# FIELD EVALUATION OF SOME ATTRACTANTS FOR ATTRACTING THE ADULTS OF MEDITERRANEAN FRUIT FLY, *CERATITIS CAPITATA* (WIED) AND PEACH FRUIT FLY, *BACTROCERA ZONATA* (SAUND.)] IN MANGO ORCHARDS

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***Abstract***

Evaluation of some different attractants for attracting adults of Mediterranean fruit fly (MFF), *Ceratitis capitata* (Wied.) and Peach fruit fly (PFF), *Bactrocera zonata* (Saund.) was carried out through tw During the first experiment, all the attractants attracted PFF adults only, and Di-ammonium phosphate 3 % was the superior followed by Buminal 5 %, Bactrogel 1.3 % and Buminal 10 %.During the second experiment, all the attractants attracted both flies (MFF & PFF), but the capture of MFF adults were very low compared to the capture of PFF adults. Buminal 2.5 % and 10 % was the superior for attracting MFF adults, followed by Di-ammonium phosphate 2 %, Di-ammonium phosphate 3 % and Buminal 5 %. For attracting PFF adults, Di-ammonium phosphate 2 % was the superior, followed by Di-ammonium phosphate 3 %, Buminal 2.5 %. Buminal 5 % and Buminal 10 %.

## INTRODUCTION

Fruitflies (family : Tephritidae) are well known pests in Egypt. They attack fruits reducing both yield and quality. Mediterranean fruit fly (MFF), *Ceratitis capitata* (Wied.) causes considerably damage and significant economic losses in apricot, peach, guava, mango, fig and citrus (Awadallah *et al.*, 1974, Saafan, 1986, Hashem *et al.*, 1987 and Saafan *et al.*, 1989).

During 90's of the last century, the Egyptian ecosystem was attacked by one of the most harmful pests, the peach fruit fly (PFF), *Bactrocera zonata* (Saund.) infested different fruits and vegetables (*e. g.* mango, peach, fig, guava, apple, citrus, tomato, ... etc.) (Oakly, 1948, Narayana and Batra, 1960, Kapoor *et al.*, 1982 and El-Minshawy *et al.*, 1999). Steyskal (1977) mentioned that protein hydrolysate used in McPhail (1983) and Anonymous (1985) mentioned that the hydrolyzed protein preparation was used as a bait for certain insects such as med-fly. In Egypt, several trials were previously conducted to evaluate some attractants against PFF and MFF (Hafez and Ezzat, 1967, Saafan, 2000 and Hanafy *et al.* (2001).

The present investigation was designed to evaluate the efficacy of some attractants for attracting adults of the Mediterranean fruit fly (MFF), *Ceratitis capitata* (Wied.) and Peach fruit fly (PFF), *Bactrocera zonata* (Saund.) in mango orchards.

The present investigation is one of a serial investigations carried out on mango plantation (very high population of PFF), on citrus plantation (low population of PFF) and on apricot plantation (medium population of PFF).

Two objectives for using the attractants, the first one, using the attractants for fruit flies control (partial bait spray and killing bags), the second one, for detecting and monitoring MFF & PFF adults.

## MATERIALS AND METHODS

Two experiments were carried out in mango plantation at Sinuris & Ibshaway districts, Fayoum Governorate (Egypt) through the two successive seasons, 20002 and 2003, the adult flies of Mediterranean fruit fly, *Ceratitis capitata* (Wied.) and Peach fruit fly (PFF), *Bactrocera zonata* (Saund.).

The experiments were carried out in three mango locations (orchards) which represent the different dynamics of PFF population.

*** The first experiment** the 1*st* experiment was carried out during six weeks (27/8/2003 to 8/10/2002), and the attractants were used as follow :

- Buminal (protein hydrolyzate) as a food attractant (in two concentrations, 5 % and 10 %, during the 1*st* experiment, and in three concentrations, 2.5 %, 5 % and 10 % during the 2*nd* experiment).
- Di-ammonium hydrogen orthophosphate (3 %) as an aggregating attractant during the 1*st* experiment and at 2 % and 3 % during the 2*nd* experiment.
- Bactrogel, wettable powder 1.3 % during the 1*st* season only.

McPhail traps (described by Nicanor *et al.*, 1993) were used and baited weekly with the used attractants.

Five replicates of each concentration were placed in a randomized distribution with a distance of 30 m between every trap and other. The experiment was carried out for six weeks. Traps position were changed weekly. Captured flies were collected in plastic jar, inspected in laboratory of Plant Protection Research Institute (PPRI). Mean captured per trap per day "CTD" for males and females was calculated.

* **The second experiment** the 2*nd* experiment was carried out during six weekly inspections (29/7/2003 to 9/9/2003). The same procedures for trapping, lures, collecting captured flies, inspections and calculations were conducted as in the 1*st* experiment.

Results were analysed using two way ANOVA. Mean separation was conducted using L.S.D. ($P > 0.05$) (MSTAT Program).

## RESULTS AND DISCUSSION

* **The first experiment** During the six weeks of inspections (27/8/2002 - 8/10/2002) at three locations. All the attractants attracted PFF adults only during the experimental periods. Comparison between attractants, locations and periods of inspections will be done by the term of "CTD" captured per trap per day.

* **Peach fruit fly (PFF) captured :**

- **The 1*st* location** Represent relatively the high population of PFF. Table 1 shows that the total mean of "CTD" was 11.43, 8.63, 15.54 and 10.46 flies for Buminal 5 %, Buminal 10 %, Di-ammon.phosph. 3 % and Bactrogel 1.3 %, respectively.

  The statistical analysis of the data showed significant differences between Buminal 10 % and Di-ammon.phosph. 3 %, while there was insignificant differences between Buminal 5 % and Bactrogel 1.3 %, and between Buminal 5 % and Buminal 10 % and also between Di-ammon. phosph. 3 % and Bactrogel 1.3 %.

- **The 2*nd* location** Represent relatively the mid population of PFF. Data indicated that the total mean of "CTD" was 5.21, 3.35, 4.27 and 3.97 flies for Buminal 5 %, Buminal 10 %, Di-ammon.phosph. 3 % and Bactrogel 1.3 %, respectively.

  The statistical analysis of the data showed insignificant differences among the four attractants.

- **The 3*rd* location** Represent relatively low population of PFF. Data presented in the same table showed that the total mean of "CTD" was 0.36, 0.37, 0.13 and 0.45 fly for Buminal 5%, Buminal 10%, Di-ammon.phosph. 3% and Bactrogel 1.3 %, respectively.

  The statistical analysis of the data showed insignificant differences among the four attractants.

Summarizing the data in Table 1, it seemed that the grand mean of "CTD" for the three locations was 5.67, 4.12, 6.65 and 4.96 flies for Buminal 5 %, Buminal 10 %, Di-ammon.phosph. 3 % and Bactrogel 1.3 %, respectively.

Table 1. Mean capture per trap per day "CTD" of PFF in McPhail traps baited with different attractants, in mango orchards at the three locations during the 1*st* season (27/8/2002 to 8/10/2002).

| Attractants | Mean of CTD of PFF during inspection periods | | | | | | | | | Grand mean | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1*st* location | | | 2*nd* location | | | 3*rd* location | | | | | |
| | Male | Female | Total | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| Buminal 5 % | 4.21 | 7.22 | 11.43 ab | 1.60 | 3.61 | 5.21 a | 0.15 | 0.21 | 0.36 a | 1.99 a | 3.68 ab | 5.67 a |
| Buminal 10 % | 2.90 | 5.73 | 8.63 b | 0.96 | 2.39 | 3.35 a | 0.19 | 0.18 | 0.37 a | 1.35 a | 2.77 b | 4.12 a |
| di-Ammonium phosphate 3 % | 4.61 | 10.93 | 15.54 a | 0.87 | 3.40 | 4.27 a | 0.05 | 0.08 | 0.13 a | 1.84 a | 4.80 a | 6.65 a |
| Bactrogel 1.3 % | 3.83 | 6.63 | 10.46 ab | 1.06 | 2.91 | 3.97 a | 0.15 | 0.30 | 0.45 a | 1.68 a | 3.28 ab | 4.96 a |
| Mean | 3.89 a | 7.63 a | 11.52 a | 1.12 b | 3.08 b | 4.20 b | 0.13 c | 0.19 c | 0.32 c | 1.71 | 3.63 | 5.35 |

LSD values at 0.05 for :

| Attractants : | | | Locations : | |
|---|---|---|---|---|
| Male | 2.88 | 1.33 | 0.18 | 1.14 |
| Female | 4.93 | 2.69 | 0.21 | 1.99 |
| Total | 7.42 | 3.93 | 0.37 | 3.06 |

The statistical analysis of the data, in Table 1, showed insignificant differences among the four attractants, while there was significant difference between the three locations. Also, statistical analysis of the data in Table 1 showed insignificant differences between the four attractants in males, while for females there were significant differences between Buminal 10 % and Di-ammon.phosph. 3 %, insignificant differences among Buminal 5 %, Buminal 10 % and Bactrogel 1.3 % and insignificant differences between Buminal 5 % and Di-ammon.phosph. 3 %.

**** The second experiment :**

**A- Mediterranean fruit fly (MFF) capturedty the 1*st* location**

Represent relatively high population of MFF. Table 2 shows that the total mean of "CTD" was 0.13, 0.01, 0.06, 0.05 and 0.04 fly for Buminal 2.5%, Buminal 5%, Buminal 10%, Di-ammon.phosph. 2% and Di-ammon.phosph. 3%, respectively.

The statistical analysis of the data shows insignificant differences among the five attractants.

- **The 2*nd* location** Represent relatively the mid population for MFF. Table 2 indicates that the total mean of "CTD" was 0.02 fly for Buminal 2.5 %, 0.02 fly for Buminal 5 %, 0.04 fly for Buminal 10 %, 0.05 fly for Di-ammon.phosph. 2 % and 0.02 fly for Di-ammon. phosph. 3 %.

The statistical analysis of the data shows significant differences among the three attractants, Buminal 2.5%, Buminal 5%, Di-ammon.phosph. 3% and the other two attractants, Buminal 10% and Di-ammon.phosph. 2%, while there was insignificant differences among Buminal 2.5%, Buminal 5% and Di-ammonium phosph. 3 %, also between Buminal 10% and Di-ammon.phosph. 2 %.

- **The 3*rd* location** Represent relatively the low population of MFF. Data presented in Table 2 showed that the total mean of "CTD" was 0.02, 0.02, 0.04, 0.02 and 0.03 fly for Buminal 2.5%, Buminal 5%, Buminal 10%, Di-ammon.phosph. 2% and Di-ammon.phosph. 3%, respectively.

The statistical analysis of the data shows insignificant differences among the five attractants.

Summarizing the data in Table 2, it seems that the grand mean of "CTD" for the three locations was 0.05, 0.02, 0.05, 0.04 and 0.03 fly for Buminal 2.5 %, Buminal 5%, Buminal 10 %, Di-ammon.phosph. 2 % and Di-ammon.phosph. 3 %, respectively.

The statistical analysis of the data, in Table 2, shows significant differences among the five attractants.

**B- Peach fruit fly (PFF) captured :**

**The 1*st* location** Represent relatively the high population for PFF. Table 3 shows that the total mean of "CTD" was 6.93 flies for Buminal 2.5 %, 4.13 flies for Buminal 5%, 5.90 flies for Buminal 10 %, 20.57 flies for Di-ammon. phosph. 2 % and 17.48 flies for Di-ammon.phosph. 3%.

The statistical analysis shows significant differences among the three concentrations of Buminal and the two concentrations of Di-ammon. phosph., while there was insignificant difference among the three concen-trations of Buminal, also between the two concentrations of Di-ammon. phosph.

- **The 2*nd* location** Represent relatively the mid population for PFF. Data in the table indicate that the total mean of "CTD" was 1.54, 1.85, 0.85, 2.56 and 3.36 flies for Buminal 2.5 %, Buminal 5 %, Buminal 10 %, Di-ammon.phosph. 2 % and Di-ammon.phosph. 3 %.

The statistical analysis of the data shows significant differences among Di-ammon.phosph. 3 % and the two attractants, Buminal 2.5 % and Buminal 10 %, while there was insignificant differences between the three concentrations of Buminal, and also between the two concentrations of Di-ammonium phosph.

- **The 3*rd* location** Represent relatively the low population for PFF. Table (3) shows that the grand mean of "CTD" was 1.69 flies for Buminal 2.5 %, 1.17 flies for Buminal 5 %, 1.22 flies for Buminal 10 %, 3.36 flies for Di-ammon.phosph. 2 % and 2.32 flies for Di-ammon.phosph. 3 %.

The statistical analysis shows significant differences among Di-ammon.phosph. 2 % and the three concentrations of Buminal, also, there were significant differences among Buminal 5 % and the two concentrations of Di-ammonium phosph. There were insignificant differences among the three concentrations of Buminal, also, between the two concentrations of Di-ammonium phosph.

Summarizing the data in Table 3, it seems that the grand mean of "CTD" for the three locations was 3.38, 2.38, 2.66, 8.83 and 7.72 flies for Buminal 2.5 %, Buminal 5 %, Buminal 10 %, Di-ammon.phosph. 2 % and Di-ammon.phosph. 3 %, respectively.

Table 2 . Mean capture per trap per day "CTD" of MFF in McPhail traps baited with different attractants, in mango orchards at the three locations during the 2*nd* season (29/7/2003 to 9/9/2003).

| Attractants | Mean of CTD of MFF during inspection periods | | | | | | | | | Grand mean | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1*st* location | | | 2*nd* location | | | 3*rd* location | | | | | |
| | Male | Female | Total | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| Buminal 2.5 % | 0.05 | 0.08 | 0.13 a | 0.01 | 0.01 | 0.02 b | 0.01 | 0.01 | 0.02 a | 0.02 a | 0.03 a | 0.05 a |
| Buminal 5 % | 0.00 | 0.01 | 0.01 a | 0.01 | 0.01 | 0.02 b | 0.01 | 0.01 | 0.02 a | 0.01 a | 0.01 a | 0.02 a |
| Buminal 10 % | 0.01 | 0.05 | 0.06 a | 0.01 | 0.03 | 0.04 a | 0.01 | 0.03 | 0.04 a | 0.01 a | 0.04 a | 0.05 a |
| di-Ammonium phosphate 2 % | 0.02 | 0.03 | 0.05 a | 0.01 | 0.04 | 0.05 a | 0.00 | 0.02 | 0.02 a | 0.01 a | 0.03 a | 0.04 a |
| di-Ammonium phosphate 3 % | 0.03 | 0.01 | 0.04 a | 0.01 | 0.01 | 0.02 b | 0.02 | 0.01 | 0.03 a | 0.02 a | 0.01 a | 0.03 a |
| Mean | 0.02 a | 0.04 a | 0.06 a | 0.01 a | 0.02 a | 0.03 a | 0.01 a | 0.02 a | 0.03 a | 0.01 | 0.03 | 0.04 |

| Locations | | | Attractants | | |
|---|---|---|---|---|---|
| Sex | F-value | LSD 0.05 | Sex | F-value | LSD 0.05 |
| Male | 1.58 | 0.02 | Male | 0.63 | 0.02 |
| Female | 1.08 | 0.03 | Female | 1.16 | 0.04 |
| Total | 1.45 | 0.04 | Total | 0.69 | 0.06 |

Table 3 . Mean capture per trap per day "CTD" of PFF in McPhail traps baited with different attractants, in mango orchards at the three locations during the 2*nd* season (29/7/2003 to 9/9/2003).

| Attractants | Mean of CTD of MFF during inspection periods | | | | | | | | | Grand mean | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1*st* location | | | 2*nd* location | | | 3*rd* location | | | | | |
| | Male | Female | Total | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| Buminal 2.5 % | 3.32 | 3.61 | 6.93 b | 0.73 | 0.81 | 1.54 bc | 0.93 | 0.75 | 1.69 bc | 1.66 b | 1.72 b | 3.38 b |
| Buminal 5 % | 1.82 | 2.31 | 4.13 b | 0.64 | 1.21 | 1.85 abc | 0.61 | 0.57 | 1.17 c | 1.02 b | 1.36 b | 2.38 b |
| Buminal 10 % | 2.07 | 3.83 | 5.90 b | 0.28 | 0.57 | 0.85 c | 0.62 | 0.60 | 1.22 bc | 0.99 b | 1.67 b | 2.66 b |
| di-Ammonium phosphate 2 % | 7.04 | 13.53 | 20.57 a | 0.87 | 1.69 | 2.56 ab | 1.41 | 1.95 | 3.36 a | 3.11 a | 5.72 a | 8.83 a |
| di-Ammonium phosphate 3 % | 6.55 | 10.93 | 17.48 a | 1.11 | 2.25 | 3.36 a | 1.14 | 1.18 | 2.32 ab | 2.93 a | 4.79 a | 7.72 a |
| Mean | 4.16 a | 6.84 a | 11.0 a | 0.72 b | 1.30 b | 2.02 b | 0.94 b | 1.01 b | 1.95 b | 1.94 | 3.05 | 4.99 |

| Locations | | | Attractants | | |
|---|---|---|---|---|---|
| Sex | F-value | LSD 0.05 | Sex | F-value | LSD 0.05 |
| Male | 40.66** | 0.85 | Male | 6.89** | 1.10 |
| Female | 68.60** | 1.12 | Female | 15.91** | 1.44 |
| Total | 59.07** | 1.91 | Total | 12.13** | 2.46 |

Table 4 . Mean capture per trap per day "CTD" of MFF and PFF in McPhail traps baited with different attractants in mango orchards, Fayoum Governorate during the 2*nd* season (29/7/2003 to 9/9/2003).

| Fruit flies | MFF | | | PFF | | |
|---|---|---|---|---|---|---|
| Attractants | Male | Female | Total | Male | Female | Total |
| Buminal 2.5 % | 0.02 a | 0.03 a | 0.06 a | 1.66 b | 1.72 b | 3.38 b |
| Buminal 5 % | 0.01 a | 0.01 a | 0.02 a | 1.02 b | 1.36 b | 2.38 b |
| Buminal 10 % | 0.01 a | 0.04 a | 0.05 a | 0.99 b | 1.67 b | 2.66 b |
| di-Ammonium phosph. 2 % | 0.01 a | 0.03 a | 0.04 a | 3.11 a | 5.72 a | 8.83 a |
| di-Ammonium phosph. 3 % | 0.02 a | 0.01 a | 0.03 a | 2.93 a | 4.79 a | 7.72 a |
| Mean | 0.01 | 0.03 | 0.04 | 1.94 | 3.05 | 4.99 |
| F-value | 0.63 | 1.16 | 0.69 | 6.89** | 15.91** | 12.13** |
| L.S.D. at 0.05 | 0.02 | 0.04 | 0.06 | 1.10 | 1.44 | 2.46 |

The statistical analysis of grand mean, in Table 3, shows significant differences between the three concentrations of Buminal and the two concentrations of Di-ammon. phosph. There were insignificant differences among the three concentrations of Buminal, also, between the two concentrations of Di-ammon. phosph.

Table 4 illustrated that all the attractants attracted PFF more than MFF adults. For PFF adults, all the attractants attracted females more than males, while for MFF adults, Buminal 5 % attracted male's equal females, while Buminal 10 % and Di-ammon.phosph. 2 % attracted females more than males, Di-ammon.phosph. 3 % and Buminal 2.5 % attracted males more than females.

From the forementioned findings, it could be concluded that all the attractants attracted PFF adults only during the 1*st* experiment (August-October, 2002), while in the second experiment (July-September, 2003), all the attractants attracted both of the two flies (MFF & PFF), although the
captured of MFF adults were very low compared to the capture of PFF adults, because of the low population of the MFF in the tested locations.

In the two experiments, all the attractants attracted females more than males of PFF adults, but in the 2*nd* experiment, there were differences among attractants for attracting males and females of MFF.

The fore-mentioned results are in agreement with the findings of Hanafy *et .al* (2001), where they mentioned that, Di-ammon.phosph. 3 % was more efficient attracting PFF adults when used with other four Ammonium compound attractants.

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# التقييم الحقلى لبعض الجاذبات فى جذب الحشرات الكاملة لذبابة فاكهة البحر المتوسط وذبابة ثمار الخـــوخ

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نظرا لما تلعبه الجاذبات المختلفة لذباب الفاكهة من دور هام فى المكافحة، وأيضا فى الاستدلال على وجود الذباب، فقد تم التقييم الحقلى لجاذبات مختلفة لجذب ذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ وذلك فى سلسلة أبحاث أجريت فى حدائق المانجو (حيث تعداد ذبابة الخوخ مرتفع جداً)، وفى حدائق الموالح (حيث تعداد ذبابة الخوخ منخفض)، وفى حدائق المشمش (حيث تعداد ذبابة الخوخ متوسط) وذلك نظراً لعدم وجود أو ندرة وجود ذبابة فاكهة البحر المتوسط.

وهذا البحث هو الأول فى هذه السلسلة .. والذى أجرى فى حدائق المانجو بمركزى سنورس وأبشواى بمحافظة الفيوم، خلال موسمى ٢٠٠٢، ٢٠٠٣ حيث كانت نتائج تقييم المواد المختبرة كالتالى :

فى التجربة الأولى (٢٠٠٢) جذبت المواد المختبرة ذبابة ثمار الخوخ فقط، بينما لم تجذب ذبابة فاكهة البحر المتوسط (وذلك بسبب الإرتفاع الكبير جداً فى تعداد ذبابة الخوخ فى حدائق المانجو خلال ذلك الموسم) وكان الداى أمونيوم فوسفيت ٣ % هو الأكثر فى الجذب لذبابة الخوخ، تلاه البومينال ٥ % ثم البكتروجيل ١,٣ %، وكان الأخير فى الجذب هو البومينال ١٠ %.

فى التجربة الثانية (٢٠٠٣) جذبت المواد المختبرة كلا من ذبابة فاكهة البحر المتوسط وذبابة ثمار الخوخ إلا أن تعداد الذبابة الأولى كانت قليلة جدا إذا ماقورنت بأعداد الذبابة الثانية. كان البومينال ٢,٥ %، البومينال ١٠ % هما الأكثر جذبا لذبابة فاكهة البحر المتوسط تلاهما الداى أمونيوم فوسفيت ٢ % ثم الداى أمونيوم فوسفيت ٣%، ثم فى المرتبة الأخيرة البومينال ٥ %. وبالنسبة لجذب ذبابة ثمار الخوخ كان الداى أمونيوم فوسفيت ٢% هو الأعلى جذبا تلاه الداى أمونيوم فوسفيت ٣ %، ثم البومينال ٢,٥ %، بينما جاء فى المرتبة الأخيرة كلا من البومينال ٥% والبومينال ١٠ %.