

## POPULATION DYNAMICS AND CONTROL OF FRUIT FLIES BY USING DIFFERENT TRAPS IN UNIVERSITY ORCHARD

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### ABSTRACT

Fruit fly belongs to family Tephritidae, found all around the world. It consists of 4,700 spp. in almost 500 genera. In the present paper the population dynamics and efficacy of different traps were studied. The present experiment was conducted at University orchard consisting of mango, citrus, loquat, guava, almond and peach trees. Four different traps were used to attract and capture the fruit flies. These traps include Methyl Eugenol, Apple, Peach fruits, Apple Vinegar, and bait of Banana, mango. Steiner type traps were placed in the orchard by complete randomized design. Fruit flies were collected from the traps after every seven days and preserved. The result indicated that methyl eugenol captured the maximum number of fruit flies. The maximum number of fruit flies were captured during the week 34-40. The oriental fruit fly was the dominated species in the University orchard.

**Keywords:** Fruit fly, Traps, Orchard, Methyl eugenol

### INTRODUCTION

Fruit flies are the most destructive pests of agricultural products including horticultural industry (Chinajariyawong *et al.*, 2003). Worldwide, there are 4000 species of fruit flies belonging to the family, Tephritidae. Among 350 species had caused economic losses to crops and showed a valid threat to the economy (White and Elson-Harris, 1992). A number of species belong to Tephritidae family damaged wide variety of different horticultural products like fruits, vegetables, seeds, leaves and other plant parts (Joomaye *et al.*, 2000; Prabhakar *et al.*, 2012). Fruit flies have been found almost in every part of the World. *Bactrocera* belongs to Tephritidae which comprises of 440 species spread mainly in hot and humid areas of Asia, the South Pacific region and in Australia (Haider *et al.*, 2011; Prabhakar *et al.*, 2012). *B. dorsalis*, oriental fruit fly causes 5-100 percent damage to a range of fruits in Pakistan (Syed *et al.*, 1970; Khan *et al.*, 2005). In Guava up to 80 % yield loss had been recorded (Abdullah *et al.*, 2002; Gillani *et al.*, 2002).

Adult female flies directly punctured the fruit and eggs were laid 2-4 mm deep inside the pulp. The larvae start damage after hatching. Fruit fly likes young and soft fruits for laying

eggs. The maggots live inside the developing fruits and take food from the fruit. Under the optimum conditions, fruit flies can complete their life stages almost in thirty days.

Different methods of pest control have been used to control the damage done by this pest throughout the world (Deguine *et al.*, 2015). Fruit flies control methods could be integrated like orchard sanitation with some chemical substance or control of pest with some other living organism refer as biological control. Sterile Insect Technique (SIT) could also be used to control this pest. In Pakistan, farmers mostly rely on insecticides for the management of this pest (Ahmed *et al.*, 2010; Nadeem *et al.*, 2012). The use of chemicals to control fruit fly had great risk to the environment. It caused environmental pollution, biomagnification, damage to non target organisms. Fruit fly has developed resistance against chemicals (Hsu and Feng, 2000; Maklakov *et al.*, 2001). With the use of chemical pesticides, cost of the production has also been increased. The use of lure or fruit fly attractant derived from any natural organic material or plants which involved smaller cost could present better results for control of fruit fly. These traps are harmless to the surroundings and no health hazard to the applicator. Methyl Eugenol is the most significant attractant and provides better results (Shelly *et al.*,

2010; Haq *et al.*, 2015). In the present research the population dynamics and efficacy of different traps were studied.

## MATERIALS AND METHODS

The study was conducted in Orchard at PMAS Arid Agriculture University Rawalpindi consists of different fruit trees .eg., almond, mango, peach, citrus and loquat.

### Composition of different traps

#### Treatment 1 (Trap 1)

It consists of Methyl Eugenol. In each trap cotton sticks were impregnated with 10 drops of Methyl Eugenol. After one week cotton sticks was replaced with the fresh cotton and 10 drops were added.

#### Treatment 2 (Trap 2)

It consists of apple and peach. These both fruits have smelled that help to attract the fruit flies in the orchard. Almost 500 gm of fruit was placed in the traps.

#### Treatment 3 (Trap 3)

It consists of Apple Vinegar. It was first boiled and then cooled at room temperature. Soap water drops were added to this. 100 ml of Apple vinegar was used in one trap.

#### Treatment 4 (Trap 4)

It consists of Bait of fruit pulp. Mango pulp, guava and banana were mixed together to form a recipe.

### Efficacy of different traps

Traps used in this research were Steiner trap type. These traps were used to hang with the trees under the shade. They were installed by complete randomized design at the height of 1.5 meter, so that adult flies may come easily and trapped. Every treatment had its five replications. Population of fruit flies was noted weekly.

### Population dynamics

The total number of fruit flies captured by different traps per month were calculated during 2015-16 to study the population dynamics of fruit flies in the University orchard.

### Identification of Fruit Flies Species

Fruit flies were identified on the basis of its morphological characteristics described by the pictorial key given by Prabhakar *et al.*, 2012.

## RESULTS AND DISCUSSION

### Efficacy of different traps

The number of fruit flies captured in different traps in the year 2015-16 shown in Fig. 1. Results indicated that methyl eugenol was more effective to attract the fruit flies as compare to all other treatments. The total number of flies caught during week 20- in methyl eugenol was 37.55 adults. The data of week 24 to 28 (15<sup>th</sup> of June to 6<sup>th</sup> of July 2015) showed a little variation (Fig. 1). The data of week 28-32 (13<sup>th</sup> of July to 3<sup>rd</sup> of August) showed small changes in the results. The data

indicated that methyl eugenol had highest number of adults per trap. During week 32-36 of 2015, mean population in methyl eugenol was 33.00 adults per trap while treatment number 4 had the mean number of fruit flies 5.75 per trap. Results indicated that population in the month of August start building up. The data from the week 36- 40 of 2015 (1<sup>st</sup> September to 29<sup>th</sup> September) revealed that population continued building up and mean population in methyl eugenol was 44 adults per trap. The results from the week 40-44 of 2015 (30<sup>th</sup> September to 27<sup>th</sup> October, Fig. 1) indicated once again decreased in the population.

Results from week 44-48 of year 2015 (28<sup>th</sup> of October to 24<sup>th</sup> of November, Fig.1) indicated that the population density continuously decreasing. The mean population of adults was lower than the previous month. The methyl eugenol was only able to attract 10.50 adults per trap while apple vinegar was at the lowest population with 0.15 adults per trap. Results from the week number 48 to 52 of 2015 (25<sup>th</sup> November to 22<sup>nd</sup> December) indicated that methyl eugenol attracted 4.95 adults per trap. Fruits and fruit bait attracted 0.40 adults per trap while apple vinegar attracted 0.10 adult per trap. Data from the week 52 of 2015 and 1-3 of 2016 (23<sup>rd</sup> December to 19<sup>th</sup> January) indicated the same trend as in the previous month.

The results of experiment during week 3 to 7 of the year 2016 (20<sup>th</sup> January to 15<sup>th</sup> February) revealed that mean population of fruit flies start increasing. The number of flies trapped were as follow 13.35, 1.25, 0.25 and 1.15 adults per trap in methyl eugenol, fruits, apple vinegar and fruits bait respectively. The mean number of fruit flies during week 7-11 of the year 2016 (16<sup>th</sup> February to 15<sup>th</sup> March) increased. The data of week 11-15 of 2016 (16<sup>th</sup> March to 12<sup>th</sup> April) showed the 23.55 adults per trap in methyl eugenol. The results of the experiment during week 15-19 (13<sup>th</sup> April to 10<sup>th</sup> May) indicated 26.15 adults per trap in methyl eugenol. Fruit traps caught 2.80 adults per trap.

### Population dynamics of fruit flies

The total number of fruit flies captured in all traps per month showed that the lowest population of 94 flies during January and the maximum population of 1094 fruit flies was recorded September, week 36-40 of 2015. Population build up started from last week of January (Fig. 2).

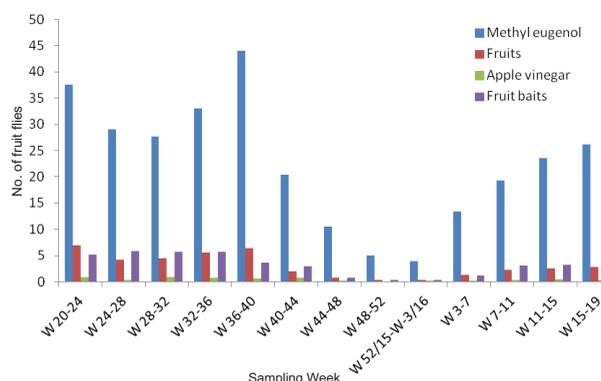
### Species of fruit flies

*Bactrocera dorsalis* Hendel, oriental fruit fly was the dominating species in the orchard. The other species found in the orchard was peach fruit fly, *Bactrocera zonata* saunders (Fig. 3).

This Paper described the efficacy of different traps to control fruit flies and population dynamics of fruit flies. The results indicated that methyl eugenol was the most effective tretamnet to attract the male fruit flies as compared with the all other treatments. The comparison among the efficacy of methyl eugenol, ethyl benzoate and molasses as bait for trapping the oriental fruit fly species *Bactrocera dorsalis* were studied by Chu *et al.*, 1996 and reported the similar results that 250-300 males were attracted toward methyl eugenol as compared with the molasses and ethyle benzoate (few fillies). It is reported that ME is a dominant lure used to

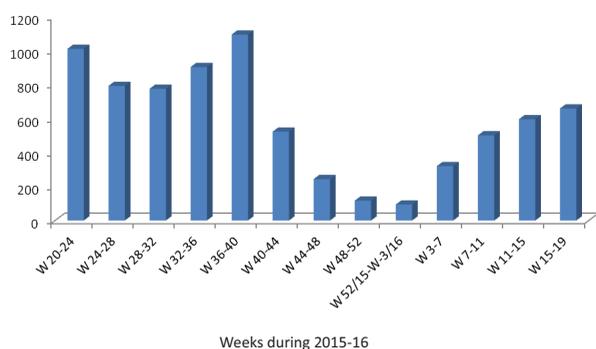
attract males of many tephritidae family species (Shelly *et al.*, 2010; Tan and Nishida, 2012) and According to ME, can be mixed or integrated with pesticide to use in male annihilation technique (Cunningham, 1989). MAT method has been effectively used in the suppression and managing of many *Bactrocera* species (Fletcher and Prokopy, 1991).

The present study indicated that the population of fruit flies was maximum during the week 36-40 and it was lower during week 48 to 1<sup>st</sup> three weeks of January. Abdullah and Latif (2001) also reported similar trend. The results of this study would be helpful for monitoring and management of fruit flies in the Pakistan.



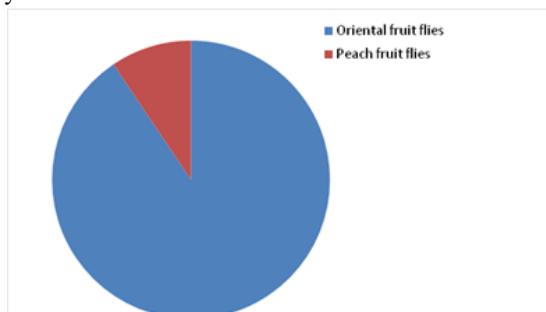
**Fig. 1**

Efficacy of different traps to attract fruit flies during the year 2015-16.



**Fig. 2**

Population dynamics of fruit flies during 2015-16 in University orchard.



**Fig. 3**

Population of Oriental fruit fly and Peach fruit flies in University orchard during 2015-16.

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