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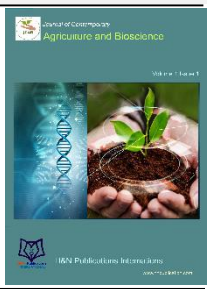

Research Article

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Efficacy of IPM Package against Cucurbit Fruit Fly (*Bactrocera Cucurbitae* Coquillet) of Bitter Gourd

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A b s t r a c t

A field experiment was conducted at the farmer's field at Sreepur, Gazipur during 2019-2020 with a view to evaluating the effects of IPM package against fruit fly in bitter gourd. Crop under IPM plots (Sex pheromone + Sanitation + Beneficial insects) resulted comparative lower fruit damage and produced higher yield than the non IPM plots. The lowest fruit infestation was obtained from the IPM treated plot (4.67%) whereas the highest was in the non IPM plots (16.22%). The infestation status of IPM and non IPM plots reflects in the yield. Comparative higher yield was obtained from IPM plots (27.45 t/ha) than the non IPM plots (18.30 t/ha). Higher gross return (Tk. 411750/ha) and gross margin (Tk. 283200/ha) was also recorded from IPM treated plot than the non IPM plots.

Keywords: *Bitter gourd, IPM package, fruit fly and fruit infestation.*

Introduction

Climatic condition and soils of Bangladesh are highly favourable for growingvarious vegetables. Among them cucurbits are the major groups (Nasiruddin et al., 2004). Bitter gourd (*Momordica charantia*) is one of the most important cucurbitaceous vegetable in Bangladesh for its good market value which encouraged the farmers to cultivate in large scale. In 2012-2013 cropping year, 52020 metric tons bitter gourd was produced in Bangladesh (BBS, 2013). Fruit fly, *Bactrocera cucurbitae* Coquillet, is a major pest causing yield loss in bitter gourd grown in Bangladesh. Fruit flies reduce yield as well as the quality fruit (IPM CRSP, 2004). Fruit flies damage fruits by puncturing and laying eggs under the soft skin in both mature and green fruits (Hollingsworth and Allwood, 2000). The eggs hatch and feed inside the fruit causing the fruits to rot (Dhillon, 2005a) resulting in unmarketable fruits. The cucurbit fruit fly is the most destructive pests of bitter gourd causing yield loss ranging from 30-100% (Dhillon et al., 2005b; Shooker et al., 2006; Amin et al., 2011). A recent survey report revealed that farmer's use 2-3 insecticides in a mixture at 3-4 days interval in fields. On the other hand, uncontrolled application of huge amount of insecticides causes harmful effect on human health as well as environment. Unfortunately no single technique has so far been showed to be an effective and dependable to control this pest (Kapoor, 1993). However, BARI scientists have already been developed IPM package to combat the pest. IPM package involving use of sex pheromone trap, weekly release of egg and larval parasitoid and removal of infested shoots and fruits (sanitation) can significantly reduce fruit fly population. The present study was undertaken to observe the performance of IPM package in a large scale among the farmer's field.

Materials and Methods

The trial was carried out at the farmer's established bitter gourd field at Sreepur, Gazipur during 2019-2020. The experiment was laid out in RCB design with 6 dispersed replications. The unit plot size was 0.15 ha and total area was 0.9 ha. There were two treatments viz. T_1: IPM trials [Sex pheromone trap + sanitation + weekly release of egg parasitoid, *Tricogramma evanescence* @ 1g parasitized eggs/ha and larval parasitoid, *Bracon hebetor* @ 1 bunker(1000-1200 adults)/ha and T_2: Non IPM trials (Farmer's practice – spraying of Voliam Flexi 300SC or Proclaim 5SG or Sobicron and Basthrin at 4 days interval). A distance of 500 m was maintained between the IPM and non IPM plots. The sex pheromone trap was placed with 10m × 10m spacing in the field. The sex pheromone trap was placed one after another on April, 2019. Data on fruit infestation was recorded from randomly selected areas/plot at each harvest (1 m^2). Yield and infestation data were also recorded from both IPM and non IPM plots**.** Number of insects caught in the pheromone traps was also recorded. Data were analyzed statistically using paired T-test.

The integrated pest management (IPM) package for the control of cucurbit fruit fly consists of sex pheromone, cultural, mechanical and biological control methods.

Results and Discussions

The result indicated encouraging performance of IPM package to reduce fruit fly population on bitter gourd (Table 1).

Table 1. Effect of IPM package against fruit fly in bitter gourd at Sreepur, Gazipur during 2019-2020

Treatments	Infested fruit (%)	Reduction of fruit infestation (%)	Yield (t/ha)	Yield increase (%)
IPM	4.67	71.21	27.45	50
Non IPM	16.22	-	18.30	-
"t" value	12.23	-	5.67	-
Level of significance	**	-	**	-

** = Significant at 1% level

Sex pheromones have been utilized in the insect pest control program through population monitoring, survey, mass-trapping, mating disruption and killing the target pest in the trap (Bottrell, 1979). Yield losses due to fruit fly infestation vary from 19.19 to 69.96 percentages in different fruits and vegetables (Kabir et al. 1991).

Table 2. Cost and return analysis of brinjal at Sreepur, Gazipur during 2019-2020

Treatments	Gross return (Tk/ha)	Cost of production (Tk/ha)	Gross margin (Tk/ha)
IPM	411750	128550	283200
Non IPM	274500	139875	134625

The market price of bittergourd was 15 Tk/kg.

involves the use of mechanical forces or manual operations to interfere with the insect feeding, shelter and reproduction. For ince, sanitation of the field before, during and after the cropping, removal of the alternate food sources for the pests and mechanibarriers are some of the cultural and mechanical control measures to manage BSFB in the field. However, BSFB moths that emerge from the pupae in soil or migrate from neighboring eggplant crops are important sources of infestation. In addition to these known sources of infestation, dry brinjal stalks from previous crop that have been stored by the farmers as fuel for cooking serve as another important source of BSFB infestation (Alam et al., 2003).

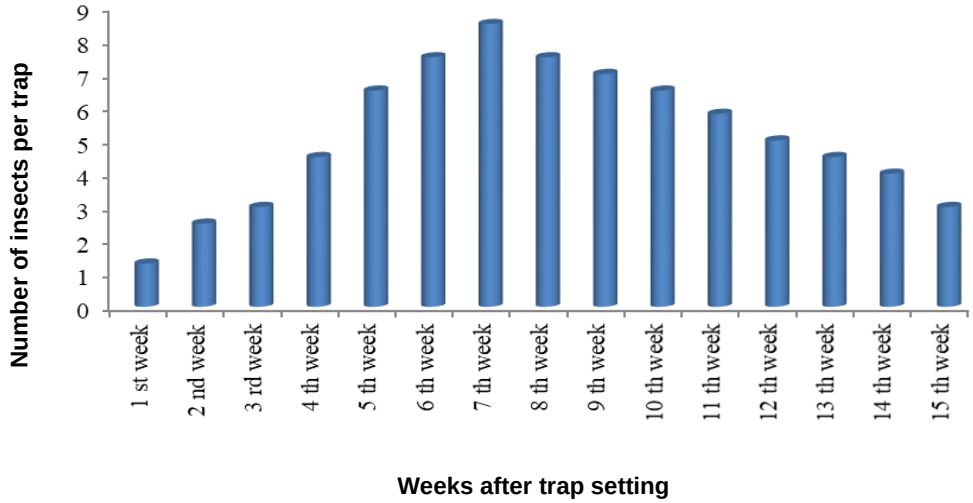

Figure 1. Number of insects per trap in different weeks after trap setting at Sreepur, Gazipur

Fruit fly infestation was reduced by 53 to 73 percent and yields were raised 1.4 to 2.3 times using the traps (IPM CRSP Annual Highlights, 2002-2003). The lowest fruit infestation was obtained from the IPM treated plot (4.67%) whereas the highest was in the non IPM plots (16.22%). The infestation status of IPM and non IPM plots reflects in the yield. Comparative higher yield was obtained from IPM plots **(**27.45 t/ha**)** than the non IPM plots **(**18.30 t/ha). Higher gross return (Tk. 411750/ha) and gross margin (Tk. 283200/ha) was also recorded from IPM treated plot than the non IPM plots **(**Table 2). Number of captured adult per trap increased with the increase of plant age and reached peak at 5^{th} – 9^{th} week of trap setting and thereafter population decreased with the progress of the season (Fig 1).

Due to the poor mobility of insects, the insect can be easily collected by hand and adults, eggs and larvae were killed by hand. This happens from 10.30 am to 11.00 am. 3:30 pm to 4:00 pm. When the insect activity in plants is high, it was carried out twice on plots used for treatment measures.

Cultural control methods involve the manipulation of crop environment as well as management, whereas mechanical control

Removal and prompt destruction of the BSFB infested shoots and fruits at regular intervals have been suggested as an effective strategy to manage the BSFB on brinjal in South and Southeast Asia (Rahman et al., 2002; Talekar, 2002; Arida et al., 2003; Satpathy *et al.,* 2005). This pruning is especially important in early stages of the crop growth, and this should be continued until the final harvest. The use of barriers combined with prompt destruction of the BSFB infested shoots significantly reduced the damage to shoots than by using either the barrier or the sanitation alone (Alam et al., 2003). Hence field sanitation and mechanical barriers could significantly reduce the BSFB damage and could be an effective component of IPM.

The profit margins and production area significantly increased whereas pesticide use and labor requirement decreased for those farmers who adopted this IPM technology. For instance, socioeconomic studies in Bangladesh revealed that the adoption of BSFB IPM has reduced about 30% of the total production cost when compared to the non-IPM adopters (Alam et al., 2003). It has clearly been proven that this IPM technology has positive impacts on the lives of bitter gourd growers in the region.

The result indicated encouraging performance of IPM package to reduce fruit fly population on bitter gourd. Farmers are very much interested to use IPM package for higher yield and economic return. Sex pheromone should be very available in the market at low price. This technology is poison free and easily applicable

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