

Monitoring of fruit fly, *Bactrocera zonata* (Diptera: Tephritidae) population by installing traps in mango orchard Bahawalnagar, Pakistan.

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Abstract

Mango is king of fruits and grown in various countries including Pakistan. The production of mango fruits in Pakistan is low due to attack of various insect pests especially fruit flies. Fruit flies are the major issue in the mango production. Fruit flies are considered as quarantine and key pests of Agricultural and horticultural crops causing huge losses in crop production. The current study was conducted at a farmer field in Bahawalnagar, to monitor the population of fruit flies installing different traps like bottle, jar, and pheromones traps (methyl eugenol) in mango orchards. Data were recorded from January, 2020-December, 2020. The results showed that maximum population of male fruit flies was captured in pheromones traps while minimum in jar traps. The population of fruit flies was emerged in month of April and no population was recorded in first three month and last one month of study. The June and July were the most favorable months for fruit fly attack on mango while December was least. Pheromones traps which are installed at 12 feet height from the ground surface captured 99% fruit fly population while lowest 30% population were captured at 4 feet height. Methyl eugenol trap were more effective to capture maximum population of fruit flies among tested traps. It can prove effective trap in controlling pest population in the mango orchards globally especially in Pakistan.

Keywords: Peach fruit fly, Tephritidae, Quarantine pest, Mango orchard, Bahawalnagar, Pakistan

Introduction

Fruit flies belong to order Diptera, and family Tephritidae consisted of 5000 species all over the world including Pakistan. These are destructive pest of various agricultural and horticultural crops especially soft fruits and vegetables (Haider et al., 2011; Nadeem et al., 2012; Prabhakar et al., 2012). It has been estimated that fruit flies directly or indirectly can cause 90-100% yield losses according to species, hosts, location, and season (Sapkota et al., 2010; Sharma et al., 2015). According to Hussain et al. (2010), US\$ 200 million/year losses are caused by fruit fly. Out of 5000

species, eleven species such as *Bactrocera dorsalis*, *B. zonata*, *B. cucurbitae*, *Carpomya vesuviana*, *C. incompleta*, *Dacus diversushad*, *D. ferrugineus* and *Myiopardalis pardalina* have been recorded in Pakistan (Abdullah et al., 2002; Stonehouse et al., 2002; Panhwar, 2005). Among eleven species, *B. zonata* is the primary polyphagous pest and cause economic losses and widely distributed in in tropical and subtropical areas of the world (Sarwar, 2006; Sarwar et al., 2013; Khan and Akram, 2018; Hasyim et al. 2008, Sarwar et al., 2013; Vargas et al., 2015). The fruits such as peach, mango, guava, citrus, apple, fig and apricot have

recorded highly infested fruits by this pest. It not only infest fruits but vegetables such as eggplant, tomato and pepper are considered its secondary hosts (Hashem et al., 2004; Ghanim, 2009; El-Gendy, 2012). The integrated pest management (IPM) techniques such as cultural, physical, mechanical, biological, botanicals, use of pheromones and chemicals etc. have been applied against *B. zonata* to minimize its attack and avoid yield losses (Ekesi and Billah, 2007; Ekesi et al., 2009; Manrakhan and Grout, 2010). The pest population is increasing now a days in study area, but no ecofriendly management technique is still proved effective in control this pest. Before the implementations of any approach against this pest, the proper knowledge about time of its attack on fruits and vegetables is very important. There is need to check the efficacy of traps against current pest. For this purpose, the current study was conducted.

Material and methods

The study was conducted at a farmer field in Bahawalnagar during 2020 to monitor the population of fruit fly, *B. zonata*. The different traps like pheromone traps, jar traps and bottle traps were installed on selected mango plants and all cultural practices were maintained

throughout the study period as standard. Pheromones traps were installed on different heights like 4,6,8,10, and feet heights from ground. There were three replications following the randomized complete block design (RCBD). The jar and bottle traps were prepared according to Javaid et al. (2020) and Abbas et al. (2018), while pheromones traps (methyl eugenol) were purchased from market. Data were recorded on weekly basis and number of males captured and counted. The mean population of male capture per trap, per week and per month were calculated.

Results and discussion

The current study showed that June and July are the favorable month for pest attack on mango fruits as compared to remaining months. During the first three months (January-March) and last month (December) of study no population of fruit fly was recorded. The highest fruit fly population was recorded in pheromones while lowest in jar traps. In month of June 196.98 fruit fly/pheromones trap was recorded while no population was recorded in January, February, March and December months. Chen and Ye (2007) had investigated the similar results about peak population of fruit flies.

Table 1. Average mean population of fruit flies captured in different installed traps

Months	Traps		
	Jar	Pheromones	Bottle
January	0.00	0.00	0.00
February	0.00	0.00	0.00
March	0.00	0.00	0.00
April	9.1	18.34	12.65
May	51.28	121.87	109.54
June	65.77	196.98	132.34
July	89.23	179.65	165.76
August	56.76	103.89	100.57
September	34.77	81.98	67.89
October	9.26	16.34	11.44
November	2.01	8.11	4.56
December	0	0	0

The peak attack of fruit fly was recorded in June month followed by July, August, May,

September, April and October (Table 1). Pheromones traps was found most effective

traps for capturing the male fruit fly followed by bottle traps and jar traps (Figure 1). In month of

August 100.57 male fruit fly/ bottle trap was captures while 56.76 in jar trap

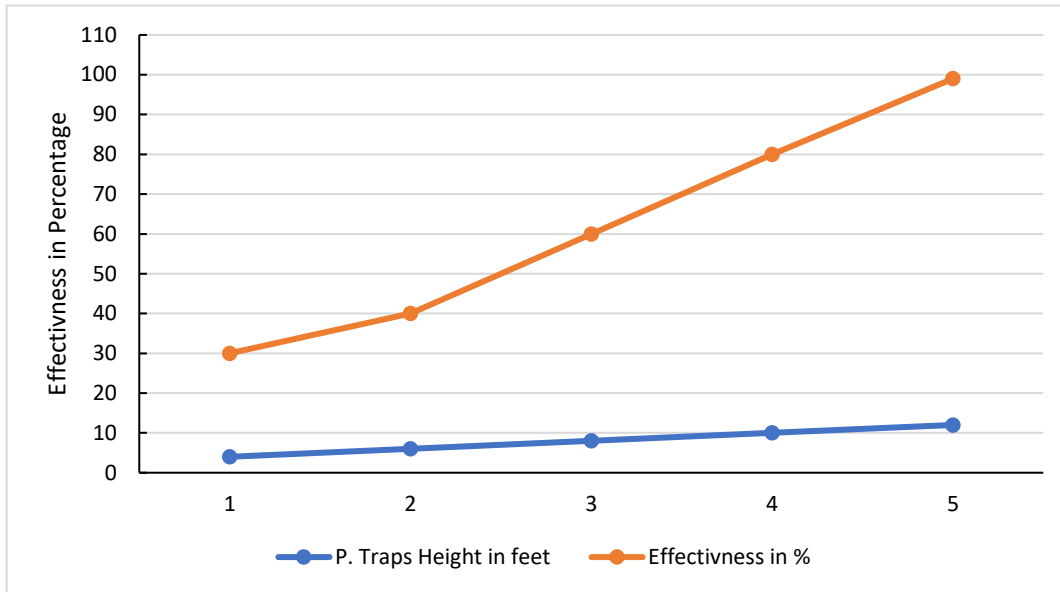


Figure 2. Effectiveness of Pheromone traps height to capture fruit flies

Pheromones traps which are installed at 12 feet height from the ground surface captured 99% fruit fly population while lowest 30%

population were captured at 4 feet height shown in Figure 2.

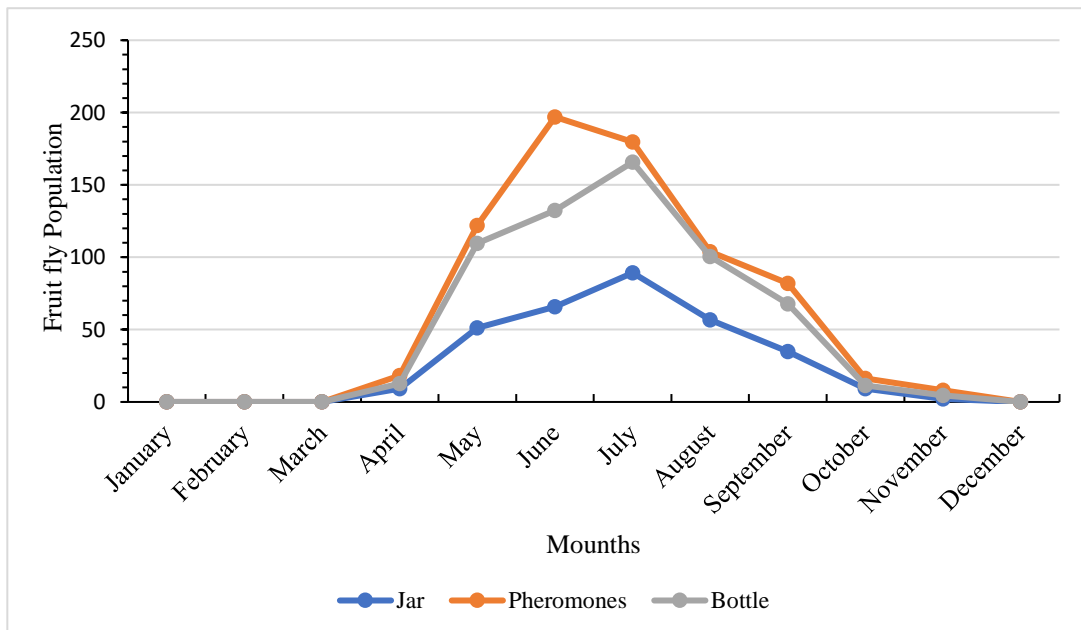


Figure 1. Population fluctuation of fruit flies captured in different installed traps

Our findings are not in line with previous studies in which they reported that the population of fruit fly increase with increase in

month (Javaid et al., 2020). In the current study, more variations in pest population were recorded. Our findings are similar to Javaid et al.

(2020). They had reported that no male fruit fly population was observed in month of January and December. Fruit fly population was started in month of April in all traps while decline from month of September (Figure 1). Win et al. (2014) had concluded that the fruit fly population started to decline after October while Mahmood and Mishkatullah (2007) had reported November to February. In another study August was reported the most preferable month for fruit fly attack (Gillani et al., 2002). The study concluded that pheromones traps were found best traps among installed traps. The population of pest can be minimized by installing pheromones traps like methyl eugenol as a sex attractant for fruit fly.

Conclusion

It can be concluded that fruit fly population started to appear in April gradually increases and reached its peak population during June and July and then declined afterwards. No population was recorded from December to March. Seasonal adaptation mechanism is necessary to control insect population. So, this study will be helpful to future predication when fruit fly population were more dangerous to mango orchard and also to adopt precautionary measure against fruit fly.

Conflict of interest

Authors declare no conflict of interest.

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