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Evaluation the efficiency of pheromone traps and monitoring of fruit fly population in peach orchards in Swat valley

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Abstract
Fruit flies are the major insect pests of fruits and vegetables and cause a huge economic damage to the fruits and cucurbits. To manage the pest, a proper monitoring strategy is needed. Usually sex attracting pheromone traps are used. Therefore a field study was conducted at Agriculture Research Institute (North) Mingora Swat to study the population of fruit flies and evaluate the efficiency of the pheromone traps in the monitoring and control of fruit fly. Three different designs of pheromone traps with sticker were installed in the peach orchards during summer 2011 and 2012. The recorded data showed that the population was at maximum at the beginning and decreased towards the end of the season. Analysis of variance showed significant differences among the populations trapped during different weeks of the seasons. The data revealed that the flat trap was the most efficient while the box trap showed poor performance. It is required that these traps may be assessed in other fruit orchards in different climates and regions of the country.

Keywords: Fruit Fly, Monitoring Peach, Pheromone, Population Traps

1. Introduction
Fruit flies (Diptera: Tephritidae) are common along the tropics and subtropics of the globe and cause significant economic damage to fruit and vegetable crops [1]. Apart from direct losses to fruit and vegetable crops; they slow down the pace of agricultural development in many countries due of the severe trade quarantines for export [2]. With increasing importance on quality of fruit and vegetable produce and with the prospect of growth of trade in horticultural produce, importing as well as exporting nations are giving increasing consideration to fruit fly management at pre-harvest and post-harvest stages [3]. The peach fruit fly, *Bactrocera zonata* (Saunders) and Mediterranean fruit fly (MFF), *Ceratitis capitata* (Wiedemann) are the most dominant and serious pests on fruit orchards in the world. They ruthlessly attack of more than 300 host fruits species while some vegetables as secondary hosts [4, 5]. Endeavors to control the fruit flies through baiting into killing devices were initiated during 1960's [6]. Since the pheromones of the fruit fly have been identified, its traps have been developed and tested as monitoring and control tools [7]. Baiting and cultural practices for management of fruit flies have been tried in most studies [8]. The present study was designed to evaluate the performance of different pheromone traps in peach orchard, to identify best trap for fruit fly monitoring and to promote the advance monitoring concept of fruit flies in Swat, Pakistan.

2. Methodology
The present study was conducted at Agriculture Research Institute (North) Mingora, Swat. The experiment was conducted in two consecutive seasons during 2011 and 2012. For this purpose the peach orchard was selected to install the pheromone traps. Three different types of traps equipped with synthetic pheromone traps provided by FUJI FLAVOR. LTD under the brand name FIELDCATCH® were used. These traps were included Flat trap (T1), Delta trap (T2) and Box trap (T3). The experiment was laid out in randomized complete block design (RCBD) with three replications. The traps were equipped with a lure (filled with synthetic pheromone) to attract the fruit flies and sticker to which the fruit fly sticks. The lure of the traps was used for one month and replaced after one month. Similarly the sticker was used for eleven days and changed after eleven days of interval. The data was recorded on weekly basis and recorded in the field notebook. Observations made were the number of flies trapped per week.

The trapped insects were counted and mean was calculated as fruit flies trapped per day. The recorded data was analyzed for LSD test using statistical package *MSTATC*.

3. Results and discussion

The data shows that that Flat trap (T1) trapped maximum number of flies compared to Delta (T2) and Box trap (T3) (Table 1). The table 1 shows that the number of flies trapped per week increased to mid of season while started decline toward the end of the season. The data shows that the population was maximum during mid of the season while decreased gradually towards the end of the season (Graph 1). The results revealed significant differences among these three traps for trapping flies. Laskar and Chatterjee [9] and Sharifi *et al.*, [10] also reported that the number of adult flies attracted per bait varied significantly in different baits/traps. Herman *et al.*, [11] reported differences in the trapping efficiency of three different traps Llopis *et al*., [12] noted significant differences among the trap in attracting and killing flies. The result revealed that flat trap (T1) was the most consistent and efficient trap as compared to the delta trap (T2) and box trap (T3). The analysis revealed that Flat trap (T1) trapped maximum number of flies during W1 (28.26), followed by Delta trap (T2). During the W1, Box trap captured lowest number (26.10) of the flies. Similarly, in the subsequent weeks (W2 to W10) Flat trap showed better performance followed by Delta trap (T2). Box trap showed lowest capturing efficiency as compared to Flat and delta traps. Laskar and Chatterjee[9] have also reported the efficiency of baits in fruit fly monitoring and control. Sharifi *et al.*, [10] noted that pheromone equipped traps attract and kill fruit flies and suggested that pheromone traps can be used to monitor and control fruit flies. Llopis *et al.*, [12] has reported the efficiency of fruit fly traps in fruit fly control and recommended its use to farmers.

Data shown in figure 1 indicates that the population of the fruit was low at the onset of the season (W1 and W2). The population trended to increase as the season advanced (W3 and onward) while start to decrease later in the season. Similar results have also been reported by Laskar and Chatterjee [9]. Mazomenos *et al.*, [6] also reported that fruit fly population trended to decrease later in the season.

Table1: Means of 10 weeks for number of flies trapped during June-Aug 2011-12

S. No	W1	W 2	W 3	W4	W5	W6	W7	W8	W9	W10
Flat trap	28.86a	29.45a	29.08a	29.43a	33.13a	32.41a	36.16a	34.5a	29.71a	25.66a
Delta trap	26.59b	26.22b	26.54b	28.34b	30.53b	30.57b	31.7b	31.7b	27.97b	25.33ab
Box trap	26.10b	25.51c	26.25c	27.75b	29.82b	28.98c	28.69c	29.36b	27.97b	24.877b
LSD	0.8495	0.6817	0.6659	0.6106	1.2182	0.9684	0.8171	0.0143	0.7654	0.5855

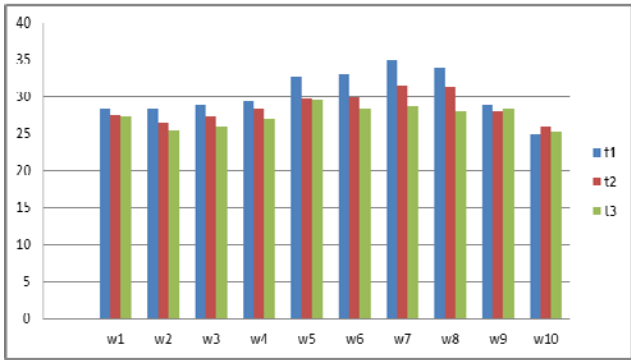

Fig 1: The graph shows fruit flies population trapped during 2011-12. Flat trap (t1), delta trap (t2) and Box trap (t3)

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