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ECOFRIENDLY MANAGEMENT OF FRUIT FLY IN BITTER GOURD AND SPONGE GOURD USING PHEROMONE TRAP IN CENTRAL PLAIN ZONE OF PUNJAB INDIA

Nisha Sharma*, Gurpreet Kaur and Gurpreet Singh
Punjab Agricultural University-Farm Advisory Service Centre, Patiala-147001, Punjab, India.
*Corresponding author E-mail: nishasharma@pau.edu
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ABSTRACT

Bitter gourd and sponge gourd are two major cucurbits grown during rainy season in central plain zone of Punjab including Patiala district. Among various insect pest prevalent during this season fruit fly is the major pest causing huge economic loss to farmers (30-70%). During baseline survey of Sanaur block of Patiala it was observed that farmers have poor knowledge about time of insect attack, its pattern and extent of loss by this pest. Therefore, firstly awareness camps and then field demonstration were conducted at farmer's field among three different villages (Sanaur, Assarpur and Kartarpur) during May-June, 2025. Total 100 fruit fly traps were installed among 25 farmers under both the crops. This demonstration covers about 6.25 acres area having 1000m^2 areas with each farmer. An average 21.80% and 17.65% increase in yield of bitter gourd and sponge gourd, respectively was observed in demonstrated fields. It was noticed that farmers are contented with the usages of this technology, as this is bit cheaper, easy and effective for longer duration. Therefore, more awareness camps and demonstration needs to be conducted in near future so that farmer's losses can be reduced.

Keywords **:** Pheromone trap, bitter gourd, sponge gourd, fruit fly.

Introduction

Cucurbits commonly known as gourd family occupies an area of 4.29 million hectares in India with 10.52 t/ha productivity which accounts about 5.6% of total vegetable production of the country. It is predominant group of vegetable grown during summer and rainy season in Punjab. Among cucurbits bitter gourd and sponge gourd are two majorly grown cucurbits during rainy season in district Patiala. Both are cross pollinated crops having trailing habits extensively grown all over the tropics and sub -tropical regions of country. Bitter gourd owns a special place in cucurbitaceous family because of its exceptional medical advantage like it is used for treatment of diabetes, dysentery, gout and rheumatism and prevention of breast cancer. In India, it is cultivated in an area of 1.10 lakh ha with production of 13.76lakh tonnes and productivity 12.5 t/ha. (Anonymous, 2020). Sponge gourd is also known as *loofah* is used as bath sponge and dish cleaning sponge besides its use as vegetable and commonly known as *ram tori* in Punjab. It has several health benefits as it is rich in fibre which helps in digestion and prevents constipation, excellent source of minerals like potassium and magnesium and vitamins (A, C &B) and also having low glycaemic index which prevents sudden spike in glucose level. There are various biotic and abiotic factors which limit the crop production and productivity of these crops and ultimately decrease yield and degrade quality of produce.

Among various insect pest cucurbit fruit flies (*Bactocera cucurbitae*) is the serious pest accountable for major yield loss in both the crops and the extent of losses varies between 30 to 70% (Dhillon *et al.,* 2005) depending upon crop species and favourable environmental condition. The cucurbit fruit flies remain active throughout the year but during winter months it hibernates in adult stage and hides itself

under the leaves. Whereas, during hotter and dry period it takes shelter under humid and shady place and become most active when temperature falls 32.5°C and relative humidity reaches between 60-70% (Keck, 1951). Therefore, rainy season is most suitable time for its attack which results in huge economic loss to farmers. In India, the incidence of the fruit fly on cucurbits was first reported by (Lefroy, 1907). It was reported by (Sohrab *et al.,* 2018) and (Manoj *et al.,* 2017) that bitter gourd is most infested host of fruit fly followed by sponge gourd. The female fruit flies puncture the young tender fruits and lay eggs under the fruit skin with their ovipositor by making a scar on the fruit. This is not visible at the time of attack and later on these scars serve as entry points for various pathogens leads to fruit rot and decay. Once the egg hatches the larvae feed on the pulp of fruit and make it unmarketable. Further, reduced yield, poor quality fruit (misshapen and small size fruits) and increased cost on pest management practices (rigorous insecticide spray, high cost of chemicals and spraying cost) leads to economic loss and burdens the farmers. This pest is devastating and cause huge yield losses and very difficult to control once its attack occurs. This pest attacks the commercial part of the crop i.e fruit which directly cause economic loss to growers. Farmers are using synthetic pesticide indiscriminately to manage this pest which led to the problem of pest resurgence, hazardous impact on natural predators, environment pollution, pesticide residues as well as burdens the farmer's pockets. Since the maggots damage the fruits internally, it is difficult to control this pest with insecticides. Therefore, this study was planned with the objectives:

1. Management of cucurbit fruit fly before the attack of pest by using eco- friendly approach i.e.; pheromone traps
2. To assess the yield loss caused by the attack of fruit fly during rainy season along with economics of using pheromone trap vis a vis use chemical insecticides

Materials and Methods

The present study was conducted on eco -friendly management of fruit fly in cucurbits (bitter gourd and sponge gourd) by using pheromone traps. Under this 25 demonstration was conducted in three villages of Sanaur block which is known as hub of vegetable cultivation of district Patiala. These demonstrations were conducted in the month of June during the year 2025 in three selected villages i.e.; Sanaur, Assarpur and Kartarpur. Before conducting demonstrations, a base line survey of these villages was conducted to get information on farmer's knowledge of fruit fly, its attack and damage, their approach for controlling this pest and their needs and challenges. It was observed that farmer were only using chemical spray to control fruit fly and they bear about 30-70% loss due to this pest because once this fly attack it is very difficult to control and it degrade the quality of produce upto large extent. Although some farmers are using the pheromone trap available in market but they are not aware about recommended technology and number of traps required per acre and methods of its installation in field. Therefore, before conducting demonstration the awareness camps was conducted in these villages to get farmers aware about the attack of fruit fly in cucurbits, its symptom and extent of damage and management by eco-friendly management techniques.

Total 25 farmers were selected among these three villages to conduct demonstrations on effectiveness of fruit fly trap (pheromone trap) in two majorly grown crops during rainy season i.e. bitter gourd and sponge gourd. These traps were procured from Department of Vegetable Science, Punjab Agricultural University, Ludhiana. According to the recommendation of Punjab Agricultural University 16 traps per acre were be installed at farmers filed in bitter gourd and sponge gourd. Among these 25 farmers 100 traps were distributed which covers an area of 1000m^2 per farmer with 500m^2 under each crop i.e; bitter gourd and sponge gourd and total 6.25 acres' area was covered. These traps were installed between 3rd to 4th week of June by hanging these traps on plants approximately 1.35-1.50 m also recommended by (Jiji *et al*., 2009) above from ground level as the vines of these crops were stacked on support (bans) with the help of nylon thread. During the demonstrations scientists frequently visited the fields to ensure proper installation of trap, cleaning of these traps and not to spray any pesticide to control these fruit flies. Total fruit yield of both the crops were recorded in fruit fly installed trap plots as well as in control plots.

Results and Discussion

It is evident from the Fig-1 that average yield of bitter gourd 117.50 q/acre was recorded under demonstrated field which is 21.80% higher in comparison to farmers' practices (91.88 q/acre). Similarly, the average yield of sponge gourd was also 17.65% higher under demonstrated field (121.70 q/acres) then farmer's practices (100.21q/acre). These findings are in line with the results of (Sarkar *et al.*, 2017) and (Pilania *et al.,* 2021).

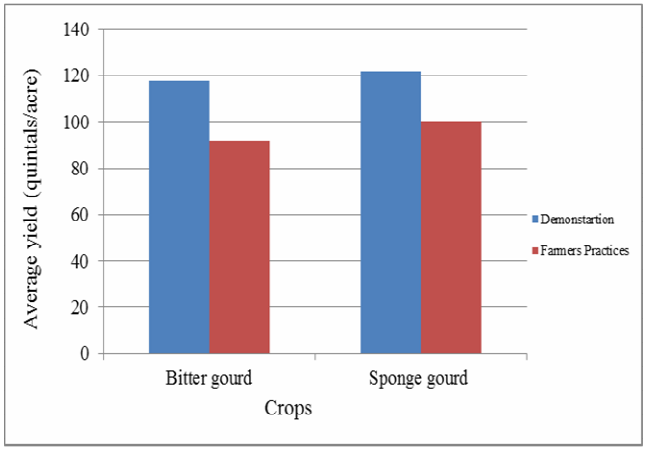

Fig. 1: Yield comparison of demonstrated technology with farmers' practices

The economics of using fruit fly trap were analyzed (Table-1) for ecofriendly management of cucurbits fruit fly in comparison to farmer practice. The cost of cultivation is reduced around 6.88% under demonstration as compared to farmer's practices. This might be due to 3-4 lesser spray in comparisons to farmer's practices where fruit fly trap was not installed as well as less labour required for unnecessary spray. Further, the net return of bitter gourd (Rs. 1,45,347) and sponge gourd (Rs. 1,85,918) also increased under demonstrated plots then farmers' practices which ultimately leads to higher B:C ratio 1.95 in bitter gourd and 2.58 in sponge gourd under demonstrated farmers field. This technology reduced their expense on spraying and also save water usages. Similar findings are reported by (Jain *et al*., 2021) and (Sohrab *et al*., 2018) in different cucurbit crops.

Table 1 : Economics of demonstration and farmer's practices

Crops	Economics of Demonstration				Economics of farmers Practices			
	Yield (q/acre)	Gross Return (Rs)	Net Return (Rs)	B:C	Yield (q/acre)	Gross Return (Rs)	Net Return (Rs)	B:C
Bitter gourd	117.50	219725	145347	1.95	91.88	171815.60	91950.60	1.51
Sponge gourd	121.70	258004	185918	2.58	100.21	212445.230	132859.2	1.66

Impact of this technology

During the study, it was observed that 86% farmers are unaware (Table-2) of the appropriate trap density, installation height, lure replacement interval and field sanitation measures. It was also noted that 16.5% farmers have view that due to installation of these traps more attack of fruit fly occurs in their field as they saw large amount of flies attracted towards these trap and collected within these bottles. This may be because of more male flies attracted towards these traps and move around theses bottles which can be clearly seen by an individual.

Table 2 : Impact of demonstrations on farmers' knowledge and adoption of fruit fly traps

Parameters	Before demonstration (%)	After Demonstration (%)
Unawareness about use of fruit fly trap	86.00	28.0
Already using these fruit fly traps	8.35	65.00
More flies are visible in the field around plants	6.66	18.50
Farmers satisfied within the use of these traps	7.00	78.0
PAU available traps more economical and beneficial than market available traps	9.00	83.30
Cost effective than spraying technique	35.00	76.0

Constraints in adoption of this technology

The major constraints is the inadequate knowledge among farmers regarding the correct use of fruit fly management practices such as pheromone traps, bait application, and field sanitation. Further, economic factors also play a vital role in limiting its adoption. The relatively high initial cost of pheromone traps, along with the expenses for lure replacement, discourages small and marginal farmers. Moreover, absence of subsidies or financial incentives, leads farmers to perceive this technology as costly compared to conventional chemical insecticides, which appear cheaper and provide quick visible results. In addition to this, effective fruit fly management requires community-level or area-wide adoption; however, lack of co-ordination and co-operation among neighbouring farmers reduces the effectiveness of the technology.

When only a few farmers adopt the practice, re-infestation from adjacent fields discourages its continued use. Also round the year cultivation of cucurbits, the presence of alternate host plants, and poor field sanitation increase fruit fly population pressure, making management more challenging. As a result, the technology often fails to provide the expected level of control, leading to reduced confidence among farmers.

Conclusion

The use of fruit fly traps in cucurbits (bitter gourd and sponge gourd) at farmers' fields has a significant positive impact on crop health and productivity. Fruit fly traps help in effectively reducing the adult fruit fly population, which in turn lowers egg laying and maggot infestation in fruits. This results in reduced fruit damage, improved fruit quality, and a higher proportion of marketable produce in both the crops by 21.80% in bitter gourd and 17.65% in sponge gourd. By minimizing reliance on chemical pesticides, traps contribute to safer food, lower production costs, and protection of beneficial insects and the environment. Additionally, fruit fly traps serve as an important monitoring tool, enabling farmers to detect pest incidence early and take timely management actions. Overall, the adoption of fruit fly traps in cucurbits leads to increased yield, better economic returns, and sustainable pest management at the farmer's field level. This is safer for natural enemies and same trap can be used for other cucurbits after recharging. Further, water required for spraying of insecticide can be saved by adopting such ecofriendly-technologies.

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