J. Agric. Sci. Mansoura Univ., 32 (5): 3779 - 3789, 2007

ABILITY OF PEACH FRUIT FLY, *Bactrocera zonata* (SAUNDERS) TO ATTACK SOME HORTICULTURAL AND VEGETABLE FRUITS

Fetoh, B.A. and Nehad A. Soleiman
Plant Protection Research Institute (Ppri), Dokki, Giza, Egypt

ABSTRACT

Ovipositional preference of peach fruit fly, *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) was examined by using some usual and unusual horticultural and vegetable fruits. In addition to the known hosts list of the pest, it attacked two varieties of palm date and grape. Also, evaluation of susceptibility of three varieties of eggplant, tomato, mask tomato, potato and other cucurbits was elicited. Egg-larval and pupal durations in each separate plant fruit were determined. Also, total life cycle and percentage of adult emergence, life cycle and sex ratio were discussed.

INTRODUCTION

Fruit flies are of great importance in the whole world. With respect to host use, tephritids have been classified as monophagous like the olive fruit fly, *Bactrocera oleae* (Rossi), stenophagous like Asclapidaceae fruit fly, *Dacus longistylus* (Wied.), and oligophagous or polyphagous like *Bactrocera zonata* (Saunders) (White *et al.* 2000). Polyphagous species have always received the most attention because of it economic importance. Peach fruit fly, *B. zonata* is a dangerous polyphagous pest attacking many plant fruits. In Egypt, the pest was early detected in 1924 (Efflatoun, 1924) at Port Said governorate then it was disappeared. In early nineties, the pest was detected after incubating guava fruits collected from Khanka area in Qalubia governorate. Also, El-Minshawy *et al.*, (1999) had recorded the pest on guava fruits in 1999 in Alexandria and Hashem *et al.*, (2001), had studied the diversity and abundance of the pest in different horticultural orchards in Egypt. It was obvious that the pest is strong and destructive to many horticultural plant fruits. Peach fruit fly population increased and established rapidly as a result of suitable climatic conditions, neglecting the effective role of the internal plant quarantine between governorates and lack of action control measures. According to FAO/IAEA report (2000) the economic loss as a result of peach fruit fly infestation to horticultural plant fruits was estimated in Egypt as 190 million EUR / year. Few years ago, it was thought that peach fruit fly infestation is restricted to most of the horticultural fruits and few vegetables but under the current situation of this pest and its enormous increase, it attacked some plant fruits which were not observed before. In (2004) a dangerous and grasping attention phenomenon had floated on the surface, *B. zonata* attacked potato tubers in field in Giza governorate (Abd-Elsamea and Fetoh, 2006). Although not typical, this phenomenon indicates that this insect pest have the ability to use numerous plant fruits as hosts for its larval development (FAO, 2000).

Identification of new or unusual hosts of *B. zonata* is of interest, because this may shed light on the evolution of host finding and acceptance.

Also, this may provide clues to future host range expansion in host race formation in *B. zonata* in Egypt.

The main objective of the present work is testing and determining whether the introduced plant fruits are used by *B. zonata* as hosts and its preference to them. Also, life cycle, adult emergence and sex ratio are of interest.

MATERIALS AND METHODS

Sources and rearing conditions:

Peach fruit fly pupae were obtained from 13 generation old stock colony maintained at Horticulture Insect Department, Plant Protection Research Institute (PPRI). Two separate screen cages measured 50 × 50 × 50 cm were used to keep the adult flies and to introduce the plant fruits inside them. The flies were provided with sugar and protein hydrolysate in a ratio of 3:1 and water supply. Sixty hundred newly emerged flies were divided equally as 100 ♀:100 ♂ in three replicates and placed in each cage. The flies were kept under 25±1°C, 75-80 %RH and (14L: 10 D) till maturation.

Introduced plant fruits:

The plant fruits used in the present work are listed in Table (1) as follows:

Table (1): List of different host fruits introduced to *B. zonata*.

Family	Common name	Scientific name
Horticultural plant fruits		
Anacardiacae	Mango	*Mangifera indica*
Ebenaceae	Persimmon	*Diospyros kaki*
Myrataceae	Guava	*Psidium guajava*
Palmaceae	Palm date Two Varieties Variety 1 Zaghlol red Variety 2 Samani yellow	*Phoenix dactylifera*
Rosaceae	Apple	*Malus spp.*
Rutaceae	Grapefruit Lemon Valencia orange	*Citrus paradisi* *Citrus limon* *Citrus ssinensis*
Vitaceae	Grape Variety Melissa	*Vitis vinifera*
Vegetable plant fruits		
Cucurbitacae	Cantloupe Cucumber Striped gourd Zucchini	*Cucumis melo* *Cucumis sativus* *Cucumis dudiam elongate Cucurbita pepo*
Solanaceae	Rounded eggplant Long black eggplant Long white eggplant Musk tomato (=Harankash) Potato Tomato	*Solanum melonga* *Physalis pruinosa* *Solanum tubersum.* *Lycopersicon esculentum*

Puncture response and infestation of introduced plant fruits:

Test fruits were washed, weighed and introduced to the matured flies inside the screen cages. After 24 hours, the fruits were removed and kept

inside plastic containers 20 × 20 ×15 cm contained about 50 ml of sand for receiving resulted pupae. Each punctured fruit was kept separately. Puncture response was examined after 48 hours using binoculars and the punctures number was counted. The fruits were exposed to the flies in two ways:

Non -choice test:

The plant fruits were introduces to the flies inside the cages separately. The fruits were hanged as in the choice test and removed after 24 hours then kept in plastic containers to receive the resulted pupae.

Choice test:

The plant fruits were introduced to the flies inside the cages together at the same time. Each fruit was hanged inside the cage using a cotton thick thread folded two times around the fruit to enable the females to choose the puncture site freely and to prevent crowdies of females on the fruit surface. The fruits were removed after 24 hours and kept in plastic containers as above.

Egg-adult development and survival:

The tested fruits were incubated under 25±1°c and 75-80% RH. After 9 days, sand was sieved for presence of resulted pupae. The collected pupae were kept in transparent plastic cups (200 ml) till adult emergence. Sex ratio was determined from each plant fruits.

The puncture response and infestation methods were implicated for both horticultural and vegetable host as well.

Statistical methods:

Weight and fruit indices were transformed to *log* x+1 before analysis of variance (ANOVA). The means were separated by Duncan's multiple Range Test ($P \leq 0.05$).

RESULTS

Non-choice test:

The puncture response and the rearing success on the twenty species of the tested fruits are shown in Table 2. Peach fruit fly, *B. zonata* has punctured all the introduced fruits. Puncture response revealed the hosts usually responded differently to peach fruit fly even in closely related hosts. Among the horticultural fruits, the mean number of puncture varied from 2.33 (in grape) to 7.67 (in guava), while in vegetables the mean puncture number was from 1.0 (in harankash) and 11.0 (in striped gourd). Of the twenty fruit species which were attacked and punctured, two did not yield pupae, (lemon and cantaloupe). Dissection of these fruits showed that egg did not hatch properly. The mean yield of pupae /fruit from the successfully infested horticultural hosts ranged from 8.33 (in grape) to 130.33 (palm date, variety 2), while in vegetable fruits it was 2.3 (in harankash) and 212.7 (in rounded eggplant). Results of overall weight of fruits used in the test and their infestation indices are summarized in Table 3. Mean weight of horticultural fruits used was 16.08g / fruit (in grape) and 327.65 g/fruit (in grapefruit) but in vegetable fruits the lowest weight of fruits was 4.1 g/fruit (harankash) and the highest was 125.6 g/fruit (rounded eggplant). The overall infestation indices in

the horticultural fruits ranged from 102.0 to 3783.67 puparia /kg of fruits in grape and palm date fruits variety 2, respectively, while in vegetable fruits it ranged from 0.0, 243.9 to 1795.7 puparia /kg of fruits in cantaloupe, harankash and tomato, respectively. No significant correlation ($P > 0.05$) was detected between the fruit weight and number of puparia for any evaluated species. Mean pupal viability for those reared on horticultural fruits were 81.01 and 100.00 in grapefruit and grape, respectively, but those reared on vegetable hosts revealed 72.9 as in long black eggplant to 100.0 as in tomato, harankash, zucchini and cucumber.

Table (2): Infestation indices by the peach fruit fly, *B. zonata* on different horticultural and vegetables in non-choice test.

Fruits	Mean No. of Punctures/Fruit	Range of Punctures /Fruit	Mean No. of Pupae/Fruit	Range No. of Pupae/Fruit
Horticulture Fruits				
Mango	7.33a	(6 – 9)	78.33b	(70 – 85)
Guava	7.67a	(6– 9)	65.33b	(61 – 70)
Persimmon	5.65c	(5 – 6)	63.67b	(61 – 65)
Apple	7.61a	(3 – 6)	12.33cd	(9 – 16)
Palm date variety 1 (Zaghlol red)	5.59 c	(5 – 7)	64.33 b	(55 – 70)
Palm date Variety 2 (Samani yellow)	6.670b	(5 – 8)	130.32a	(105 – 171)
Grape	2.33 f	(1 – 3)	8.33d	(5 – 12)
Valencia orange	4.33d	(4 – 5)	30.00 c	(25 – 35)
Baladi lemon	4.33d	(3 – 5)	0.00d	(0-0)
Grapefruit	4.00e	(3 – 5)	33.34c	(3 – 5)
Vegetable Fruits				
Rounded eggplant	6.3 bcd	(5-7)	212.7a	(200-218)
Long black eggplant	2.0e	(1-3)	24.7e	(19-30)
Long white eggplant	7.0 bc	(2-3)	26.7e	(17-33)
Tomato	3.0 def	(2-4)	57.7c	(50-65)
Haranakash	1.0 ef	(1-1)	2.3 fg	(2-3)
Potato	2.7 def	(2-3)	113.3b	(105-120)
Zucchini	8.3 b	(4-14)	30.3e	(28-33)
Cucumber	5.3cd	(3-7)	11.0f	(7-15)
Cantaloupe	3.3 e	(2-5)	0.0g	(0-0)
Striped gourd	11.0 a	(2-5)	40.0d	(35-42)

The same letter(s) in the same column are not significantly different. ($P > 0.05$).
Numbers between brackets refer to the range.

Table (3): Mean weight of some horticultural and vegetable fruits, their infestation indices by the peach fruit fly, *B. zonata* and the respective pupal viability in non-choice test.

Fruits	Mean fruit weight (g)	Mean no. of pupae/kg of fruits	Pupal viability
Horticulture Fruits			
Mango	225.15b	348.66e	91.72a
Guava	111.79c	595.33d	90.27a
Persimmon	65.02d	980.12c	93.18a
Apple	121.78c	102.33f	87.43a
Palm date variety 1 (Zaghlol red)	25.81ef	2480.31b	90.11a
Palm date Variety 2 (Samani yellow)	34.52e	3783..67a	90.79a
Grape	16.08ef	511.67d	100.00a
Valencia orange	128.64c	232.33e	94.32a
Baladi lemon	5.90f	0.0 g	0.00b
Grapefruit	327.65a	102.0f	81.01a
Vegetable Fruits			
Rounded eggplant	125.6a	1672.0 bc	86.1ab
Long black eggplant	33.3bc	750.8 cd	72.9b
Long white eggplant	31.7bc	883.2 cd	79.5ab
Tomato	32.3bc	1963.6a	100a
Haranakash	4.1e	243.9 e	100a
Potato	57.7d	1795.7 b	88.0ab
Zucchini	35.3c	1000.0 c	100a
Cucumber	40.1bc	274.3 de	100a
Cantaloupe	124.7b	0.0f	0.0c
Striped gourd	99.5b	402.0 d	84.1ab

The same letter(s) in the same column are not significantly different. (P > 0.05).

Choice test:

Table 4 showed the puncture response in horticultural fruits which ranged from 1.0 (grapefruit and Baladi lemon) to 6.67 (mango and guava) while in vegetables it ranged from 0.0 and 2.3 (potato, harankash, cantaloupe and long black eggplant) to 10.3 (long white eggplant). Mean number of produced pupae varied from 4.0 (grapefruit) to 68.64 (mango) but in vegetables it was 0.0 in long white eggplant, harankash, potato & cantaloupe and 10.0 in cucumber and 127.7 rounded eggplant. Data in Table 5 refers that the mean weight of fruits ranged from 13.37 g (grape) to 321.46 g (grapefruit) and 3.5 g (harankash) to 125.0 g (rounded eggplant). The lowest mean number of puparia /kg produced was 16.9 (grapefruit) and the highest was 1736.3 (palm date variety 2) and it ranged from 0.0 (long white eggplant, haranansh, potato & cantaloupe) and 190.0 (striped gourd) to 1024.0 (rounded eggplant).

Table (4): Infestation indices by the peach fruit fly, *B. zonata* on different horticultural and vegetables in choice test.

Fruits	Mean No. of Punctures /Fruit	Range of Punctures /Fruit	Mean No. of Pupae/Fruit	Range No. of Pupae/Fruit
Horticultural fruits				
Mango	6.67 a	(5 – 8)	68.64a	(53 – 75)
Guava	6.67a	(6 – 7)	43.00c	(37 – 47)
Persimmon	5.63b	(5 – 6)	41.67d	(35 – 45)
Apple	2.00e	(1 – 3)	8.33g	(7 – 9)
Palm date variety 1 (Zaghlol red)	3.33d	(3- 4)	35.00e	(29 – 39)
Palm date Variety 2 (Samani yellow)	4.00c	(3 – 5)	55.01 b	(50-59)
Grape	1.66ef	(1 – 2)	6.0h	(5 – 8)
Valencia orange	2.00e	(1 – 3)	12.67f	(11 – 14)
Baladi lemon	1.00f	(1 – 2)	0.0h	(0-0)
Grapefruit	1.00f	(0 – 3)	4.00h	(0-12)
Vegetable fruits				
Rounded eggplant	7.3ab	(6-9)	127.7a	(110-150)
Long black eggplant	2.3de	(3-7)	27.3b	(21-31)
Long white eggplant	10.3a	(7-16)	0.0d	(0-0)
Tomato	3.7d	(3-5)	22.0bc	(18-28)
Haranakash	0.0e	(0-0)	0.0d	(0-0)
Potato	0.0e	(0-0)	0.0d	(0-0)
Zucchini	5.3bc	(4-7)	11.7cd	(10-18)
Cucumber	5.3bc	(3-7)	10.0cd	(8-11)
Cantaloupe	0.0e	(0-0)	0.0d	(0-0)
Striped gourd	6.0c	(4-7)	18.7bc	(15-20)

The same letter(s) are in the same column not significantly different. (P > 0.05). Numbers between brackets refer to the range.

Pupal viability in horticultural fruits pupae production was 75.0 and 100.0 from grapefruit and grape, respectively. In vegetable fruits it was 66.3 for pupae produced from striped gourd and 100.0 for those produced from long black eggplant and tomato. Tables 6&7 cleared that the shortest egg-larval duration was observed in palm date variety 2 fruits (8.0 days) and the longest was in grapefruit 19.67 days. In case of vegetables egg-larval duration ranged from 10 days (tomato) and 13 days (long white eggplant and cucumber). The shortest pupal duration was related to pupae resulted from guava fruits (8.33 days) and the longest was to those derived from grape and grapefruit (14.0 days). In vegetables, the pupal duration in all infested fruits ranged from 9.0 - 9. 5 days except those derived from potato which took 18.7 days. Adult emergence and sex ratio of the produced individuals are showed in Tables 6 and 7.

Table (5): Mean weight of some horticultural and vegetable fruits, their infestation indices by the peach fruit fly, *B. zonata* and the respective pupal viability in choice test.

Fruits	Mean fruit weight (g)	Mean no. of pupae/kg of fruits	Pupal viability
Horticultural fruits			
Mango	231.87b	295.33 cd	87.68 a
Guava	109.76 c	393.33 c	82.95 a
Persimmon	56.16d	740.66 b	83.20 a
Apple	113.10 c	73.33 e	84.03 a
Palm date variety 1 (zaghlol red)	23.29 de	1505.3ab	86.66 a
Palm date Variety 2 (Samani yellow)	32.09 de	1736.12 a	88.49 a
Grape	13.37 e	430.12 c	100.00 a
Valencia orange	125.73 b	101.33 d	76.32 a
Baladi lemon	5.19 f	0.00 g	0.00b
Grapefruit	321.46 a	16.97 f	75.02 a
Vegetable fruits			
Rounded eggplant	125.0a	1024.0a	96.7a
Long black eggplant	30.0f	900.0b	100a
Long white eggplant	38.0de	0.0d	0.0c
Tomato	32.3ef	681.0bc	100a
Haranakash	3.5g	0.0e	0.0c
Potato	57.7c	0.0e	0.0c
Zucchini	35.3 ef	343.0c	100a
Cucumber	40.2d	250.0cd	69.3b
Cantaloupe	125.2a	0.0e	0.0c
Striped gourd	99.5b	190.0d	66.3b

The same letter(s) are in the same column not significantly different. (P > 0.05).

Table (6): Biological parameters of the peach fruit fly, *B. zonata* reared on some horticultural fruits.

Fruits	Mean egg - larval duration in days [Ns]	Pupal period in days [Ns]	Adult viability [Ns]	Sex ratio [Ns]	
				♀	♂
Mango	9.33(9-10)	10.67(10-11)	77.35(76-79)	47.00	53.00
Guava	8.67(2-9)	8.33(8-9)	48.83(18-50)	45.00	55.00
Persimmon	11.33(11-12)	11.67(10-13)	48.18(46-50)	43.00	57.00
Apple	13.61(13-14)	12.33 (11-14)	16.29(15-17)	49.00	51.00
Palm date variety 1 (Zaghlol red)	11.33(10-13)	12.76(13-15)	57.33(55-59)	51.00	49.00
Palm date Variety 2 (Samani yellow)	8.0(11-12)	12.33 (12-13)	94.13 (3.72)	46.00	54.00
Grape	12.41(12-13)	14.00(13-15)	80.19(80-80)	44.00	56.00
Valencia orange	13.25(18-21)	13.67(13-15)	31.82(30-32)	37.00	63.00
Baladi lemon	0.0(0-0)	0.0(0-0)	0.0(0-0)	0.00	0.00
Grapefruit	19.67(12-17)	14.00(13-15)	26.13(25-27)	41.00	59.00

[Ns] non significant (P > 0.05).
Numbers between brackets refer to the range.

Table (7): Biological parameters of the peach fruit fly, *B. zonata* reared on some vegetable fruits.

Fruits	Mean egg -larval duration in days [Ns]	Pupal period in days [Ns]	Adult viability [Ns]	Sex ratio [Ns]	
				♀	♂
Rounded eggplant	12.0(10-14)	9.0(8-11)	91.50(86-97)	55.00	45.00
Long black eggplant	12.5(11-14)	9.5(8-11)	86.50(73-100)	63.00	37.00
Long white eggplant	13.0(11-14)	9.5(7.5-12)	80.00(80-80)	60.00	40.00
Tomato	10.0(9-11)	9.0(8-11)	100.00(100-100)	51.00	49.00
Haranakash	13.0(12-15)	9.0(6-12)	100.00(100-100)	53.00	47.00
Potato	11.7(11-13)	18.7(18-20)	78.50(69-88)	56.00	46.00
Zucchini	12.0(11-13)	9.0(8-11)	100.00(100-100)	53.00	47.00
Cucumber	13.0(12-14)	9.5(7.5-12)	83.00(66-100)	55.00	45.00
Cantaloupe	0.0(0-0)	0.0(0-0)	0.00(0-0)	0.00	0.00
Striped gourd	12.5(11.5-14)	9.0(7-11)	87.33(84-90)	53.00	47.00

[Ns] non significant (P > 0.05).
Numbers between brackets refer to the range.

DISCUSSION

From the results of the present work, it is obvious that peach fruit fly, *B. zonata* has the ability to attack many horticultural and vegetable fruits intensively. Infestation rate of peach fruit fly varied among horticultural and vegetable fruits as well, we may postulate that the value of the fruit as larval resource depends on its abundance and fruiting phonology. Herbivorous insects use a variety of host cues when foraging for oviposition sites. Studies that have measured insect host preference from close ranges have shown these cues to include size, shape, color and chemical structure (Prokopy and Owens 1983, Prokopy and Roitberg 1984). Other's work suggests that size plays an important role in the ovipositional response of females independent of the taxonomic status (Prokopy *et al.*, 1984). A more comprehensive understanding of how insects forage for oviposition sites may be obtained through examining the mechanism by which several hosts are integrated in host choice (Kennedy 1965, Chew and Robbins 1984). In other laboratory studies, it was found that Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) preferred larger hosts (Feron 1962, Sanders 1968, Nakagawa *et al.*, 1978). Also, many insects show preference for larger hosts when given choices of several sizes ((Mitchell 1975, Ahman 1984 and Courtney 1982) has suggested that females select larger hosts to maximize their reproductive efforts. Some tephritids prefer an intermediate size host that reflects the size of natural fruit most used by the females in field (Diehl and Prokopy 1986). This may explain why peach fruit fly oviposited in some unusual vegetable fruits as potato tubers in field; despite it is not one of the pest's preferred hosts. There is no previous searches in this trend found, but in the same direction other searches found on the host preference of the Medfly, *C. capitata* among vegetables like Back and Pemberton (1915) who mentioned that tomato and pepper attacked in Palestine by Medfly in non-choice test and no attack occurred on eggplant. Draz (1985) found that the most attractive vegetables to rearing Medfly were tomato, squash, hot pepper and cold pepper, while no pupation occurred in strawberry. Finally, Foda *et al.*,

(1989) mentioned that host preference of the Medfly among vegetables was arranged as: zucchini, tomato, pepper and no eggs deposed in eggplant.

The size of fruits is not the only reason makes the insect oviposition in plant fruit. De Sousa *et al.*, (1984) noted Medfly preferred red to green and yellow hosts and Nakagawa *et al.*, (1978) found that wild Medfly chooses yellow over red and green hosts. Agee *et al.* (1982) revealed that females are more sensitive to light in the 480 to 500 nm (yellow and green) range, this may explain the attack of peach fruit fly to palm date fruits (variety 1, zaghlol and variety 2, Samani). The ability of females to perceive differences in light density between fruits and foliage may help them to locate suitable hosts (Kennedy *et al.*, 1961). Medfly prefers fruit size of diameter 4.0 cm or less, spherical, green and fruit extract like grape (Freeman and Carey 1990). This also may give a hint of peach fruit fly oviposition in grape. Further more Suplicy Filho *et al.*, (1984) and Adalton Raga *et al.*, (2006) stated that there was no effect of weight of fruits on its susceptibility to fruit flies infestation. From another point of view, the economic importance of peach fruit fly is manifested to a large degree in the qualitative component of its life history. There are some aspects which play rather large role in enabling the pest population to multiply rapidly and persist during unfavorable periods. The extent to which generations overlap influences the relative amplitude of the population surges. The numerical gap between generations will be less as generation overlap increases. This is the case with the pest since generations will overlap highly if suitable hosts are available. In Egypt, it is well known that Delta and Nile Valley are cultivated with consecutive plant hosts either horticultural or vegetable and mostly mix of horticultural and vegetable fruits which give the opportunity to peach fruit fly to increase its infestation rate especially in case of absence of its favorable hosts to keep itself alive. Peach fruit fly lacks to diapause as the tropical and subtropical tephritids, so any contributions which individuals reared on less suitable hosts may be making toward population growth rate are effectively swamped by surge brought about peach fruit fly attacking key host. Another important reason which gives a great hand in increasing and distributing peach fruit fly in Egypt is absence of the internal quarantine role between governorates. Prevention of infested fruit transport from governorate to another by means of quarantine inspectors shall decrease the disaster we are facing in Egypt now as the infestation rate of peach fruit fly is increasing day after day which threatens fruit industry in Egypt and export future. The relationship between host and some biological aspects of peach fruit fly *Bactrocera zonata* (Saunders) will be undertaken in near future.

REFERENCES

Adalton Raga, Miguel F.De Souza Filho, Daniela A O. Perestes, De Azevedo Filho and Mario E. Sato (2006). Susceptibility of guava genotype to natural infestation by *Anastrepha* spp. (Diptera: Tephritidae) in municipality of Monte Algere do Sul, State of Sao Paulo,. Brazil. Neotropical Entomology, 35 (1): 121 – 125

Abd Elsamea, S. and Badr El-Sabah A. Fetoh (2006). New record of *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) on potatoes in Egypt. Egypt J. Agric. Res., 84 (1) 61-63.

Agee, H. R., E. Boller, Remund, J,C. Davis and D. L. Chambers. (1982). Spectral sensitivities and visual attractants studies on the Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann), olive fly, *Dacus oleae* (Gemlin), and the European cherry fruit fly , *Rhagoletis cerasi* (L.) (Diptera; Tephritidae). Z. Angew. Ent. 93 (4): 403 – 412.

Back, F. A. and C. F. Pembeberton (1915). Susceptibility of citrus fruits to attack of the Mediterranean fruit fly, *Ceratitis capitata* Weid. J. Agric. Res., (3)311-330.

Carey, J. R. (1984). Host specific demographic studied on the Mediterranean fruit fly, *Ceratitis capitata*. Ecological Entomology, 9, 261- 270.

Chew,F.S. and R. K. Robbins (1984). Egg lying in butterflies. Pp. 65 – 79. in R.I. Yane – Wright & P.R. Ackery [eds.] , Biology of butterflies. Academic , London.

Courtney, S.P.(1982). Convolution of Pierid butterflies and their cruciferous food plants. IV. Curicifer appearance and *Anthocharis cardamines* (L.) oviposition. Oecologica. 52 : 258 – 265.

De Sousa, H. M. L., O.H.D. Pavan and I.D. Silva (1984). Oviposition and alightment behavior of *ceratitis capitata* (Diptera : Tephritidae) on colored spheres. Rev. Bras. Entomol. 28 (1) : 11 – 14.

Diehel , S. R. and R. J. Prokopy (1986). host selection behavior differences between the fruit fly sibling species *Rhagoletis pomenella* and *R. mendax* (Diptera ; Tephritidae) . Ann. Ent. Soc. Am. 79 (1) : 266 – 271.

Draz, A. A. (1985). Studies on the role of the Mediterranean fruit fly, *Ceratitis capitata* (Weid.) as a pest of vegetables and fruits in Ismailia governorate. Ph.D. Thesis, Fac. Agric., Suez Canal Univ.

Efflatoun, H. C. (1924). A monograph of Egyptian Diptera part II., Fam. Trypaneidar. Men. Soec. Ent. Egypte 2(2)1-132.

El-Minshawy, A. M.; M. A. Al-Eryan and A. I. Awad (1999). Biological and morphological studies on the peach fruit fly, *Bactrocera zonata* found recently in Egypt. 8th Nat. Con. of Pests & Diseases of Vegetables and Fruits in Ismailia, Egypt.

F.A.O.(2000). Food and Agriculture Organization. Statistics Database, http:// www.fao.org.

Feron, M. (1962). L'insticnt de reproduction chez la mouche Mediterranean des fruit *Ceratitis capitata* Wied. (Dipt. : Trypetidae). Comportment sexual- comportment de ponte. Rev. pathol. Veg. Entomol. Agric. Fr. 41: 1 – 129.

Foda, S. M.; M. H. Saffan and A. G. Hashem (1989). Susceptibility of some secondary host fruits and vegetables to egg laying and larval development of Mediterranean fruit fly, *Ceratitis capitata* Weid. Egypt. J. Agric. Res., 67 (1)55-62.

Freeman, R. and J. R. Carey (1990). Interaction of host stimuli in the ovpositional response of the Mediterranean fruit fly (Diptera : Tephritidae). Environ. Entomol. 19 (4) 1075 – 1080.

Hashem, A.G., Mohammad, S. M. A. and El-Wakkad M.F. (2001). Diversity and abundance of Mediterranean and peach fruit flies (Diptera : Tephritidae) in different horticultural orchards. Egypt. J. Appl. Sci. 16 (1), 303 – 314.

Kennedy, J. S. (1965). Mechanism of host plant selection. Ann. Appl. Biol. 56: 317 – 322.

Kennedy, J. S., C. O. Both and W. j. S. Kershaw. (1961). host findind of the aphid in the field. III. Visual attraction. Ann. Appl. Biol. 49 : 1 – 21.

Michell, R. (1975). The evolution of oviposition tactics in the bean weevil, *Callosobruchus maculates* (F.) Ecology, 56 (3): 696 – 702.

Nakagawa, S., R. J. Prokopy, T. T. Y. Wong, J. R. Ziegler, S. M. Michell, T. Urago and E. J. Harris. (1978). Visual orientation of *Ceratitis capitata* flies to fruit models. Ent. Exp. Appl. 24 : 193 – 198.

Prokopy, R. J. and E. D. Owens (1983). Visual detectants of planrs by herbivourous insects. Ann. Rev. Entomol. 28 : 337 – 364.

Prokopy, R. J., P. T. McDonald and T. T. Y. Wong (1984). inter-population variation among *Ceratitis caitata* flies in host acceptance pattern. Entomol. Exp. Appl. 35: 65 – 69.

Sanders, V. W. (1968). Die eiablagehandlung der mittelmeerfruchtfliege *Ceratitis capitata* ihre abhängigkeit von größe und dichte der früchte. Z Tierpsychol. 25 : 1 – 21.

Suplicy Filho, N.; A. S. Sampaio; I. Myazaki; E. A. Bieran; D. A. Oliveira and A. A. Veiga (1984). Estudos de fatores determinantes do grau de susceptibilidade ao parasitismo por " mosca das frutas" *Anastrepha* spp., em cinco variedades de goiaba. Biolὸgico 50:169-179.

White, I. M. and M. M. Elson-Harris (1994). Fruit flies of economic significance: Their Identification and Bionomics. CAB international. Oxon, UK.601p.

"قدرة ذبابة ثمارالخوخ علي إصابة بعض ثمار الحاصلات البستانية والخضر"

بدر الصباح عبد المنعم فتوح و نهاد عبد الحميد سليم
اتمعهد بحوث وقاية النباتات– الدقي –جيزة– مصر

تم دراسة تفضيل ذبابة ثمار الخوخ لوضع البيض داخل بعض ثمار الحاصلات البستانية والخضر المعتاد والغير معتاد إصابتها بالحشرة ، وقد وُجد أنه بالإضافة إلي العوائل المعـــروف إصـــابتها بالحشرة انها تصيب بعض اصناف البلح مثل الزغلول الاحمر والسماني الأصفر والعنب (ميلسيا) كما تم تعين قابلية بعض ثمار الخضر مثل ثلاثة اصناف من ثمار الباذنجان والطماطم و البطاطس والحرنكش وبعض القرعيات للإصابة، وتم قياس فترة تطور الذبابة من البيض إلي الحشرة الكامله ، وكذلك دورة الحياة و النسبة المئويه لخروج الحشرات الكاملة والنسبة الجنســية بــين الإنـــاث والذكور.