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EFFICACY OF SELECTED INSECTICIDES IN CUCURBIT FRUIT FLY MANAGEMENT

Fatema Ahmed[1], Md. Mamunur Rahman[1], Mohammad Zahangeer Alam[2], Mansura Afroz[1] and Md Ruhul Amin[1*]

[1]Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1706, Bangladesh. [2]Department of Environmental Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur 1706, Bangladesh.

***Corresponding e-mail:** mramin@bsmrau.edu.bd

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ABSTRACT

The field study was conducted from November 2020 to April 2021 at Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh to assess the efficacy of four insecticides namely Karate 2.5 EC, Ripcord 10 EC, Shobicron 425 EC and Neem oil on cucurbit fruit fly (*Bactrocera cucurbitae*) infesting sweet gourd (*Cucurbita moschata*). The insecticides were applied for three times at 10 days intervals which significantly reduced the infestation of fruit fly compared to untreated control. The lowest fruit infestation (9.1±0.5%) was obtained in Shobicron 425 EC treated plot at 7 days after 3rd spray. The effects of the insecticides on yield of sweet gourd differed significantly ranging from 6.9 to 21.4 ton/ha. The highest yield (21.4 ton/ha) was obtained in plot treated with Shobicron 425 EC, followed by Ripcord 10 EC (18.9 ton/ha). The highest marginal benefit cost ratio (3.1) was obtained from the plot treated with Shobicron 425 EC which was followed by 2.9 with Ripcord 10 EC and 2.4 with Karate 2.5 EC treated plots.

Keywords: *Bactrocera cucurbitae*, benefit cost ratio, insecticides

Sweet gourd (*Cucurbita moschata* Duch. ex Poir.) is a widely grown Cucurbitaceous vegetable. The incidence of insect pests, particularly red pumpkin beetle, epilachna beetle and cucurbit fruit fly limits its production (Afroz *et al*. 2019). Cucurbit fruit fly, *Bactrocera cucurbitae* Coquillett (Diptera: Tephritidae) is a polyphagous pest of cucurbits, accounting for 71.5 percent fruit infestation on sweet gourd in Bangladesh (Amin *et al*. 2011). Adult flies visit fruits during oviposition and lay their eggs into the fruits. As a result of the larvae's internal feeding pattern, controlling this pest is difficult. Farmers in Bangladesh use a variety of broad-spectrum chemical pesticides to increase crop production and reduce yield loss caused by the pest. Therefore, the present study was undertaken to determine the efficacy of some selected insecticides against cucurbit fruit fly infesting sweet gourd.

The study was conducted from November 2020 to April 2021 in the experimental field of the Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, Bangladesh. The sweet gourd genotype China line was cultivated in the experimental plots following randomized complete block design having plot size of 4.0 m × 4.0 m. There were 3 replications and the spacing between block to block and plot to plot was 1.5 m and 1.0 m, respectively. Four insecticides, namely Karate 2.5 EC (@ 1.0 ml/L, a.i. λ-Cyhalothrin), Ripcord 10 EC (@ 1.0 ml/L, a.i. Cypermethrin), Shobicron 425 EC (@ 2.0 ml/L, a.i. Profenofos Q + Cypermethrin) and Neem oil (@ 3.0 ml/L, a.i. Azadirachtin) were applied as treatments along with untreated control. Three sprays were done in the field at 10 days intervals started from the first sign of infestation. Data were collected at three and seven days after each spray. Three plants of each row were visually observed to collect data on total number of fruits and number of infested fruits, and percent fruit infestation was calculated. The fruits of each plot were weighed separately using a weighing machine and the yield from each treatment was converted into ton/ha. The costs for labor and inputs were considered as total expenditure. The net return was calculated by subtracting the expenditure of treatment from its gross return i.e. price obtained from total yield. The adjusted net return of each treatment was calculated by subtracting the net return of the control from the net return of the treatments. Then, Benefit Cost Ratio

(BCR) was calculated dividing adjusted net return by total cost. One way analysis of variance (ANOVA) followed by Tukey HSD posthoc test (at 5% level of significance) was done to determine the variation of the effects of the insecticides on fruit infestation rate and yield of sweet gourd. The statistical software package IBM SPSS 20.0 was used for data analysis.

Effect of different insecticides on the infestation rate of fruit fly in sweet gourd is presented in Table 1. Fruit infestation rate at 3 and 7 days after first, second and third sprays of the tested insecticides showed significant differences (first spray: $F_{4,10} = 6.2$, $p < 0.01$ and $F_{4,10} = 4.0$, $p < 0.05$; second spray: $F_{4,10} = 6.3$, $p < 0.01$ and $F_{4,10} = 7.7$, $p < 0.01$; third spray: $F_{4,10} = 8.9$, $p < 0.01$ and $F_{4,10} = 12.9$, $p < 0.01$, respectively). Infestation rate at 3 days after first spray ranged from 11.1±5.6 to 42.1±4.8%. The lowest infestation (11.1±5.6%) was observed in Shobicron 425 EC treated plot. The highest fruit infestation (42.1±4.8%) was observed in control plot which was statistically similar with the plot treated with Neem oil (35.7±7.1%). Fruit infestation at 7 days after first spray ranged from 15.1±2.6 to 50.0±9.6% where the lowest fruit infestation (15.1± 2.6%) was observed in Shobicron 425 EC treated plot and the highest infestation (50.0±9.6%) was observed in control plot. Fruit infestation at 3 and 7 days after second spray ranged from 15.0±2.5 to 52.5±10.0% and 13.9±1.4 to 56.0±9.8%, respectively. At 3 days after second spray, Shobicron 425 EC showed the lowest fruit infestation (15.0±2.5%) and untreated control plot showed the highest infestation (52.5±10.0%). At 7 days after second spray, both Shobicron 425 EC and Ripcord 10 EC treated plot showed statistically similar and the lowest fruit infestations (13.9±1.4 and 19.8±3.1%, respectively). Neem oil treated plot showed the highest level of fruit infestation (56.0±9.8%) which was statistically similar with untreated control plot (53.3±10.2%) and Karate 2.5 EC treated plot (31.5±5.2%). Infestation rate at 3 days after third spray ranged from 9.7±5.0 to 54.4±13.7%. The lowest fruit infestation rate (9.7±5.0%) was observed in Shobicron 425 EC treated plot which was statistically similar with Ripcord 10 EC treated plot (16.4±1.1%). The highest infestation rate (54.4±13.7%) was observed in untreated control plot which had non-significant difference with Neem oil (47.6±2.4%) but significant difference with Karate 2.5 EC, Ripcord 10 EC and Shobicron 425 EC treated plots. Infestation rate at 7 days after third spray ranged from 9.1±0.5 to 58.7±12.5%. The lowest fruit infestation rate (9.1±0.5%) was observed in Shobicron 425 EC treated plot. The highest infestation rate (58.7±12.5%) was observed in untreated control plot which had non-significant difference with Neem oil (39.3±1.8%) treated plot. Abrol *et al.* (2019) reported 21.52%, 13.62% and 8.72% fruit fly infestation in bottle gourd with the application of 0.004% λ-cyhalothrin, and 46.15%, 39.62% and 34.60% with 2.0% neem oil application at 10 days after first, second and third foliar spray, respectively. Lad *et al.* (2020) observed that lambda-cyhalothrin and azadirachtin showed 41.77% and 42.31% fruit infestation, respectively at 7 days after first spray. The present findings showed conformity with these where lambda-cyhalothrin was more effective to reduce fruit infestation than azadirachtin. Balas *et al.* (2018) found that profenophos 50 EC @ 0.05% showed 39.68% and 34.96% fruit infestation at 3 and 7 days after second spray, respectively and lambda-cyhalothrin 5 EC @ 0.005% showed 34.07% and 38.62% fruit infestation

Table 1. Effects of different insecticides on the fruit infestation rate of fruit fly in sweet gourd

Treatment	1st Spray		2nd Spray		3rd Spray	
	3 DAS	7 DAS	3 DAS	7 DAS	3 DAS	7 DAS
Karate 2.5 EC	30.2±1.6ab	33.3±8.3 ab	34.0±3.3 ab	31.9±5.2 ab	22.4±1.4 bc	20.7±0.7 bc
Ripcord 10 EC	26.2±1.2ab	27.8±2.8 ab	32.8±4.3 ab	19.8±3.1 b	16.4±1.1 c	14.5±1.2 bc
Shobicron 425 EC	11.1±5.6 b	15.1±2.6 b	15.0±2.5 b	13.9±1.4 b	9.7±5.0 c	9.1±0.5 c
Neem oil	35.7±7.1 a	38.9±5.6ab	39.7±3.2 ab	56.0±9.8 a	47.6±2.4 ab	39.3±1.8 ab
Untreated Control	42.1±4.8 a	50.0± 9.6 a	52.5±10.0 a	53.3±10.2 a	54.4±13.7 a	58.7±12.5 a

Data expressed as mean±S.E. Means within a column followed by no common letter(s) are significantly different by Tukey posthoc statistic at $P \leq 0.05$ (DAS = Days after spray).

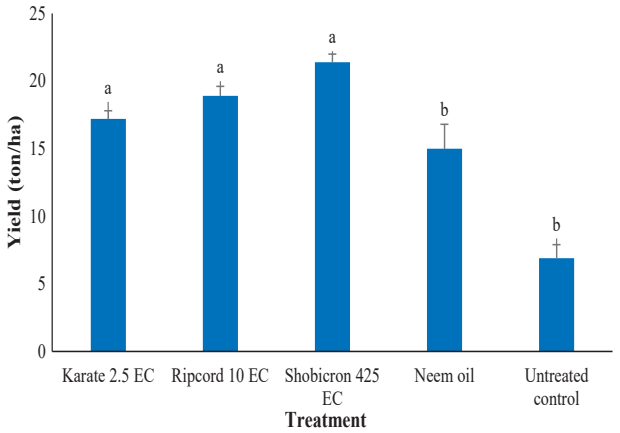


Figure 1. Yield of sweet gourd under different insecticidal treatments.

at 3 and 7 days after second spray, respectively. In the current study, the profenophos containing insecticide i.e. Shobicron 425 EC showed the highest efficacy in reducing fruit fly infestation in comparison to lambda-cyhalothrin (Karate 2.5 EC).

The obtained yields of sweet gourd from plots treated with different insecticides are presented in Figure 1. The effect of different insecticides on yield differed significantly ($F_{4,10} = 34.0$, $p < 0.001$). Yield of sweet gourd ranged from 6.9 to 21.4 ton/ha. The highest yield (21.4 ton/ha) was obtained from plot treated with Shobicron 425 EC and the lowest yield (6.9 ton/ha) was obtained from untreated control plot. Yield of the plots treated with Karate 2.5 EC, Ripcord 10 EC and Shobicron 425 EC showed statistically similar results. The current findings supported the results of Abrol *et al.* (2019) who obtained higher yield in bottle gourd from 0.004% lambda-cyhalothrin treated plot (10.5 kg/plant) than 2.0 % neem oil treated plot (8.2 kg/plant).

The management cost, gross return, net return, adjusted net return of different insecticidal management approaches applied against fruit fly in sweet gourd during November 2020 to April 2021 is presented in Table 2. Management cost was the highest (Tk. 54340.0) with Shobicron 425 EC and the lowest (Tk. 25000.0) was found in untreated control. The highest gross return (Tk. 321000.0) was found with Shobicron 425 EC, followed by Tk. 283500.0 with Ripcord 10 EC. The lowest gross return (Tk. 123000.0) was found with untreated control, followed by Neem oil (Tk. 225000.0). The highest net return (Tk. 266660.0) was recorded with Shobicron 425 and the lowest Tk. 98000.0 in untreated control. The highest adjusted net return (Tk. 168660.0) was recorded with Shobicron 425 EC which was followed by Tk. 138000.0 with Ripcord 10 EC and Tk. 113100.0 with Karate 2.5 EC. The lowest adjusted net return (Tk. 83100.0) was recorded with Neem oil whereas untreated control had no adjusted net return. The highest MBCR of 3.1 was obtained from the plot treated with Shobicron 425 EC, followed by 2.9 with Ripcord 10 EC, 2.4 with Karate 2.5 EC. The lowest marginal benefit cost ratio (1.9) was found from the plot treated with Neem oil.

According to the present findings, the tested insecticides exhibited different levels of toxicity where Shobicron 425 EC showed better efficacy against cucurbit fruit fly with higher marketable yield.

Table 2. Marginal benefit cost ratio (MBCR) analysis of selected insecticidal management approaches against fruit fly in sweet gourd from November 2020 to April 2021

Treatments	Management cost (Tk)	Gross return (Tk)	Net return (Tk)	Adjusted net return (Tk)	MBCR
Karate 2.5 EC	46900.0	258000.0	211100.0	113100.0	2.4
Ripcord 10 EC	47500.0	283500.0	236000.0	138000.0	2.9
Shobicron 425 EC	54340.0	321000.0	266660.0	168660.0	3.1
Neem oil	43900.0	225000.0	181100.0	83100.0	1.9
Untreated control	25000.0	123000.0	98000.0	-	-

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[2]Department of Agricultural Biology, Kyungpook National University, Daegu, Korea

[3]Department of Horticulture, Sangju National University, Sangju, Korea

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Journals

Amin MR, Bussiere L and Goulson D. 2012. Effects of male age and size on mating success in the bumblebee *Bombus terrestris.* Journal of Insect Behavior, *25*: 362-374.

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