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Evaluation of Traps and Baits to Protect Bottle Gourd against Cucurbit Fruit Fly (*Bactrocera cucurbitae* Coquillett) Infestation in Barind Tract

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ABSTRACT

A field experiment was carried out to develop an eco-friendly management practice to control fruit fly (*Bactrocera cucurbitae* Coquillett) by using some traps and baits. Field trial was conducted during April to July 2020 at Somaspur village in Godagari upazila under the district Rajshahi to assess the efficacy of certain traps and baits against fruit fly infestation on bottle gourd. Among the traps and baits (Pheromone trap, Mashed sweet gourd trap, Indigenous food bait & Banana pulp bait), lowest fruit infestation on number basis (26.94%) and weight basis (28.98%) was registered in Pheromone trap followed by Banana pulp bait (49.17% on number basis and 51.90% on weight basis). The highest number of adult fruit fly (38.22) also trapped in pheromone trap. The highest percent reduction of fruits over control on both number basis (66.12%) and weight basis (63.74%) was also found in Pheromone trap. The results suggest that Pheromone trap can be used for controlling of fruit fly on bottle gourd.

Key words: *Bactrocera cucurbitae*, Baits, Bottle gourd, Fruit fly, Traps

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1. INTRODUCTION

Cucurbits are one of the widely cultivated vegetables crop in Bangladesh. Among vegetables growing in Bangladesh, cucurbits are most important group especially for its leafy vines and fruit with higher nutritious values (β-carotene), long shelf-life and acceptable palatability to all levels of consumers (Anonymous, 2006). Bottle gourd, *Lagenaria siceraria* is one of the cucurbit vegetables, grown widely in Bangladesh. It is commonly grown in winter season in our country, but some new varieties are now cultivated in summer and winter season throughout the country. At present annual production of bottle gourd is 2,32,000 Metric tons in Bangladesh (BBS, 2018). The edible portion of bottle gourd fruit contains 96.3% moisture, Energy-63 Kj (15 kcal), Carbohydrates-5.87 gm, Fat-0.02 gm, Protein-0.6 gm, Vitamin C-10.10 mg, Zinc-3.77 mg, Potassium-3320.0 mg, Magnesium-162.33 mg (Milind & Satbir, 2011). Fruits are used as cooked vegetables and for preparation of sweets and pickles. Bottle gourd is also known for its immense medicinal uses such as cooling effect, diuretic and cardio-tonic properties. Fruit pulp is used as an antidote against certain poisons and is good for controlling constipation, night blindness and cough. A decoction made out of leaf is

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taken for curing jaundice (Thamburaj & Singh, 2001). Fruit fly, *Bactrocera cucurbitae* Coquillet, is a major pest causing yield loss in bottle gourds and infests all 15 kinds of cucurbit vegetables grown in Bangladesh. Fruit flies reduce yield as well as the quality of fruit (IPM CRSP, 2004). Crop loss is often more than 60% (Kapoor, 1993). Depending on the environmental conditions and susceptibility of the crop species, the extent of losses varies between 30 to 100% (Gupta & Verma, 1992; Dhillon et al., 2005a,b,c; Rakshit et al., 2011). Farmers of Bangladesh mainly use different types of insecticides to control fruit fly but these insecticides have several side effects on human body and environments. These chemical insecticides are also responsible for insecticide resistance, pest resurgence, outbreak of secondary pests and destruction of non-target organisms. However, due to the non-judicious use of synthetic insecticide have created undesirable effect on non-target organisms as well as serious environment pollution and serious hazard to human health. Considering the above points the present research work was planned to overcome problem due to indiscriminate use of insecticide and develop an eco-friendly management strategy of fruit fly in Barind tract.

2. MATERIALS AND METHODS

The experiment was conducted at Somaspur village in Godagari upazila under the district Rajshahi during the period of April to July 2020. The land was ploughed and cross-ploughed for several times with a power tiller to obtain good tilth. All ploughing operations were followed by laddering for breaking up the clods. All weeds and stubbles were removed from the field and then it was divided into 15 equal plots of $1.5\times1.5m^2$ with a distance of 30 cm between the plot. Finally, the unit plots were prepared as 10 cm raised beds along with basal doses of recommended fertilizers maintaining single pit in each for experiments. The high yielding variety of BARI Lau-4 was used as planting material. Before sowing, seeds were soaked overnight for proper germination. Three seeds were sown in each pit and one healthy seedling per pit was maintained through thinning at 7 days after germination. Each plant was supported by bamboo platform (bamboo macha) for easy creeping and preventing from lodging. Proper growth and development of each plant was maintained with all recommended horticultural practices.

The treatments consisted of: T_1= Pheromone trap (designed by BARI with cue-lure and soapy water, soapy water replaced at 7 days interval), T_2= Mashed sweet gourd trap (mashed sweet gourd mixed with water and Sevin 50 WP at the rate of 2 gm per 100 gm of mashed sweet gourd, replaced at 4 days interval), T_3= Banana pulp bait (Over ripe banana 500 gm + 10 ml molasses + 10 gm borax and 2.5 ml malathion, replaced at 4 days interval), T_4= Indigenous food bait (Fermented rice 200 gm + 5 ml molasses + 4 gm borax and 1 ml malathion, replaced at 4 days interval) and T_5= Untreated Control. Materials for different treatments were changed according to Sapkota et al. (2010). The treatments were laid out in a Randomized Complete Block Design (RCBD) with three replications.

After 5 days of each treatment application, data were collected by observing all the fruits present per plot through naked eye. Numbers of fruit flies trapped were recorded at 7 days interval for different traps, according to the method of Nasiruddin et al. (2002). Data were collected on the following parameters: (i) total and infested number of fruits, (ii) number of healthy or marketable fruits, iii) total and infested weight of fruits, iv) weight of healthy or marketable fruits. Percent infestation of fruits was calculated on both number and weight basis using the following formulae-

$$\text{Percent fruit infestation}=\frac{\text{Mean number of infested fruit}}{\text{Mean number of total fruit}}\times100$$

$$\text{Percent fruit infestation}=\frac{\text{Mean weight of infested fruit}}{\text{Mean weight of total fruit}}\times100$$

Data were analyzed by MSTATC and SPSS programs and DMRT was performed when it was necessary.

3. RESULTS AND DISCUSSION

Effect of different traps and baits was evaluated based on percent fruit infestation (number and weight basis) and number of adult fruit fly trapped. Percent fruit infestation based on number of fruit was varied significantly ($p<0.01\%$) at different treatments (Table 1). The treatment Pheromone trap recorded the minimum infestation of 26.94% mean fruit damage on number basis was significantly superior over the rest treatments. The treatment Banana pulp bait recorded the mean fruit damage of 49.17% on number was found next best treatment followed by Indigenous food bait with the mean fruit damage of 58.47% on number basis, were statistically similar. The treatment Mashed sweet gourd trap recorded the mean fruit damage of 68.06% on number basis. The maximum damage was found with the untreated control with 79.31% mean fruit damage on number, which was significantly inferior to all other treatments.

Percent fruit infestation based on weight of fruit was varied significantly ($p<0.01\%$) at different treatments (Table 2). The treatment Pheromone trap recorded the minimum infestation of 28.98% mean fruit damage on weight basis was significantly superior over the rest treatments. The treatment Banana pulp bait recorded the mean fruit damage of 51.90% on weight was found next best treatment followed by Indigenous food bait with the mean fruit damage of 59.21% on weight basis. The treatment Mashed sweet gourd trap recorded the mean fruit damage of 70.02% on weight basis. The maximum damage was found with the untreated control with 79.93% mean fruit damage on weight, which was significantly inferior to all other treatments.

Effect of traps & baits based on number of adult fruit fly trapped was varied significantly ($p<0.01\%$) at different treatments (Table 3). The treatment Pheromone trap captured highest mean number of adult fruit fly (38.22), which was

Table 1 Effect of traps and baits against fruit fly based on number of fruit

Treatments	Mean percent fruit infestation at different pickings				
	1st counting	2nd counting	3rd counting	4th counting	Cumulative mean percentage
T_1= Pheromone trap	23.33c	31.11b	21.67c	31.67c	26.94d
T_2=Mashed sweet gourd trap	68.33ab	62.22a	63.33ab	78.33ab	68.06b
T_3= Banana pulp bait	46.67bc	53.33a	43.33bc	53.33bc	49.17c
T_4= Indigenous food bait	60.00ab	62.22a	56.67ab	55.00bc	58.47c
T_5= Untreated Control	85.00a	68.89a	78.33a	85.00a	79.31a
$LSD_{0.05}$	26.44	15.46	27.12	24.88	9.57
SE (±)	8.11	4.74	8.32	7.63	2.93
Level of significance	**	**	**	**	**
CV (%)	24.78	14.78	27.35	21.78	9.01

In a column, means followed by a similar letter(s) are not significantly different whereas, means followed by a dissimilar letter(s) are significantly different as per DMRT; CV, Co-efficient of Variation; **, Significant difference at 1% level of significance.

Table 2 Effect of treatments against fruit fly based on weight of fruit

Treatments	Mean percent fruit infestation at different pickings				
	1st counting	2nd counting	3rd counting	4th counting	Cumulative mean percentage
T_1= Pheromone trap	25.50c	29.85c	24.58c	35.98c	28.98e
T_2=Mashed sweet gourd trap	67.93ab	64.59ab	66.27ab	81.29ab	70.02b
T_3= Banana pulp bait	56.25b	53.76b	43.49bc	54.09c	51.90d
T_4= Indigenous food bait	60.15ab	63.34ab	57.28ab	56.08bc	59.21c
T_5= Untreated Control	87.82a	69.44a	77.61a	84.83a	79.93a
$LSD_{0.05}$	29.16	13.10	26.26	25.84	6.57
SE (±)	8.94	4.02	8.05	7.92	2.01
Level of significance	**	**	**	**	**
CV (%)	26.02	12.38	25.90	21.97	6.01

In a column, means followed by a similar letter(s) are not significantly different whereas, means followed by a dissimilar letter(s) are significantly different as per DMRT; CV, Co-efficient of Variation; **, Significant difference at 1% level of significance.

Table 3 Effect of treatments on number of adult fruit fly trapped

Treatments	Mean No. of adult fruit fly trapped			
	1st counting	2nd counting	3rd counting	Cumulative mean
T_1= Pheromone trap	41.00 a	37.67a	36.00a	38.22a
T_2= Mashed sweet gourd trap	5.67d	6.67d	5.67d	6.00d
T_3= Banana pulp bait	23.67b	21.67b	21.33b	22.22b
T_4= Indigenous food bait	19.33c	17.00c	17.00c	17.78c
T_5= Untreated Control	0.00e	0.00e	0.00e	0.00e
$LSD_{0.05}$	2.00	2.60	2.84	2.05
SE (±)	0.614	0.796	0.869	0.630
Level of significance	**	**	**	**
CV (%)	5.94	8.30	9.41	6.49

In a column, means followed by a similar letter(s) are not significantly different whereas, means followed by a dissimilar letter(s) are significantly different as per DMRT; CV, Co-efficient of Variation; **, Significant difference at 1% level of significance.

significantly superior over the rest treatments. The treatment Banana pulp bait captured second highest mean number of adult fruit fly (22.22) followed by Indigenous food bait (17.78). The lowest mean number of adult fruit fly (0.00) captured in untreated control, which was significantly inferior to all other treatments.

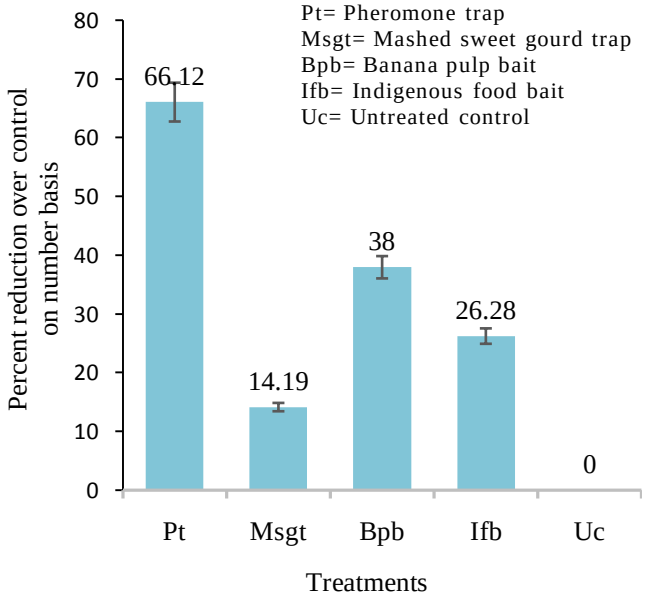

Fig. 1 Percent (%) reduction of bottle gourd fruits over control on number basis resulted from different treatments.

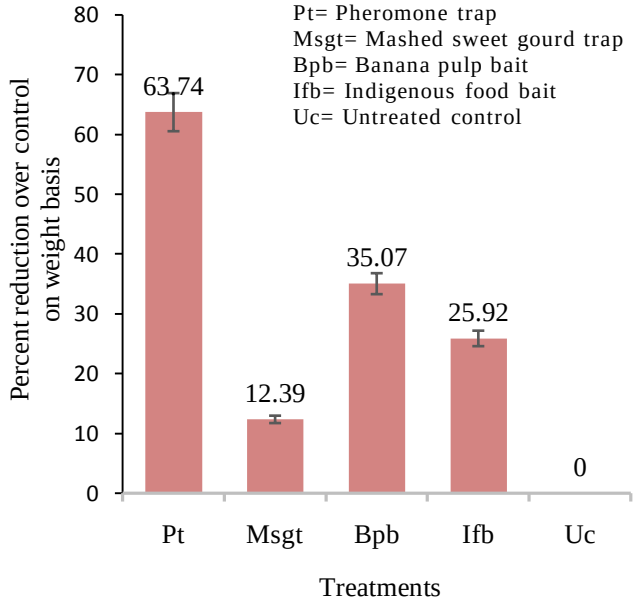

Fig. 2 Percent (%) reduction of bottle gourd fruits over control on weight basis resulted from different treatments.

Percent reductions of fruits over control on number basis were calculated and the results are shown in Figure 1. It was found that the highest percent reductions of fruits over control on number basis were recorded in Pheromone trap (66.12). The use of Banana pulp bait resulted second highest (38.00) percent reduction of fruit over control followed by Indigenous food bait (26.28). The least percent reduction of fruit over control was recorded Mashed sweet gourd trap (14.18). Thus, Pheromone trap provided the highest percent reduction of fruits over control on number basis.

Percent reduction of fruits over control on weight basis was calculated and the results are shown in Figure 2. It was found that the highest percent reduction of fruits over control on weight basis was recorded in Pheromone trap (63.74). The use of Banana pulp bait resulted second highest (35.07) percent reduction of fruit over control followed by Indigenous food bait (25.92). The least percent reduction of fruit over control was recorded Mashed sweet gourd trap (12.39). Thus, Pheromone trap provided the highest percent reduction of fruits over control on weight basis.

The overall effectiveness of traps and baits against fruit fly for mean data the descending order was: Pheromone trap> Banana pulp bait> Indigenous food bait>Mashed sweet gourd trap. The present investigation is in agreement with the findings of Nasiruddin et al. (2002), who reported Pheromone trap performed more effectively than other trap he used. Sharifi et al. (2013), noted that Pheromone equipped traps attract and kill fruit flies and suggested that pheromone traps can be used to monitor and manage fruit flies. Similarly Sohrab et al. (2018) reported that cue-lure trap was found the most effective against cucurbit fly and large number of cucurbit fruit flies was caught by using cue-lure trap.

4. CONCLUSION

Bottle gourd is much popular vegetable due to its nutritional values and availability. However, due to high infestation of fruit fly, bottle gourd production is reducing to an alarming rate. From the present study, it can be concluded that Pheromone trap was the most effective among different traps and baits considering fruit damage, number of adult fruit fly trapped and percent reduction of fruit over control. Therefore, farmers can be motivated to apply Pheromone trap for the controlling of cucurbit fruit fly in bottle gourd and to reduce the use of synthetic chemical insecticides, which keep a safe environment and safe human health as well as wild life from hazardous chemicals.

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