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Research Article

COMPARATIVE EFFICACY OF DIFFERENT TACTICS FOR THE MANAGEMENT OF OKRA SHOOT AND FRUIT BORER, *EARIAS VITTELLA* (FAB.) UNDER FIELD CONDITION

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Abstract

Comparative field efficacy of different control measures of okra shoot and fruit borer, *Earias vittella* were evaluated in the Entomology Field Laboratory, Bangladesh Agricultural University during February to May, 2014. Field efficacy of two selected chemical insecticides (Decis 2.5EC, Agritaf 50SP), three botanicals (Neem oil, Pitraj oil and Mahogany oil), one parasitoid (*Trichogramma chilonis*), Light trap along with Hand picking and Trap crop (Maize) were evaluated by analyzing percent shoot and fruit infestations. BARI-1 (okra variety) was used as a test crop in the experiment. Among the tactics, the minimum shoot (4.72%) and fruit infestations (6.77%) were observed in the plots treated with Decis 2.5EC followed by Neem oil treated plots (4.83% in shoot and 7.56% in fruit). The highest reduction of percent shoot infestation (79.89%) and fruit infestation (64.97%) over untreated control plots was found in the Decis 2.5EC sprayed plots followed by Neem oil while the lowest percent reduction of shoot infestation (29.86%) and fruit infestation (29.43%) were recorded in case of Light trap + hand picking. Neem oil and Decis 2.5EC were found very effective in managing *E. vittella* up to 7 days after each spraying. Agritaf 50SP, Pitraj oil, Mahogany oil, *T. chilonis* and trap crop were also found effective over untreated control plots although were significantly lower than Decis 2.5EC and Neem oil. Therefore, application of Decis 2.5EC and Neem oil were mostly effective and Light trap + hand picking was the least effective measures in controlling *E. vittella.*

Key word: Decis; Agritaf; Neem oil; Pitraj oil; Mahogany oil; *T. chilonis;* Light trap; hand picking and Trap crop

Introduction

Okra (*Abelmoschus esculentus* L.) is one of the most common summer vegetables grown in Bangladesh which is also known as lady's finger, dharos, vendi, gumbo. It is well distributed in the Indian subcontinent and East Asia (Kochhar 1986). Okra contains proteins, carbohydrates and vitamin C (Dilruba et al. 2009) and plays an important role in human diet (Kahlon et al. 2007; Saifullah and Rabbani 2009). Okra production in Bangladesh is affected by many factors while major portion of okra produced is being damaged by some serious insect pests. Among the insect pests, okra shoot and fruit borer (OSFB), jassid, aphid, whitefly, and cotton leaf roller attack the okra where, OSFB (*Earias vittella* and *E. insulana)* is considered as one of the most destructive pests of okra (Aziz et al. 2011; Butani and Jotwani 1984). *Earias.* sp. alone can cause 52.33 to 70.75 percent overall damage (Pareek and Bhargava 2003) and 88 to 100 percent fruit infestations (Radake and Undirwade 1981). According to Fletcher and Mishra (1990) the OSFB is one of the most important pests of okra crop may cause up to 41.60% yield loss. *E. vittella* attacks rigorously on okra both at the vegetative and fruiting stages. The adult female okra shoot and fruit borer, *E. vittella* lays eggs singly on leaves, floral buds and on tender fruits. On hatching, small brown caterpillars bore into the top shoot and feed inside the shoot before fruit formation. The shoots wilt and dry results the development of side branches. Caterpillars preferably attack and bore into the fruits (when fruits are available) and feed inside. As a result, fruits become small and/or deformed and ultimately cause qualitative and quantitative losses. Conventionally farmers are using various synthetic insecticides vastly but due to the unconscious and unjustified use of synthetic insecticides create several problems in agro-ecosystem such as direct toxicity to beneficial insects, fishes, human health (Goodland et al. 1985; Munakata 1977; Pimental 1981), insecticides resistance, environmental hazards etc.

Therefore, it is now urgently need to develop effective management strategy with safe and effective biodegradable insecticides. In this aspects, biologically active natural plant products, biological agents such as parasitoids, cultural and mechanical control measures could be useful. Plant

products such as neem, mahogany, pithraj etc. are broad spectrum, biodegradable, and widely using in the pest management. On the other hand, *Trichogramma* has already been identified as an effective tool for the pest management (Annonymous 2001) and considered as universal parasite of Lepidoptera eggs. Unfortunately very limited attempts have been made for appropriate management of *E. vittella* in Bangladesh although it has been considered as a major pest of okra. Therefore, the experiment was conducted to find out the most effective management tactics for *E. vittella.*

Materials and Methods

The research works were conducted in the Entomology Field Laboratory of Bangladesh Agricultural University, Mymensingh, Bangladesh during February to May, 2014. The experimental field was prepared thoroughly by ploughing followed by laddering to have a good tilth. Clods were broken down with hammer and the stubbles of the crops and uprooted weeds were removed from the field. Manures and fertilizers were applied during final land preparation at recommended doses. The whole experimental field was 17m in length and 7.5m in breadth, which was divided into 3 equal blocks and each block was again divided into eight plots. The unit plot size was 180cm by 170cm. Each of the unit plots was separated by 45cm and each block was separated by 60cm. Seeds of BARI Dharos-1 were collected from the seed dealer of Mymensingh town. Seeds were soaked in water for overnight and sown directly in the pits @ 3 seeds per pit. Pits were prepared maintaining line to line distance of 50cm and pit to pit distance 40cm. There were 12 plants in each unit plot distributed into 3 equal rows. Nine treatments such as application of Decis 2.5EC (2ml/L), Agritaf 50SP (3gm/L), Neem oil (5ml/L), Pitraj oil (5ml/L), Mahogany oil (5ml/L), Parasitoid, *Trichogramma* (0.1 million adults/ha), Light trap (10 traps/ha) along with hand picking, Trap crop and untreated control plots were laid out in a Randomized Complete Block Design (RCBD) with three replications. A total of 3 spraying and parasitoid augmenting were done. Maize was used as trap crop which was sown during the seed sowing of host plants. Data on infested as well as healthy shoots and fruits were taken after 7 days of treatment application and continued from vegetative to fruiting stage of the okra plants. The efficacy of different treatments in managing okra shoot and fruit borer was determined by counting the percentage shoot and fruit infestation (Rahman et al. 2012). Percent shoot and fruit infestations by OSFB were calculated by using the following formulae.

$$\%\,\text{Shoot infestation} = \frac{\text{Number of infested shoot}}{\text{Total number of shoot}} \times 100$$

$$\%\,\text{Fruit infestation} = \frac{\text{Number of infested fruit}}{\text{Total number of fruit}} \times 100$$

All the data were analyzed statistically by the computer package MSTAT-C program. The mean differences among the infestations were separated with Duncan's Multiple Range Test (DMRT) at 5% level of probability.

Results and Discussion

Efficacy of different treatments considering shoot damages

Significant variation was found in the percent shoot damage in okra plant after application of different treatment (Table 1). In every counting all treatments were found significantly effective in lowering shoot infestations comparing to untreated control plot. After seven days of first treatment application, the mean percentage of infested shoot was found minimum in Decis 2.5EC (3.28%) treated plots followed by Neem oil (3.30%) treated plots. The highest percentage of infested shoot (13.89%) was found in the plots treated with Light trap + hand picking followed by parasitoid and trap crop treated plots.

Likewise, the lowest percentage of infested shoot was recorded in Decis 2.5EC (5.55%) sprayed plot which was statistically similar to Neem oil (5.71%), Agritaf (7.86%) and Pitraj oil (9.07%) sprayed plot at 7 days after second treatment application. On the other hand, the highest percentage of shoot infestation was observed in Light trap + hand picking treated plot (18.81%). Moderate shoot infestations were recorded in trap crop (13.12%), parasitoid (13.73%) and Mahogany oil (11.50%) treated plots. Similar to the first and second treatment application at 7 days after third application, the lowest percentage shoot infestation was observed in Decis 2.5EC and Neem oil sprayed plots (5.33% and 5.47% respectively). Among the treatments, the highest shoot infestation was recorded in Light trap + hand picking (16.71%) treated plot followed by trap crop, parasitoid and mahogany oil treated plots.

From the overall mean percentage of shoot infestations it was clear that, the minimum shoot infestation was observed in the plots treated with Decis 2.5EC followed by neem oil Whereas, maximum shoot infestation was found in the plots treated with light trap + hand picking followed by parasitoid, trap crop and mahogany oil. Moreover, maximum reduction of shoot infestation was found in Decis 2.5EC (79.89%) treated plots followed by Neem oil treated plot and the lowest reduction was found in Light trap + hand picking (29.86%) followed by trap crop and parasitoid treated plots. Therefore, efficacy of treatments in controlling shoot infestation can be ranked as Decis > Neem oil > Agritaf > Pitraj oil > Mahogany oil > Trap crop > Parasitoid > Light trap & hand picking. The present finding is in partly agreement with the observation of Mazed (2009) as he mentioned that hand picking contribute minimum reduction of shoot infestation whereas chemical treatment showed maximum. The insecticidal treatments of the present study provided 70.56% to79.89% shoot infestation reduction over control. On the other hand, this reduction range was 56.51% to 79.43% when botanicals were used.

The reduction over control resulted by those botanicals were reasonable. Therefore, these botanicals might be safely used to manage OSFB.

Efficacy of different treatments considering fruit damage

Data on fruit infestations from different treated and untreated plots almost showed the more or less similar trends with the shoot infestation by okra shoot and fruit borer (Table 2). All treatments were effective comparing with untreated control but there was significant variation among different treatments in reducing fruit infestations caused by OSFB. At seven days after first treatment application, the lowest percentage of infested fruit (5.15%) was recorded in Decis 2.5EC sprayed plots followed by Neem oil (5.27%) and Agritaf 50SP (6.90%). On the contrary, the highest fruits infestation was exhibited in Light trap + hand picking treated plots (9.54%) followed by Mahogany oil (7.73%), Parasitoid (8.71%) and Trap crop (8.01%). At seven days after second treatment application, the lowest percent fruit infestation was recorded in Neem oil (7.53%) sprayed plots which was a bit less than Decis 2.5EC (7.60%) and Pitraj oil (8.68%) sprayed plots. On the other hand, maximum fruit infestation was found in the plots treated with Light trap + hand picking (13.52%) which was a little more than parasitoid (12.13%), trap crop (11.45%) and mahogany oil treated plots (11.08%). Agritaf (10.01%) and Pitraj oil (8.68%) were found moderately efficient in reducing fruit infestation. Similarly at seven days after third application, more or less similar results to the first counting were examined. The lowest fruit infestation was found under Decis 2.5EC (7.57%) which was slightly higher than Neem oil (9.88%) and Pitraj oil (11.22%) sprayed plots where Decis and Neem oil treated plots. Maximum fruit infestation was observed in Light trap + hand picking (17.86%) followed by Trap crop (15.25%), Parasitoid (15.35%) treated plots.

Based on overall mean percent fruit infestations, maximum fruit damage was found under control condition (19.33%) which was three times higher than the and minimum (6.77%) fruit damage was observed under Decis 2.5EC treated plots. Among the treatments, plots treated with light trap + hand picking were observed maximum fruit infestation followed by parasitoid, trap crop and mahogany oil treated plots. These results were also supported by the percent reduction of infested fruit over control (Table 2) where the highest reduction was found in Decis 2.5EC treated plots (64.97%) and the lowest in Light trap + hand picking treated plots (29.43%). Hence, the rank of efficacy of treatments based on the above results was Decis > Neem oil > Agritaf > Pitraj oil > Mahogany oil > Trap crop > Parasitoid > Light trap & hand picking > Control. Likewise, Alagar and Sivasubramaniam (2006) recorded the highest percentage of reduction in fruit damage (48.93%) when 5% Neem seed kernel was applied. In this study it was revealed that Neem oil spraying at 7 days interval could control the pest very much effectively. So it would be better to use this environmental friendly bio-pesticide for management of okra shoot and fruit borer

Table 1: Effects of different treatments on the shoot infestation by OSFB at different days after treatment

Treatments	Shoot Infestation (%)				Reduction of shoot infestation over control (%)
	7 days after 1st spraying	7 days after 2nd spraying	7 days after 3rd spraying	Mean (%)	
Decis	3.28g	5.55e	5.33f	4.72g	79.89
Agritaf	4.65f	7.86de	8.23e	6.91f	70.56
Neem oil	3.30g	5.71e	5.47f	4.83g	79.43
Pitraj oil	6.15e	9.07de	9.65e	8.29ef	64.69
Mahogany oil	7.32d	11.50cd	11.81d	10.21de	56.51
parasitoid	9.17c	13.73c	14.35c	12.41c	47.14
Light trap & hand picking	13.89b	18.81b	16.71b	16.47b	29.85
Trap crop	8.89c	13.12c	13.42cd	11.81cd	49.71
Control	17.94a	25.94a	26.57a	23.48a	0.00
CV (%)	5.48	13.37	7.01	10.36	
$LSD_{0.05}$	1.04	3.81	2.00	1.97	

Means followed by the same letter in a column are not significantly different

Table 2. Effects of different treatments on the fruit infestation by OSFB at different days after treatments

Treatments	Fruit Infestation (%)				Reduction of fruit infestation over control (%)
	7 days after 1st spraying	7 days after 2nd spraying	7 days after 3rd spraying	Mean (%)	
Decis	5.15d	7.60e	7.57e	6.77g	64.97
Agritaf	6.90cd	10.01cde	12.47cd	9.79de	49.33
Neem oil	5.27d	7.53e	9.88de	7.56fg	60.88
Pitraj oil	7.18c	8.68de	11.22de	9.02ef	53.32
Mahogany oil	7.73bc	11.08bcd	12.95cd	10.59cde	45.22
parasitoid	8.71bc	12.13bc	15.35bc	12.06bc	37.59
Light trap & hand picking	9.54b	13.52b	17.86ab	13.64b	29.43
Trap crop	8.01bc	11.45bc	15.25bc	11.57cd	40.15
Control	15.47a	20.94a	21.53a	19.33a	00.00
CV (%)	9.94	9.58	11.79	9.24	
$LSD_{0.05}$	1.89	2.52	3.75	1.78	

Means followed by the same alphabet in a column are statistically identical

Conclusions

Based on above results and discussions, application of Decis 2.5EC and Neem oil were found the mostly effective in controlling *E. vittella* among the tested management tactics in this study on the contrary, Light trap + hand picking was the least effective measures. The rank based on the efficacy of different control tactics was Decis > Neem oil > Agritaf > Pitraj oil > Mahogany oil > Trap crop > Parasitoid, *Trichogramma* > Light trap + hand picking > unsprayed control in reducing percent shoot and fruit infestation by okra shoot and fruit borer.

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