damage (%)		
		3 DAS	6 DAS	9 DAS	3 DAS	6 DAS	9 DAS
Permethrin 25EC(500ml)	30.91 (26.39)	26.92 (20.50)	26.19 (19.48)	26.63 (20.09)	26.61 (20.16)	25.92 (19.11)	26.23 (19.53)
Emamectin benzoate 5 SG(200g)	29.16 (24.42)	22.56 (14.72)	21.27 (13.16)	23.62 (16.05)	21.94 (13.96)	20.71 (12.51)	22.18 (14.25)
Fenpropathrin 30 EC (340ml)	28.55 (23.28)	24.41 (17.08)	23.12 (15.91)	24.39 (17.59)	23.31 (15.66)	22.07 (14.61)	22.75 (15.57)
Pyriproxifen 5EC followed by Fenpropathrin 30 EC (750 ml)	28.55 (23.28)	24.41 (17.08)	23.12 (15.91)	24.39 (17.59)	23.31 (15.66)	22.07 (14.61)	22.75 (15.57)
Fenvalerate 20EC (375ml)	28.65 (23.00)	23.43 (16.09)	21.73 (13.71)	24.16 (16.75)	22.97 (15.31)	21.20 (13.08)	22.87 (15.11)
Trichogramma chilonis Ishii at 10 days interval followed by Ha NPV(1 lac +250 LE)	29.61 (24.42)	27.54 (21.38)	27.16 (20.85)	27.47 (21.40)	27.28 (21.10)	26.96 (20.56)	27.39 (21.16)
Untreated control	30.17 (25.27)	34.90 (32.74)	36.43 (35.27)	37.27 (36.67)	37.05 (36.30)	37.95 (37.83)	38.55 (38.83)
S. Em. (±)	0.79	0.67	0.74	0.83	0.70	0.72	0.86
CD/ (P=0.05)	2.43	2.07	2.29	2.56	2.15	2.23	2.65

Figure in parentheses are retransformed percent values. DAS: Day after Spray
PTDP: Pre-treatment damage percent.

Calculation

Bio-efficacy of five synthetic insecticides, one bio-agent and one bio-pesticide was evaluated against the shoot borer and fruit borers of okra. Among the synthetic chemical pesticides two applications of emamectin benzoate 5 SG (200g/ha) was most effective with mean shoot damage of 9.91 per cent, while the least effective treatment was fenvalerate 20 EC (375 ml/ha) with mean shoot damage of 19.11 per cent. Similarly, against fruit borers emamectin benzoate 5 SG (200g/ha) was most effective with 12.51 per cent fruit damage; whereas, the least effective treatment was permethrin 25 EC (500ml/ha) with mean fruit damage of 19.11 per cent. The bio- agent *Trichogramma chilonis* Ishii released at the rate of 1.0 lac per hectare followed by the bio-pesticide HaNPV [250 LE/ha] after 10 days was more effective than untreated control.

Acknowledgments

Authors sincerely thank to the Head of Department of Entomology and the Director Research, MPUAT, Udaipur, Rajasthan for providing all facilities and encouragement to carry out the work.

References

1. Aslam M, Razaq M, Rana S, Faheem M. Efficacy of different insecticides against bollworms on cotton. Journal of Research (Science), Bahauddin Zakariya University, Multan, Pakistan. 2004; 15:17-22.
2. Atwal AS, Singh B. Pest population and assessment of crop losses. Publication Indian Agriculture Research Institute, New Delhi. 1990.
3. Chowdary Rajesh L, Bheemanna M, Ranjith kumar L. Bioefficacy of rynaxypyr (Coragen) 20 SC against fruit borer *Helicoverpa armigera* (Hubner) in okra. International Journal of Plant Protection. 2010; 3(2):379-381.
4. Dadheech LN, Nath G, Jat NR, Srivastava BP. Insecticidal control of the pest complex. Pesticide. 1977; 11:28-31.
5. Dhaliwal JS, Sidhu MS, Singh GX. Effect of different dates of sowing on sorghum and the incidence of red leaf spot disease and major insect pests in Punjab. Journal of Research Agricultural University, Ludhiana. 1977; 18:400-05.
6. Duraimurugan P, Suganya kanna S, Chandrasekara S, Regupathy A. Field evaluation of emamectin 5 SG against cotton bollworm, *Helicoverpa armigera* (Hubner). Pesticide Research Journal. 2007; 19(2):186-189.
7. ICAR. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi. 1997; 1088-1102.
8. Lal OP. Bio-diversity in relation to insect pest management In: Abstracts of National Conference: Plant Protection New Horizons in a Millennium held at Udaipur during February. 2001; 23-25:2001.
9. Murali baskaran RK, Rajavel DS, Suresh K, Manisegaran S, Palanisamy N. Evaluation of emamectin benzoate 5% SG (New source) against *Helicoverpa armigera* (Hubner) of cotton. Pestology. 2010; 34(5):20-22.
10. Pradhan S, Menon R. Insect population studies. I. Distribution and sampling of spotted bollworm of cotton. Proceedings of the National Academy of Sciences, India. 1945; 6(2):61-73.
11. Raghuraman M, Ajanta B, Gupta GP. Bioefficacy of acetamiprid on sucking pests in cotton. Indian Journal of Entomology. 2008; 70(4):319-325.
12. Raja J, Rajendran B, Pappiah CM, Verghese A. Management of bhindi fruit borer, *Earias vittella* (F.). In: Proceedings of the first national symposium on pest management in horticultural crops: environmental implications and thrusts, Bangalore, India. 1998, 118-

120.
13. Shah BR, Vyas HN, Jhala RC. Life table of shoot and fruit borer, *Earias vitella* (Fab.) for determining key mortality factors in okra, *Abelmoschus esculentus* (L.) Moench. National Conference on Plant Protection. New Horizons in the Millennium (NCPP) Udaipur. 2001, 4.
14. Sheedi MA. Arthropods associated with okra *Hibiscus esculentus* L. crop. M.Sc. Thesis, Sindh Agriculture University, Tandojam. 1980, 58.
15. Singh BK, Singh AK, Singh HM. Efficacy of certain synthetic insecticides and two botanicals against the okra fruit and shoot borer, *Earias vittella* (Fab.). Pest Management Economic Zoology. 2005; 13(1):99-103.
16. Udikeri SS, Badiger HK, Patil SB, Chattannavar SN. Comparative efficacy of single (BG-I) and stacked Bt-cotton hybrids (BG-II) under IPM Practices. Journal of Cotton Research and Development. 2011; 26(1):117-123.