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Efficiency of some Weather Factors on the Activity of Mediterranean Fruit Fly *Ceratitis Capitata* (Wiedemann) (Diptera: Tephritidae) on Guava Orchards at El-Dakhlia and Kafr El-Shaikh Governorate.

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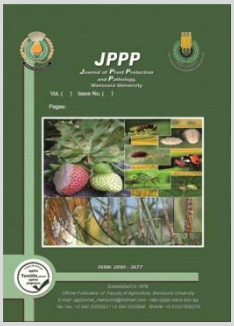

ABSTRACT

Mediteranean fruit fly (MFF), *Ceratitis capitata*, Wiedemann (Diptera: Tephritidae) is one of the most important pests destructing guava fruits. The present work aimed to study the adult activity of MFF using two sample methods and correlating the numbersof adults of MFF with Temperature and Relative humidity at El-Dakahlia and Kafr El-Shaikh Governorates during 2019and 2020 seasons. The obtained results indicated that MFFadults populations showed three distinct peaks at El- Dakahlia and Kafr El-Shaikh Governorates. The obtained results indicated that MFF recorded two peaks of the mean of infection per fruit and infection percentage, the first season at 15 August (4.43, 19.5%) and 22 August (4.76, 20.32). While in the second season recorded two peaks at (6 and 13 September) the percentage of infections were (19.67% and 22.65%) respectively. The MFF population exhibited insignificant and significant correlation coefficients with temperature in the first (r=-0.20) and second (r=0.87) seasons, whereas the population showed insignificant response to relative humidity at El-Dakahlia and Kafr El-Shaikh Governorates.

Keywords: *Ceratitis capitata* , Guava orchards, Temperature degrees, Relative humidity, Trimedlure

INTRODUCTION

The Mediterranean fruit fly (MFF), *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae) is one of the most important pests destructing fruits of over 350 species of fruits, nuts and vegetables round the world (Liquido; *et-al* 1991). In Egypt, the cause for MFF to accumulate its generations is the life of its hosts; so, it came about all around the year and multipliedfor the duration of the fruiting seasons of the orchards (Hashem, *et., al* 2001 and Ghanim 2017). Fruit production is negatively affected by Medfly; whereas, the females lay their eggs inside the fruits and the hatching maggots devour into the pulp. Moreover, the secondary infestations with bacterial and fungal diseases mostly occurred leading to fruits drop down and loss marketing value of fruits (White and Elson-Harris, 1994 and Borge and Basedow, 1997). Moustafa *et al.* (2014) and Ghanim (2017) mentioned that the presence of host fruit ripening is significantly increased fruit fly's population. On another hand, Saafan *et al.* (2005), Saafan *et al.* (2006), Ghanim and Moustafa (2009) and Moustafa *et al.* (2014) mentioned that Medfly population is significantly affected by some weather factors especially temperature degrees. According to Ghanim and Moustafa(2009) and Ghanim (2017), relative humidity plays a minor role in the build-up of Medfly population.

The danger of MFF established order has always been excessive precedence for nation location engaged in global alternate because of the fly quarantine importance, and an ongoing look for new and stepped forward semiochemical based control and detection methods remain a excessive precedence (Jang 2006 and El-Metwally ,2016). Fruit fly detection and control programs typically rely on traps baited with male sex attractant lures. Trimedlure is widely used as the "standard" synthetic male MFF attractant (Beroza,1964). It is a sex-specific attractant that widely used in detection, monitoring and control programs around the world. Trimedlure is deployed in solid dispensers that are placed in Jackson traps (IAEA,2003). Two grams of trimedlure is formulated in a polymeric plug-type dispenser that provides controlled release of the attractant for about eight weeks in Jackson traps [Leonhard *et., al* 1987, Gilbert and Bingham 2013, El-Metwally 2017 and El-Metwally, 2019). The disruption effect of MFF males was examined with different emission levels of trimedlure (Navarro *et., al* 2011). Previous studies had been done to evaluate the efficiency of diluted sex attractants of fruit flies (Drilling and Dettner 2009 ;El-Abbassi and El-Metwally, 2013 ; Ghanim ,2013; El-Metwally, 2017 and El-Metwally, 2019). The perform, life history, natural enemies and control of *C. capitata* in exceptional geographical areas were defined in lost of studies (WhiteandElson-Harris,1994 and Pappadopoulos *et al*., 2001). Seasonal activity of MFF population is highly laid low with two factors, presence of host fruit ripening similary to climatic conditions particular temperature degrees, Saafan *et al.* (2005), Saafan *et al.* (2006), Ghanim and Moustafa (2009) and Moustafa *et al.* (2014) stated that MFF population is significantly affected by from afwe weather elements especially temperature degrees. According to Ghanim and Moustafa(2009) and Ghanim (2017), RH% performes a minor position in the build-up of Medfly population. For this, the aim of this work was to study the occurrence of Medfly in guava orchard and its response to certain ecological factors (temperature degrees, relative humidity).

MATERIALS AND METHODS

An area of 5 feddans, (one feddan = 4200 m^2) planted with guava trees was for the prevailing study at The Experimental farm of Mansoura University, El-Dakahlia

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governorate. In the area with the same crop was selected in Kafr El-Shaikh governorate. The two governorates are located in the north of Delta area, Egypt.

Fruit sampels

Five trees of each orchard were homogenous in size and age were selected and marked for this study. Fruit samples were collected weekly, from the 8th of August till the 9th of November 2019 in Dakahlia governorate and from the 21st of August till the 20th of November 2020 in Kafr El-Shaikh governorate . Each sample consisted of 25 fruits (5 fruits / tree) that collected randomly from different cardinal directions (north, south, east and west) and middle of the trees. One fruit was collected for each direction) in addition fruits were collected randomly from the fallen fruits under the selected trees. Fruits samples were transferred to the laboratory for examination. Each fruit was incubated separately in a plastic dish covered with a piece of muslin for two weeks. Plastic container were containing a film of sand (about 2 cm in height), for receive the pupae resulted from the fruit fly larvae.

After two weeks, the incubated fruits were investigated and classified as un infested and infested fruits. The resulted pupae from each infested fruit were transferred to a tube and re-incubated for another two weeks under laboratory conditions until adults emergence. The resulted adult of MFF were counted for each infested fruit. The percentages of infestation were calculated as follows:

$$\text{Infestation \%} = \frac{\text{No. of infested fruits.}}{\text{Total number of the collected fruits.}} \times 100$$

Trap samples

Five white Jackson traps (Harris *et al*., 1971) were hanged in a shady side of the trees at height of two meters (with a rate of one trap per one feddan). All traps were provided with trimedlure (the sex attractant of MFF) which was renewed every four weeks. The traps were inspected every week and number of captured flies on each sticky cardboard inside trap was counted with renewal cardboard strips. The number of captured flies per trap and day (FTD) was counted as a measure of insect population.

Using the meteorological data, daily averaged temperatures and RH% were collected from the Agrometeorological Stations at El-Dakahlia and Kafr El-Shaikh governorates of investigations. The mean weekly FTDs was correlated with each weather factor using the Person simple regression coefficient and the explained variances were determined as well. In addition, the relation between FTDs and infestation percentages were evaluated. All of statistical analyses were done by using Minitab Computer Program (1998).

RESULTS AND DISCUSSION

1. Occurrence of Medfly in Guava orchards:

Results in Figure (1) illustrated that Medfly population had three distinct peaks of activity during guava fruiting season, of 2019. These peaks have been recorded at (27th of September 2019) , in the 4 of October and 11 October . The numbers of attracted flies per trap per day (FTD) at these peaks were (7.62, 9.95 and 7.48) During the second guava fruiting season (2020) at Kafr El- Shaikh , Medfly population showed three distinct peaks of activity. These peaks have been recorded, in the beginning of season 21 of August (FTD) = 2.81), 11th of September (FTD = 3.14) and 25th of September (FTD = 2.71), respectively (Figure, 1).

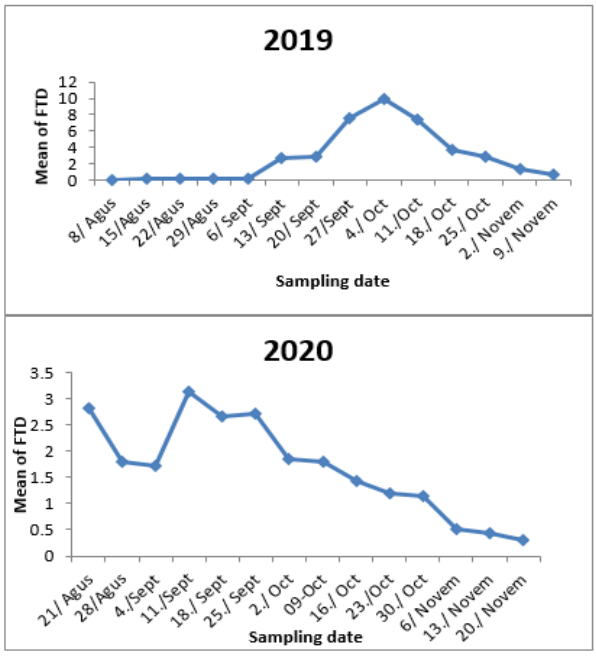

Fig. 1. Occurrence of Medfly in guava orchard during fruiting seasons of (2019) at El Mansura district, Dakahlia governorate and (2020) at Kafr El-Shaikh governorate.

2. Occurrence of Mean infection per fruit and percentage of infection:

Data in Fig (2) indicated that *C. capitata* recorded two peaks of the mean of infection per fruit and percentage of infection the first season at(15(4.43, 19.5%) and 22 August (4.76, 20.32)). While in the second season recorded two peaks at (6 and 13 September) the percentage of infections were (19.67% and 22.65%) respectively.

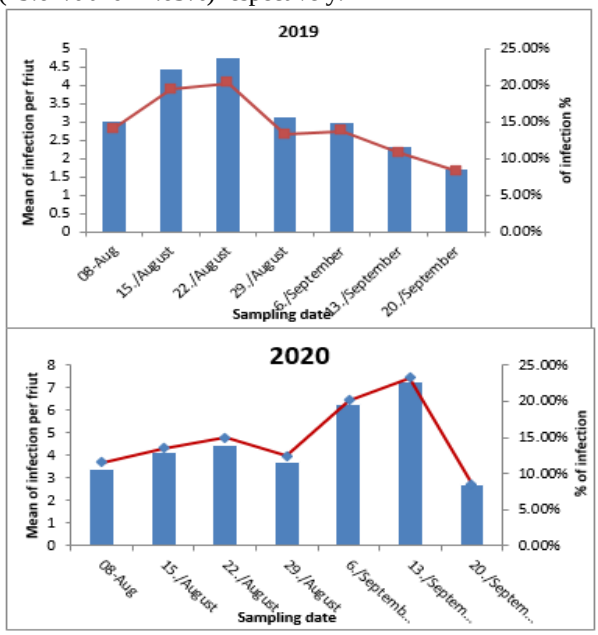

Fig. 2. Mean of infection per fruit and percentage of infection in guava orchard during 2019 at El Mansura district, Dakahlia governorate and 2020 at Kafr El-Shaikh governorate.

Data in Fig (3) indicated that percentage of infection per fruit of MFF were decreased by (0.025) in the first season , while it increased by (0.024) in the second season.

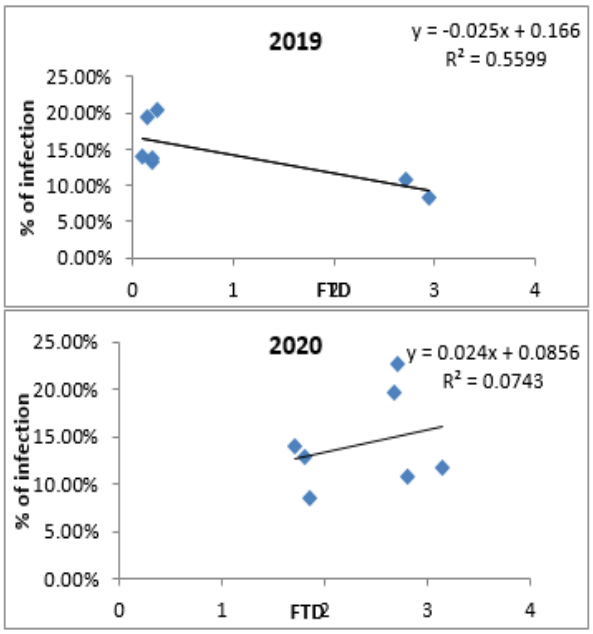

Fig. 3. The relation between FTD and percentage of infection per fruit of *C. capitata* in guava orchards during 2019 at El Mansura district, Dakahlia governorate and 2020 at Kafr El-Shaikh governorate

4. Response of Medfly to certain ecological factors:

As shown data in Table (1), Medfly population indicated low responses to the every of mean temperature and RH% during 2019 season. These responses have been at the lowest values with temperature degrees; whereas, the correlation coefficient value was insignificant during the first (r = -0.20) season, in addition, the determination coefficient value (R2) was **(**4.1%**),** in the second season temperature degrees; whereas, the correlation coefficient value was significant (r=0.87) and (R^2) was (76.5%). In response to relative humidity the correlation value was insignificant during first season (r=0.19) and second season(r=-0.19) respectively. The common effect of all the tested factors represented by 4.1% and 79.9% of the total elements affecting on Medfly population at the first and 2d seasons.

The relationship between percentage of infection per fruit and the prevailed climate factors (mean temperature and RH%), was studied throughout two seasons(2019) at El-Mansura district, Dakahlia governorate and (2020) at Kafr El-Shaikh governorate(Table.2).

Table 1. Correlation and regression coefficients between Medfly population and each of temperature degrees, relative humidity in Guava orchards at El-Mansura district, Dakahlia governorate during (2019)and Kafr El-shekh governorate during (2020) seasons.

Season	Factors	Correlation and regression				Multi regression		
		r	B	P	R^2	B	P	E.V%
2019	Temperature degree	-0.20	0.23	0.48	4.1%	- 0.18	0.84	4.1%
	Relative humidity	0.19	0.10	0.50	3.7%	0.02	0.94	
2020	Temperature degree	0.87	0.24	0.000	76.5%	0.26	0.00	79.9%
	Relative humidity	-0.19	- 0.06	0.49	3.9%	0.07	0.20	

In the first season % of infection per fruit exhibited significant positive correlation, (r=0.86) response of mean temperature, while the effect of R.H.% was highly significant negative (-0.84). In the second season static analysis showed that insignificant positive correlation between the percentage of infection per fruit and mean temperature (r=0.32)and negative significant (r=-0.64,)between of mean R.H. %, respectively (Table.2).

Table 2. Correlation and regression coefficients between percentage of infection per fruit and each of temperature degrees, relative humidity in Guava orchards at El-Mansura district, Dakahlia governorate during (2019)and Kafr El- Shaikh governorate during (2020) seasons.

Season	Factors	Correlation and regression				Multi regression		
		r	B	P	R^2	B	P	E.V%
2019	Temperature degree	0.86	1.68	0.01**	78.3%	0.02	0.19	82.1%
	Relative humidity	-0.84	-4.3	0.02*	69.6%	-0.01	0.27	
2020	Temperature degree	0.32	0.16	0.48	12.2%	0.03	0.55	64.8%
	Relative humidity	-0.64	-2.3	0.11	36.1%	0.01	0.17	

Discussion

The obtained results showed that MFF population recorded (3 peaks) of activity. These results are in agree with those obtained by Ghanim (2012), Moustafa *et al*. (2014), Ghanim (2016 & 2017) and Amara (2017); they reported that Medfly population showed two to four peaks of seasonal abundance in persimmon, apple, guava, grape, peach and citrus orchards in Dakahlia and El-Beheira governorates. Also, Hashem *et al.* (2001), reported that Medfly population had one to two peaks of seasonal abundance. While, Ghanim and Moustafa (2009), mentioned that Medfly exhibited four peaks of seasonal abundance .

Statistical analysis of the present study explained that temperature degrees play insignificant roles in increasing of Medfly population in the first season and significant relationship in the second season. These results support those obtained by Afia (2007) and Ghanim (2017); they cited that the effect of climate elements on Medfly population did now appear significantly during its active period While, Saafan *et al.* (2005), Saafan *et al.* (2006) and Ghanim and Moustafa (2009) they obtained that Medfly populations were significantly correlated with temperature degrees.

Data illustrated that relative humidity showed insignificant correlation in the first and second seasons. This agree with Herrera and Vinas (1977) they stated that the density of MFF, being positively correlated with temperature and negatively RH. Moustafa *et al*. (2014) reported that Medfly is significantly affected by temperature degrees and relative humidity. Ghanim *et., al*(2018) indicated that low responses to the every of mean temperature and RH% . These responses had been at the bottom values with temperature levels; the correlation coefficient value was insignificant during the first and 2d seasons. Kounatidis *et al*. (2008), they referred to geographic location and weather also is predicted to have vital effect upon the ability of the population to expand and thrive.

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دراسة تأثير بعض العوامل المناخية على نشاط ذبابة فاكهة البحر الابيض المتوسط على محصول الجوافة فى محافظتي الدقهلية وكفر الشيخ.

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الملخص

تعتبر ذبابة الفاكهة من أهم الافات التى تصيب محصول الجوافة . ويهدف هذا البحث لدراسة ديناميكية تعداد ذبابة فاكهة البحر الأبيض المتوسط ودراسة تأثير درجات الحرارة والرطوبة على تعداد الآفة فى كلا من محافظتى الدقهلية وكفر الشيخ . وقد أثبتت النتائج وجود ثلاث ذروات لتعداد الحشرة فى كلا من محافظة الدقهلية وكفر الشيخ ، كما أشارت النتائج الى وجود ارتباط مع درجات الحرارة غير معنوى (ر=2و) ومعنوى (ر=87و) فى الموسم الاول للمحافظتين على التوالى ، وكان الارتباط غير معنوى مع الرطوبة النسبية فى كلا من المحافظتين محل الدراسة.