



## Control fruit fly for profitable sweet gourd production

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### Abstract

A field experiment was conducted in the farmer's field at Salaipur, Mithapukur, OFRD, Rangpur during 2015-2016 to control cucurbit fruit fly effectively through the use of sex pheromone trap. The trial was conducted among six farmers. Three treatments viz., T<sub>1</sub> (Sex pheromone+Poison bait+Sanitation (9 spot)), T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot)) and T<sub>3</sub> (Farmers practice) were compared. The total land area was 7200m<sup>2</sup>. The higher fruit yield (25.86 t/ha) was obtained from T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot)). The lower fruit yield (21.43 t/ha) was obtained from T<sub>3</sub>. The gross margin (Tk.96375/ha) and BCR (3.92) was also higher with the use of T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot)). The findings related to control of fruit fly of sweet gourd will be an important role in pest management safely and it will be play important for farmer's profitability.

**Key words:** Fruit fly, sex pheromone, profitability

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### Introduction

Bangladesh is one of the most densely populated countries in the world and around a third of the Bangladeshi people live in poverty. The population growth is causing a great pressure on the natural resources of the country, especially on the cultivatable land (IFAD, 2013; Rahman et al. 2011; Sarker et al. 2010). In Bangladesh around 84% of the population is, in some meaning, dependent on agriculture for their livelihood (Dasgupta et al., 2004). Despite this, most Bangladeshis struggle to keep the agricultural production at a significant level. Pesticide use in Bangladesh has increased rapidly over the past four decades. The farmers use pesticides to increase the crop production and to prevent crop losses due to pest attack (Rahman, 2012, Ferdous et al. 2018). The

concerns regarding high pesticide usage are the possibility of pesticide resistance and their harmful effect of human health and environment (Rahman, 2002). Pesticides include compounds that are known to cause cancer, genetic damage and allergic responses. Many of the harmful effects are believed to be a direct result from overuse and misuse of pesticides. The lack of information to the farmers leads to a higher use of toxic chemicals than recommended. Pesticide poisoning and environmental damages are now common in Bangladesh due to overuse. To prevent the hazardous effects of pesticides, farmers need to be educated about the risks of overuse and the importance of using safety gear (Dasgupta et al., 2004). Despite this, little effort has been made in Bangladesh to

develop other methods than pesticides for pest management (Rahman et al. 1994). Vegetable based cropping system on currently under-utilized lands could substantially benefit smallholder farmers (Anwar et al. 2012, 2017, Ferdous et al. 2017a) and make considerable contributions to regional food security objectives, though there is uncertainty about what management options are most appropriate in these environments.

The vegetable production in Bangladesh is very low in summer. In this season, the major vegetables grown are cucurbits. Therefore, during the lag period, cucurbitaceous vegetables play an important role to supplement this shortage (Rashid, 1993). Cucurbits occupy 66 percent of the land under vegetable production in Bangladesh and contribute 11 percent of total vegetable production in the country (IPM CRSP, 2004). Cucurbits include crops, such as cucumber (*Cucumis sativus*), squash (*Cucurbita pepo*), sweet gourd (*Cucurbita maxima*), bitter gourd (*Momordica charantia*) and snake gourd (*Trichosanthes anguina*). Fruit fly, *Bactrocera cucurbitae* Coquillet, is a major pest causing yield loss in cucurbits, and infests all 15 kinds of cucurbit vegetables grown in Bangladesh. A major constraint improved cucurbit production is high rate of fruit fly infestation (Ferdous et al., 2017b, 2017c). One of the primary cucurbit crops attacked by fruit fly is cucumber.

Cucurbits are a major group of vegetable crops grown in Bangladesh. It is available throughout the year in all parts of the country. Sweet gourd (*Cucurbita moschata*) is one of the most common popular cucurbits grown in Bangladesh. It is a good source of carotene and calcium. It contains 93 % water, 0.7 % mineral, 0.7 % fibre, 1.4 % protein, 0.5 % fat and 4.5 % carbohydrate per 100 g of edible portion. But cucurbit fruit fly is a major problem in its production. The crop is attacked by a large number of insect pests of which fruit fly (*Bactrocera cucurbitae*) is the most destructive pest. Female fly laid their eggs through long ovipositor by injuring young and tender fruits.

After hatching the larvae feed on internal soft tissue and finally fruits are rotten. The insect damages all cucurbits like bitter gourd, cucumber, sweet gourd, watermelon, squash and ash gourd. Farmers use huge amount of insecticides to control this pest which is very harmful for human health as well as environment. Sex pheromones and bio-agent are very much effective in controlling cucurbit fruit fly. So, this demonstration trial was undertaken in cucurbit growing area to popularize the technology among the farmers.

## **Materials and Methods**

The experiment was conducted at the farmer's field, Salaipur Mithapukur, OFRD, Rangpur during kharif-1 season 2015-2016. The land was medium high and the soil was sandy loam in texture which belongs to Agro Ecological Zone-3. The area mostly falls under high and medium high land areas of the Tista Meander Floodplain covering 946,803 ha (Anwar et al., 2015; Khatun et al. 2014 & Mahamood et al. 2016). Water holding capacity of the soil is good. The area receives an average annual rainfall of around 2,160 mm with an average temperature of about 25°C (Ferdous et al., 2016).

The trial was conducted among six farmers field. Small trials at farmer fields, dispersed experiments, were established (Ferdous et al., 2017a, 2018). Three treatments viz., T<sub>1</sub> (Sex pheromone + Poison bait + Sanitation (9 spot)), T<sub>2</sub> (Sex pheromone+ Poison bait + Sanitation (16 spot)) and T<sub>3</sub> (Farmers practice) were compared. Weed free field, clean cultivation and removal of old senescence or infested leaf or shoot were the integrated pest management (IPM) techniques used in the experiment. The control plot was about 1000 meter away from the pheromone treated plot. The total land area was 7200m<sup>2</sup>. Local variety of sweet gourd was used as a test crop. The crop was fertilized at the rate of recommended dose. Intercultural operation and irrigation were done as and when necessary. The sex pheromone trap and bait distance

between placed by 10m × 10m and 7.5m × 7.5m spacing just after flowering.

**Data collection and statistical analysis:** After physiological maturity, 10 randomly selected plants from each plot were harvested and plant height, yield and yield attributes of sweet gourd were measured. Yield plant<sup>-1</sup> for each crop was determined plot-wise and converted into yield on an area basis (kg ha<sup>-1</sup>). Data on number of fresh fruits plant<sup>-1</sup>, number of infested fruits plant<sup>-1</sup>, weight of fresh fruits plant<sup>-1</sup>, weight of infested fruits plant<sup>-1</sup>, yield and yield attributes were statistically analyzed using MSTAT-C software package (Ahmed et al 2017 & Ferdous et al. 2018a).

Production costs of sweet gourd included the cost of field preparation, seed, planting, irrigation, organic manure and fertilizer, plant protection chemicals, and harvesting. Gross return under a treatment was calculated by multiplying the gross amount of crop produced by the farm-gate price. The gross margin was

calculated by subtracting cost of production from the gross return (Ferdous et al., 2017b, 2017c, 2018b).

## Results

The yield and yield contributing characters of sweet gourd are presented in Table 1. Significantly the highest number fresh fruit per plant (3.96/plant) was obtained from plant treated with T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot)). The lowest number of fresh fruit per plant (2.39) was recorded from farmers practice. The number of infested fruit was only 0.049 per plant in T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot) treated plot while it was 1.63 per plant in farmers practice. The weight of fresh fruit per plant (15.16kg) was also higher with T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot) treated plot. The higher fruit yield (25.86 t/ha) was obtained from T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot) treatment and the lowest (21.43 t/ha) from farmers practice.

**Table1.** Yield of sweet gourd as influenced by sex pheromone trap at Mithapukur, Rangpur during 2011-2012.

Treatments	No of fresh fruit/plant	No of infested fruit /plant	Wt. of fresh fruit/Plant (kg)	Wt. of infested fruit/ Plant (kg)	Fruit yield (t/ha)	Fresh fruit yield (t/ha)
Sex pheromone +Poison bait+Sanitation (9 spot)	3.62 a	0.049 b	12.71 b	0.157b	22.43b	21.17b
Sex pheromone +Poison bait+Sanitation (16 spot)	3.96a	0.096	15.16a	0.366b	25.86a	25.26a
Farmers Practice	2.39b	1.63a	9.02c	4.30a	21.43b	15.03c
CV (%)	4.36	3.21	5.37	7.96	5.41	7.33

**Economic analysis:** The cost of production is estimated based on the production elements in Table 2. From cost and return analysis at salaipur, Mithapukur, Rangpur, it was found that the highest gross return 129300 BDT from T<sub>2</sub> (Sex pheromone+Poison bait+Sanitation (16 spot) treatment and gross margin 96375 BDT also found from T<sub>2</sub> (Sex pheromone+Poison bait+ Sanitation

(16 spot) treatment though the highest cost of production was involved in T<sub>2</sub> (Sex pheromone +Poison bait + Sanitation (16 spot) treatment (Table 2). The lowest yield (15.03 t/ha) was recorded from farmers practice and lowest gross return 94350 BDT from farmers practice and gross margin 64475 BDT also found from farmers practice though the lowest

cost of production was involved in farmers practice (Table 2).

**Table 2.** Cost and return analysis of sweet gourd at Mithapukur, Rangpur during 2011-2012.

Treatments	Gross return (Tk/ha)	Total variable cost (Tk/ha)	Gross margin (Tk/ha)	BCR
Sex pheromone +Poison bait+Sanitation (9 spot)	112150	30675	81475	3.65
Sex pheromone +Poison bait +Sanitation (16 spot)	129300	32925	96375	3.92
Farmers Practice	94350	29876	64475	3.15

Price (Tk/kg): Urea=11.80, TSP=22, MP=25, Gypsum=7, Zinc sulphate=140, Boric acid=180, Sweet gourd=5.

### Discussion

Fruit flies (Diptera: Tephritidae) are among the most important pests worldwide. Fruit fly causes severe damage to fruits and vegetables in Asia. The cucumber fly, *Dacus ciliatus* Loew., is a major pest of cucurbits in some countries (Azab et al., 1970; Nagappan et al., 1971). Sex pheromone trapping techniques have become widespread alternative methodologies for managing pests, especially Lepidoptera and Diptera (fruit flies) pests (El-Sayed et al., 2006, 2009, Islam and Ando, 2012; Islam et al., 2015 a,b). Throughout the last two decades, devices, feeding stations, traps, and other technologies have been developed, tested and marketed (Armsworth et al., 2008; Piñero et al., 2009; Islam, 2012). All these techniques are based on the principle of attracting efficiently the pest insects to the pheromone, where they

are removed from the rest of the population, either by retaining them in the device (e.g., mass-trapping) (Cunningham, 1989; Economopoulos, 1989). The general idea behind these methods is that a large proportion of the pest population will be removed from the agroecosystem, thus effectively reducing crop damage.

This pheromone trap can be used in organic farming and in agroecological crop protection systems (Deguine et al. 2008). The trapped insects proved very representative of the adult in field populations (Deguine et al. 2013) and were particularly appreciated by the farmers: it is simple, easy to make, low cost, uses no insecticides, and provides a positive psychological effect to the farmers communities.

### Conclusion

This is a very effective method for controlling fruit fly insect for cucurbit vegetable cultivation. But needed low price of sex pheromone trap and availability of the same in the local market. It is better than poison bait and insecticide.

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