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## Effect of type trap, height and color in attracting and capture of peach fruit fly *Bactrocera zonata*

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### Abstract

The aim of the study is to find the best types, heights and colors of traps used in attracting and catching *Bactrocera zonata*. The study was conducted in orchard in AL-Jadriya / Baghdad during season of 2017, used four different types of traps were used, three different heights and four colors of the Jackson traps with sexual pheromone "Methyl eugenol" in attracting and capture the males of peach fruit fly *B. zonata*. The results were showed that local trap was the best and caught 110 insects; while the Jackson trap catch 106, Tephritrap was 61 and the red wasp modified trap 16 during the study period. Height results (1.5 , 2.0 and 2.5 m) showed no significant effect on attract of *B. zonata* males. Traps colors had significant effect on attracting and catching males of *B. zonata*. Yellow traps was the best which caught 880 males during study period, while white ,green and red traps caught 826, 707 and 541 males respectively. Based on the results of this study, the Jackson and local trap in yellow color and white "when put it on 2 m with sexual pheromone" was an affective method to predict *B. zonata* and estimate its population.

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## Introduction

Peach fruit fly (PFF) *Bactrocera zonata* (Saunders) family Tephretidae, Thisgenus includes about 440 species, which causing significant losses to many fruits of tropical and subtropical trees. Most species are found in the tropics, South Pacific and Australia (White and Elson-Harris, 1994). The damages that caused by PFF was reached 100% of fruit without control (Hardy, 1997). In addition quarantine preventing these fruits from entering to many countries which are importing these fruits (Joomaye and Price, 2000).

The Peach fruit fly was a polyphagy pest which infect more than 40 vegetable and fruit crops such as guava, mango, peach, papaya and citrus fruits (Alzubaidy, 2000; Stonehouse *et al.* 2002). Losses caused by the insect are estimated about 320 million \$ in the middle East and about 190 million \$ in Egypt annually (FAO/IAEA, 2000).

One of the most important methods used to manage pests, particularly fruit flies, are to monitor, predict and estimate the population density of pest by sexual pheromone traps. These method are including monitoring vacillate of peach fruit fly in horticulture through male trapping by specialized pheromone is considered the mainmethod of predicting and managing the pest (Draz *et al.* 2016). The use of pheromone traps is very effective for reducing the population density of the peach fruit fly, and the eastern fruit fly in mango and guava fields of India (Divender and Raniect, 2000), The use of white and yellow pheromone traps at zero height is effective to reducing the population density of the peach fruit fly. The first record of this insect in Iraq in 1972 from fruit samples imported from Bahrain (El-Haidari *et al.* 1972), then confirmed as peach fruit fly *Dacus zonatus* it has been infect fruits of peaches and mango, watermelon and Alfalfa. Then insect disappeared from the Iraqi environment (Al-Ali, 1977). After that fruit fly *B. zonata* was recorded in orchard fruit fly of Alhafriya city in Wasit province and caused severe damage to citrus fruites (Abdulrazak *et al.* 2016).

Because the wide spread for *B. zonata* this study was conducted to investigate the effects of pheromone trap design, color and height on attracting and capture males of *B. zonata* and the possibility of using pheromone trap for population monitoring in IPM program for this pest.

## Materials and methods

### *Effect of the trap type*

This study was conducted in the Al-Jadriya region at a fruit orchard of 60 acres planted with citrus, figs, pomegranates and olives trees during the period 15/5/2017 to 1/8/2017. The red wasp, Tephri, red Jackson trap and local traps. Which designed by the researchers. The local trap consist of a plastic bottles (10×30) cm with a hole in the top, and 8 mm diameter holes in three reciprocating lines with four holes per line. Specialized traps lured with Methyl eugenol (British IPM Company) used in all traps to attract males and Dichlorovus pesticide used in the first three types of traps which used as a killing agent inside the traps, while sticky strips used in Jackson trap. were recorded every at weekly Data and lures replaced every 15 days Three traps placed for each mandarin trees (trap/tree), the distance between trees was 25 m. The traps set randomly in different replicates, Traps checked weekly, and the number of males caught was record weekly.

### *Effect of trap height*

To evaluate the effectivners of traps height Nine red Jackson lured with (Methyl eugenol) in the same orchard, Traps were placed at three high (1.5, 2.0 and 2.5) m, and the distance between traps were 25m. Three trees and three replicates used for representing the height. These trees distributed randomly. Checked weekly, and the number of males caught in the traps recorded and lures replaced every 15 day.

### *Effect of trap colour*

Twelve Jackson traps used to determine the effect of color difference on the efficiency of the trap. White, red, yellow and green colors with wavelengths (250-700, 700-750, 600-650, 500-550 nm) respectively

.Three traps for each color used for this study which placed on mandrine trees at 1.8-2m height and the distance of 25m between trees. The results recorded every week, and the lures changed every 15 days. The experiments during 15/09/2017 to 28/11/2017. Used the Random Complete Block Design (RCBD),Data were submitted for analysis of variance (ANOVA) The means compared by LSD by 0.05%(Sahuki and Wahib,1990) , results analysed by SAS softwa 2010.

**Results and discussion**

*The effect of the trap type in attracting and catching B.zonata males*

Results in Table 1 indicated the presence of a significant differences between the numbers of *B.zonata* males caught in different traps .Local trap caught the highest numbers of 110 males from *B.zonata* during the study period of 10 weeks at 11 males/ trap/week, while Jackson trap had caught 106 males with average 10.6 males/ trap/week, which was not significantly different between two traps. Numbers caught in Tephri trap significantly differences from local and Jackson traps which caught 61 males with an average 6.1 male /trap /week ,while the red wasp trap was recorded least the numbers of male catching 16 male with average 1.6 male/trap/week.

**Table 1.**Number of males of *B. zonata* caught by different type of traps.

| Sampling date | Total No .of malescaught weekly |          |         |              |                    |     |      |
|---------------|---------------------------------|----------|---------|--------------|--------------------|-----|------|
|               | (Local) traps                   | Red trap | Jackson | Tephri traps | Modified wasp trap | red | Mean |
| 22/5/2017     | 13                              | 14       |         | 8            | 0                  |     | 8.7  |
| 30/5/2017     | 22                              | 24       |         | 15           | 2                  |     | 15.7 |
| 6/6/2017      | 3                               | 3        |         | 2            | 1                  |     | 2.2  |
| 14/6/2017     | 15                              | 12       |         | 8            | 4                  |     | 9.7  |
| 22/6/2017     | 12                              | 12       |         | 6            | 2                  |     | 8    |
| 30/6/2017     | 14                              | 6        |         | 6            | 2                  |     | 7    |
| 8/7/2017      | 6                               | 8        |         | 4            | 1                  |     | 4.7  |
| 16/7/2017     | 6                               | 2        |         | 5            | 1                  |     | 3.5  |
| 24/7/2017     | 11                              | 14       |         | 3            | 2                  |     | 7.5  |
| 1/8/2017      | 8                               | 11       |         | 4            | 1                  |     | 6    |
| Total         | 110                             | 106      |         | 61           | 16                 |     |      |
| Mean          | 11                              | 10.6     |         | 6.1          | 1.6                |     |      |

L .S.D = 2.85 to compare the numbers of male in traps.

L.S.D = 4.58 to compare the numbers of male at different times.

The superiority of the local and the Jackson traps by catching the highest numbers during the study may be due to the large number and size of holes in both traps that help the natural release and rapid spread of pheromones that attract the male to both traps. While Tephri trap is characterized by lack of holes that present in one side only, this is an obstacle to the spread speed of the pheromone.

The lowest number of males were caught in the red wasp trap, which may be dueto the inappropriate design with the flying style of *B.zonata* males.

In a similar study,( El-Shblawi,2012) found no significant differences between the numbers of the Mediterranean fruit fly – *Ceratitits capitata*, which was occurred in the local, Jackson and Tephri traps.while(Bekker *et al.*, 2016) indicate that Jackson's trap was superior compared with Tephri trap in catching of olive fly *Bactrocera oleae*.

**Table 2.** Number of peach fruit fly *B.zonata* males caught at different traps heights.

| Sampling data | Numbers of males caught/trap |      |       |      |
|---------------|------------------------------|------|-------|------|
|               | 1.5 m                        | 2 m  | 2.5 m | Mean |
| 22/5/2017     | 11                           | 15   | 13    | 13   |
| 30/5/2017     | 10                           | 21   | 15    | 15.3 |
| 6/6/2017      | 1                            | 2    | 1     | 1.3  |
| 14/6/2017     | 11                           | 23   | 11    | 11.2 |
| 22/6/2017     | 19                           | 21   | 17    | 19   |
| 30/6/2017     | 14                           | 20   | 19    | 17.6 |
| 8/7/2017      | 9                            | 7    | 3     | 6.3  |
| 16/7/2017     | 3                            | 5    | 7     | 5    |
| 24/7/2017     | 15                           | 3    | 9     | 9    |
| 1/8/2017      | 11                           | 11   | 7     | 9.6  |
| Total         | 104                          | 128  | 102   |      |
| Mean          | 10.4                         | 12.8 | 10.2  |      |

L.S.D = 3.58 to compare the numbers of catching males at different heights.

L.S.D = 6.53 to compare the numbers of male at different times.

*Effect of trap height on the numbers of B.zonata males*

Results of the study showed no effect of the trap height on attracting and catching males of the peach fruit fly. The statistical analysis showed that there were no significant differences between the numbers of males caught at different heights of the traps, although there are apparent differences in the numbers of catching. Results in Table (2) indicated

that superiority of the traps placed at 2 m height, were the highest number of males, reached 128 male during the study period, at an average of 12.8 males/ trap/week. Traps placed at a height of 1.5m height were caught 104 males at average 10.4 males/trap/week. While the traps at a height of 2.5 m were the lowest catching of males, reached 102 male during the study period male at average 10.2 male/ trap/week.

**Table 3.** Number of Peach fruit fly, *B. zonata* males caught in different colours of the Jackson trap.

| Sampling data | No. of males caught in different traps /Week |           |             |             | Mean  |
|---------------|--|-----------|-------------|-------------|-------|
|               | Yellow traps                                 | Red traps | White traps | Green traps |       |
| 26/9/2017     | 44   | 34        | 51          | 32          | 40.2  |
| 3/10/2017     | 57   | 31        | 51          | 48          | 46.7  |
| 10/10/2017    | 209  | 110       | 175         | 142         | 159   |
| 16/10/2017    | 156  | 52        | 131         | 99          | 109.5 |
| 24/10/2017    | 52   | 51        | 72          | 78          | 63.2  |
| 31/10/2017    | 95   | 77        | 96          | 76          | 86    |
| 7/11/2017     | 77   | 54        | 80          | 62          | 68.2  |
| 14/11/2017    | 78   | 61        | 60          | 58          | 64.2  |
| 21/11/2017    | 50   | 31        | 47          | 63          | 47.7  |
| 28/11/2017    | 62   | 40        | 63          | 49          | 53.5  |
| Total         | 880  | 541       | 826         | 707         |       |
| Mean          | 88   | 54.1      | 82.6        | 70.7        |       |

L.S.D =15.65 for colours of Jackson trap.

L.S.D = 24.75 For different sample time.

The absence of significant differences in numbers caught at different traps height may be due to the effect of pheromone presence and spread at all elevations. In a similar study, (Draz, 2016) confirmed that 2 m placing traps was the best for attracting males of peach fly. While El-Gendy (2012) indicated that the height 1.5 m is the best height to catch *B.zonata* males El-Shblawi (2012) observed that the height of the placing of the traps on 1.8 m is the best.

#### *Effect of trap colour on catching B.zonata males*

Results in Table 3 showed that, Yellow traps were superior, and the catching the highest numbers of males of 880 during the experiment at an average 88 males/ trap/week. Followed by white traps at 826 males at a average 82.6 males/ trap/weekly. While green-colored, traps recorded 707 males during the study and at a average of 70.7 males/ trap/weekly. Red traps caught the least numbers of 541 and a average 54.1 male/ trap/week.

As indicated by the above results, there is no significant difference among the traps in yellow, white and green. However, there were significant differences between the previous traps and red traps; the high attraction of yellow and white color may be attributed to the close of the two colors with the color of the plant hosts. Also, the intensity of light reflection of the white and yellow colors, especially at the beginning of the compared to green, red and black. Prokopy *et al.* (2000) confirm that yellow traps are the most attractive of the white and orange traps maturity of the fruits, which is accurately, distinguishes by insect individuals. The results were agreed with the findings Stark and Vargas (1992) that white and yellow colored plastic traps with methyl eugenol caught the highest number of the Mediterranean fruit fly *Ceratitis capitata*. whereas Mahdi (2000) indicates that the attraction of the fruit flies of the *Dacus ciliatus* to the yellow traps and then to white traps was a lesser degree. Al-Karboli (2000) indicates to the effectiveness of white trap and food attractant in the program of integrated control of *Delia alliria* Fonseca.

It can be concluded from the results of the study that the Jackson and local traps in yellow and white colors at the height of 2 m on trees are the most effective methods to predict the presence of this insect and estimate its population. Furthermore, pheromone traps can be used individually or within the program of integrated management for control of this insect by attracting and catching a large number of *B.zonata* males.

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