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Population Density and Percentage of Infestation with Mediterranean fruit fly *Ceratitis capitata* (Wiedemann) in Two Iraqi Provinces

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Abstract:

The Population Density of Ceratitis capitata adults and the percentage of infestation of citrus and stone fruits with C. capitata larvae were studied during seasons of 2007, 2009 and 2011 in two Iraqi Provinces (Baghdad and Wassit). McPhail traps were used to estimate the mean No. of flies captured/ trap/ month in both locations. The results showed that the highest males flies captured/ month was 800 – 1000 males / trap during August – September 2009 in Al-jadirya orchard and 500 male/ trap during March 2011 in Wassit orchard. Furthermore, the results also illustrated that the highest percentage of fruit infestation was in Mandarin (77%, 65%, and 68% for years 2007, 2009 and 2011 respectively) then in Kaki (62%, 75% and 63%) for the same years respectively for Wassit orchard while, the percentage of infestation was 63%, 32%and 54% for 2007, 2009 and 2011 in Mandarin and 52%, 32% and 54% for the same years respectively in Apricot fruits.

Key words: Ceratitis capitata, percentage of infestation, population density, Iraq provinces

INTRODUCTION

Mediterranean fruit fly, *Ceratitis capitata* is considered as one of the most destructive pest on citrus fruits, stone fruits and vegetables (Vargas *et al.*1984) and it can complete development especially larval stage in the fruiting bodies of over 400 plant species in tropical, subtropical and temperate regions (Copeland *et al.* 2002).

Although Citrus are the main preferable host of this insect pest, it infests peach, pear, apple, grape, apricot, coffee, pomegranate, dates, moreover, it infests cucurbits and some flowers (Liquido *et al.*, 1990, Liquido *et al.,* 1991).

In Iraq *C. capitata* was recently identified during 2006, since then it spread to all citrus and other stone fruits orchards in the central and southern regions of Iraq. Moreover, the percentages of infestation are continuously increased, damages reducing yields by around 65% in citrus production. The recent identification expected to be as results of importation of citrus fruits from neighboring countries, especially Turkey, Iran, Jordan, Syria and Lebanon (Alrubeai and Khlaywi, 2007).

Number of techniques was used to control and manage *C. capitata* mainly either by applying chemical pesticides alone or with attractive bait traps, but these methods didn't achieve the requirement to eradicate this pest. Therefore, this project is proposed to use SIT to eradicate this pest. Therefore, the first step in this project is to estimate population density and percentage of infestation of different fruits types.

MATERIALS AND METHODS

Population Density

The population density of the Mediterranean fruit fly, *Ceratitis capitata*, was studied during the seasons 2007, 2009 and 2011. To chive this step two orchards were selected, the first citrus Orchard was in Wassit province (longitude: 45.7520954 and latitude: 32.6024025) south of Baghdad about 30 acres planted with different kinds of citrus (*citrus* spp). While the second orchard was in the same region but planted with the apricot, figs and apple.

Moreover other two orchards were chosen in Al-jadirya region – in Baghdad province (longitude: 44.348259 and latitude: 33.405002), again one planted with different citrus trees and the other planted with apricot, figs and apple.

The area of each of these orchards was 16 acres, therefore, one McPhail trap with sexual parapheromone Trimedlure was applied per 4 acres. Each trap was suspended on tree branches in a shaded area at a high 1.5 – 2.0 m and after every three weeks, new parapheromon was installed in each trap. Traps were inspected once time every week. The numbers of flies captured by the Mcphail were counted and the average/ trap/ month was represented.

INFESTATION RATE

A field experiment was carried out in the two locations

1. Location 1: Citrus orchard of 16 acres area in AL-Jadriya / Baghdad and another orchard also of 18 acres was planted with stone fruits.
2. Location 2: Citrus orchard and stone fruits orchard in Wassit province, the area of each orchard was 36 acres.

Fruits samples were collected randomly from host fruit orchard during 2007, 2009 and 2011 growing seasons. Rate of

infestation was recorded by examining 300 fruits taken randomly from each group. The collected samples were weighed, measured and then stored separately in the laboratory in plastic jar which were covered with organza clothes. To prevent entry of other flies and ants. These samples were incubated until the adult flies emerged to identified.

RESULTS

The results of population density of Mediterranean fruit fly, *Ceratitis capitata*, at Al-Jadirya orchard during the years 2007, showed that the highest mean of population density for this pest was reached to 974 male/ trap/ month and 832 male/ trap/ month during August and September respectively. The lowest mean of population density was 8 male/ trap/ month in October (Table 1).

Table (1): Mean No. of flies captured (Trap/ Month) at Al – Jadirya and Wassit orchards during 2007.

Date	Highest Density Per month in	
	Al – Jadirya	Wassit
March	52	38
April	98	86
May	213	178
June	406	171
July	195	243
August	974	3
Sept.	832	128
Oct.	8	215
Nov.	48	312
Dec.	9	62
Jan.	42	64
Feb.	32	37

Data also indicated during the same year that the highest mean of population density at Wassit orchards was 312 male/ trap/ month during November and the lowest mean of population density was 3 male/ trap/ month during August. It also notes

that the population density of Mediterranean fruit fly was started increased from March in both locations and in general the population density declined during Jan. Feb. and Dec. in both locations.

As for the year 2009 was observed that the population density of Mediterranean fruit fly began to increased from April reached to 117male/ trap/ month during June and the highest population density was 240 and 215 male/ trap/ month in November at Wassit and Al - Jadirya orchard respectively (Table 2).

Table (2): Mean No. of flies captured (Trap/ Month) at Al – Jadirya and Wassit orchards during 2009.

Date	Highest Density Per month in	
	Al – Jadirya	Wassit
March	24	32
April	43	52
May	98	86
June	117	218
July	74	56
August	18	2
Sept.	58	4
Oct.	65	108
Nov.	215	240
Dec.	158	96
Jan.	34	47
Feb.	17	32

During season (2011) the adults population of *C. capitata* was high in Nov. reached 402 male/ trap/ month at AL – Jadirya orchard and was reached 487 male/ trap/ month at Wassit orchard during March (Table 3).

Table (3): Mean No. of flies captured (Trap/ Month) at Al – Jadirya and Wassit orchards during 2011.

Date	Highest Density Per month in	
	Al – Jadirya	Wassit
March	270	487
April	118	8
May	32	5
June	18	10
July	112	18
August	215	66
Sept.	202	54
Oct.	314	181
Nov.	402	204
Dec.	210	50
Jan.	49	46
Feb.	52	34

Depending on the results of Figure (1) the population density of the *C. capitata* at Al-Jadirya orchard during the three years 2007, 2009 and 2011 showed that the highest mean of population densities was through 2007 and the lowest through 2009.

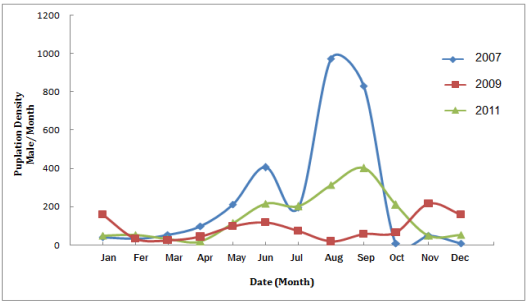

Figure (1): Mean No. of flies captured (Trap/ Month) in Al - Jadirya orchard during the years 2007, 2009 and 2011.

The results of Figure (2) showed that the highest mean of population densities of the fruit fly captured during 2011 and 2007 at Wassit orchard.

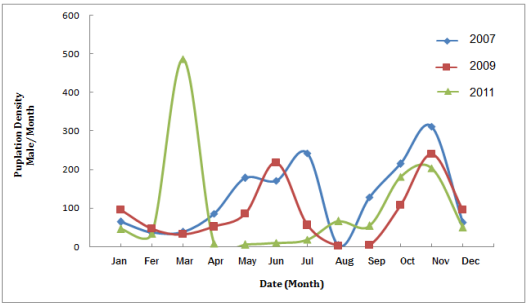

Figure (2): Mean No. of flies captured (Trap/ Month) in - Wassit orchard during the years 2007, 2009 and 2011.

Through the foregoing turns out that the highest population densities of *C. capitata* were during August and September at Al-Jadirya orchard during 2007, in addition the results in the Figure (1) also showed that the highest population densities of *C. capitata* at AL-Jadriya orchards were during 2007, because the Mediterranean fruit fly was introduced into Iraq in late 2006 (AL-Jaboory, 2006) and since then this pest spread to all citrus and other stone fruits orchards in the central and southern regions of Iraq. Moreover, host fruits availability affects on fruit fly density in addition to the availability of environmental condition fitness likes temperature and relative humidity. Furthermore, the absence of applying chemical pesticides in this year. In addition the population densities of *C. capitata* at Wassit orchard were the highest during Nov. and July (2007) , because of the different host plants in both location.

In general the population densities of *C. capitata* was noticed to be began increase during April and decline during December, because synchronized with precocity of the crop stage, where fruits of apricot began to mature through April . [Results are in harmony with that mentioned by Zaki (2008)] the population density increase of *C. capitata* adults coincides with the ripening stage of the fruits. The decline in population densities during December is attributable to low temperature

and unavailable host plants. These results are in agreement with those obtained by Compos *et al* (1989) and Ahmed and Mofleh (2003) in the Mediterranean region, host fruits are available around the year, therefore, temperatures is the main factor regulating level of populations in this areas.

In general the population densities of C. *capitata* at Al-Jadirya orchard during 2009 season were low compared to population densities during 2007 season in the same region. Due to use chemical pesticides all this year.

As for the results of the year 2011 the observed high densities of the Mediterranean fruit fly at Al-Jadirya orchards almost throughout the season as well as the continued presence in the citrus and fruits orchard. This indicated that this pest has ability to adapt to Iraqi environment and its endemism. Avido and Harpaz, (1996) and Liquido *et al* (1991) stated that C. *capitata* is adapted to various climates and it attacks most citrus varieties and subtropical fruits as well as some vegetables.

As for the results in Figure (2) showed that the population densities at Wassit orchard during 2011 was the highest in November and March during 2009 and 2011. Because of the availability of apricot fruits during March, as for the high population during Nov., due to attributable to the maturity of the citrus season and the presence of al kaki fruits in that period in the field. Both Mustafa and Abdul Jabbar (1996) and Ahmed and Mofleh (2003) noted that the peak of population density of the Mediterranean fruit fly in the coastal region of Syria and Jordan was at the middle of citrus growing season (Dec.). Moreover, the differences of population densities of Mediterranean fruit fly during different years for the same region was noted. Because of the different environmental conditions such as temperature and relative humidity as well as available or unavailable host plants, in many studies it has been noted that the climatic conditions affect the population

density of the Mediterranean fruit fly in hosts plant, in addition to the relationship between the spatial and temporal distribution of the population density of the Medfly and phenology of the hosts plant (Israely, 1996; Conti, 1990 and Harris, 1975).

Infestation Rate

The results of table (4) showed that the percentage of the infestation of the Mediterranean fruit fly at wassit region showed that the highest percentage rates were 77% for mandarin fruits and lowest percentage of infestation 25% on the local orange fruits during the year 2007. While the highest percentage of infestation was in the fruits of kaki where reached 75% and the lowest percentage of infestation 22% for local orange fruits during 2009. Whereas the highest percentage of infestation rate was 68% on the mandarin fruits and the lowest percentage of infestation rate was 28% on the local orange fruits during 2011.

Table (4): Mean Percentage of *Ceratitis capitata* infestation on different host fruits collected from Wassit orchard during the years 2007, 2009 and 2011.

Host fruits	Infestation Percentage (%)		
	2007	2009	2011
Oranges (local)	25	22	28
mandarins	77	65	68
kaki	62	75	63
apricots	45	58	60
Apple	42	45	38

As for al Al – Jadirya region the results showed that the highest percentage of infestation rate was 63% on the mandarin fruits and the lowest percentage of infestation rate was 32% during 2007 (Table 5). In 2009 the highest percentage of infestation rate was 38% on the figs fruits and the lowest percentage of infestation rate was 18% on the grapefruit, and during year 2011 the results showed that the highest

percentage of infestation rate was 54% for the apricot and mandarin fruits and the lowest was 28% on the grapefruit.

Table (5): Mean Percentage of *Ceratitis capitata* infestation on different host fruits collected from Al - Jadirya orchard during the years 2007, 2009 and 2011.

Host fruits	Infestation Percentage (%)		
	2007	2009	2011
Mandarins	63	32	54
Grapefruits	32	18	28
Oranges	36	26	45
Apricots	52	32	54
Figs	45	38	42

In general it is noted that the highest infestation rates were found on kaki, apricot, Mandarins and figs fruits. According to Liquido *et al* (1998), it attacks fruits of 374 species from 69 families, while 40% of them belong to the families Myrtaceae, Rosaceae, Rutaceae, Sapotaceae and Solanaceae. While Thomas *et al* (2001),and Umeh et al (2004) illustrate when the appropriate control is lacking *C. capitata* can damage up to 100% of a crop. While mentioning that the higher levels of damage may be expected when citrus fruits are thin- skinned or no other suitable fruits available for egg – laying (www.dpi.vic.gov.au).

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