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Survey and Population Density of Thrips, *Frankliniella Occidentalis* (Pergande) Infesting Some Vegetables Plant Flowers

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ABSTRACT

Field trial was conducted during two successive seasons on 2015 and 2016 in Qalubiya and Kafer El Sheikh Governorates. This study aims to survey of WFT *Frankliniella occidentali*s (Pergande) infesting flowers of some vegetables flowers, effect of population density of WFT *F. occidentalis* infesting flowers on some different vegetables and effect of some ecological factors on population density of WFT *F. occidentalis* infesting flowers of some different of vegetables. The survey showed that thrips ***F. occidentalis*** recorded on nine important flowers of vegetables. Eggplant flowers and pepper flowers were the most superior flowers vegetable in high infestation during two successive seasons 2016&2017 at the two locations. The general weekly mean number of the *F. occidentalis* was higher abundant at Kafr El Sheikh Governorate than these recorded in Qalubiya Governorate throughout two successive seasons 2016 and 2017 at vegetable crops. Maximum, Minimum temperature and the relative humidity were showed insignificant negative effect during the two successive seasons 2016&2017 at vegetables crops.

Keywords: WFT *Frankliniella occidentalis* vegetable crops, survey, population density, Maximum temperature, Minimum temperature and relative humidity.

INTRODUCTION

Western flower thrips (WFT), *Frankliniella occidentalis* (Pergande 1895) (Thysanoptera; Thripidae), originates from California in the USA, and is a very harmful thrips species. Since the 1960's, it had a limited dispersion in the northwestern USA, Canada and Mexico. However, it has spread to many countries around the world since the 1970's (Anonymous 2002; Kirk & Terry 2003). In Tunisia, WFT is still considered to be a quarantine pest following its introduction in the early 1990's due to indirect damage caused by the transmission of viruses such as Tomato spotted wilt virus (TSWV) and impatiens necrotic spot wilt virus (INSWV) (Elimem *et al*. 2014). WFT is a polyphagous thrips species that may attack a large range of plant species belonging to several botanical families (Belharrath *et al*. 1994; Kirk 2001; Kirk & Terry 2003; Cloyd 2009). In Egypt, El-Wakkad (2007) recorded and identified WFT (*F. occidentalis*) on flowers of five fruit varieties, apple, citrus, grape, guava and mango also, he stated that, sky-blue color trap was the most attractive color to thrips. In addition, *F. occidentalis* was the most dominant species in apple, citrus and mango followed by *Thrips tabaci* Lind.

Trials conducted in this work aimed to survey and population density of *F. occidentalis* upon some vegetable flowers were recorded as a new host for the first time in Egypt so, the present work aimed to study the following aspects:

- Survey of WFT *F. occidentalis* infesting flowers of some vegetable flower crops.
- Effect of Population density of WFT *F. occidentalis* infesting flowers of some different vegetable crops.
- Effect of some weather factors on population density of WFT *F. occidentalis* infesting flowers on some different vegetable crops.

MATERIALS AND METHODS

For studying the survey of (*Frankliniella occidentalis* Pergande) on vegetables crops experiment was carried out in Qalubiya and Kafr El-Sheikh Governorates during 2016&2017 season.

- Sampling technique:

The work started during end of summer seasons 2016 & 2017. We take fifteen randomly flowers chosen from different side of area in early morning at 7 o'clock and picked up from each treatment then kept in tightly closed paper bags and transferred to the laboratory at the same day for examination and identify with the aid of a stereomicroscope. The sampling was taken 7 days intervals continued until 8 weeks for all treatments. The total numbers were registered and the mean were calculated number of (nymph and adult) of *F. occidentalis* on (eggplant, tomato, pepper, bean, zucchini, cantaloupe, watermelon, cucumber, *Cucumis*) to study the population density and the effect of Maximum temperature, Minimum temp. and Mean relative humidity (R.H %). on population density of *F. occidentalis* in different location, the simple correlation (r) and the partial regression (b) were calculated between each of the above mentioned factors (Xs) and the weekly mean numbers of *F. occidentalis*. Analysis of variance (ANOVA) was performed on *F. occidentalis* infesting and location, between crops variables **(SAS, 1999)** and appropriate error terms for the F tests of interactions were calculated separately. Comparisons of means were performed using the Duncan's multiple range test (= 0.05).

RESULTS AND DISCUSSION

Some ecological aspects on the Western Flower Thrips (WFT), *Frankliniella occidentalis* (Pergande) (Thysanoptera; Thripidae), infesting some vegetable flowers under natural conations in Qalubiya and Kafr El Sheikh Governorates throughout two successive seasons 2016 and 2017, were investigated.

1- Survey of WFT *F. occidentalis* infestating flowers of some vegetable crops: -

Data in Table (1) showed that the survey of thrips, *F. occidentalis* recorded on nine important flowers of vegetable crops (eggplant, tomato, pepper, bean, zucchini, cantaloupe, watermelon, cucumber, *Cucumis*) revealed that eggplant and pepper flowers were the most superior flowers of vegetables in high

infestation during two successive seasons 2016&2017 at two locations followed by cantaloupe and cucumber flowers were recorded high infestation in Kafer El Sheikh Governorate during two successive seasons 2016&2017.as well as, low infestation recorded in tomato and watermelon flowers in Qalubiya Governorate but in Kafer El Sheikh Governorate recorded low infestation in zucchini and *Cucumis* flowers during two successive seasons 2016&2017.

Table 1. Survey of WFT *F. occidentalis* infesting flowers on some vegetables in Qalubiya and Kafr El Sheikh Governorates throughout two successive seasons 2016 and 2017.

English name	Family	Scientific name	Abundance degree	
			Qalubiya	Kafr El Sheikh
Eggplant	Solanaceae	*Solanum melongena*	+++	+++
Tomato	Solanaceae	*Solanum lycopersicum*	+	--
Pepper	Solanaceae	*Capsicum annuum*	+++	+++
Bean	Leguminosae	*Phaseolus vulgaris*	--	--
Zucchini	Cucurbitaceae	*Cucurbita pepo*	--	+
Cantaloupe	Cucurbitaceae	*Cucumis melo var. cantalupensis*	--	+++
Watermelon	Cucurbitaceae	*Cucumis melo*	+	--
Cucumber	Cucurbitaceae	*Cucumis sativus*	--	+++
Cucumis	Cucurbitaceae	*Cucumis melo flexuosus*	--	+

***abundance degree (+ =1 to 10) few, ++ = (10 to 20) moderate, +++ = (20 to 100high abundant)**

2- Population density of WFT *F. occidentalis* infesting flowers on some different vegetable crops.

Generally weekly mean number of the WFT *F. occidentalis* was higher abundant in Kafr El Sheikh Governorate (110 individual WFT / 50 flowers) than these recorded (70 individual WFT / 50 flowers) in Qalubiya Governorate throughout two successive seasons 2016 and 2017. (Irrespective of varieties in vegetable flowers). The statistical analysis of the total mean number of WFT showed insignificant difference at 0.05% for two locations whereas F. value equal (0. 85). Fig (1).

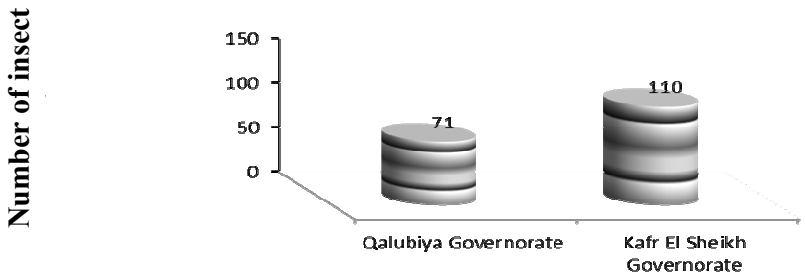

Fig. 1. Population density of WFT *F. occidentalis* infesting flowers of some vegetables in Qalubiya and Kafr El Sheikh Governorates throughout two successive seasons 2016 and 2017.

Qalubiya Governorate

On the other hand, general weekly mean number of the WFT *F. occidentalis* were higher abundant on pepper and eggplant (35 and 33 individuals WFT / 50 flowers) follow by tomato and watermelon in few numbers. The statistical analysis of the total mean number of WFT showed insignificant difference at 0.05% whereas F. value between vegetables equal (0.58). Fig(2).

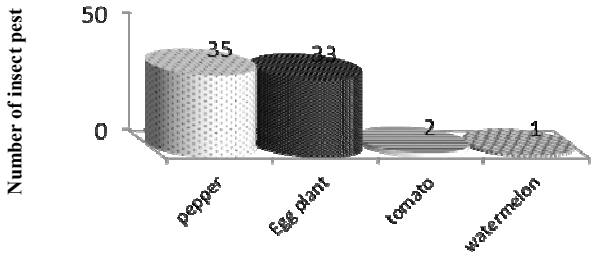

Fig. 2. Population density of WFT *F. occidentalis* infesting flowers of some vegetables in Qalubiya Governorate throughout two successive seasons 2016 and 2017.

Kafr El Sheikh Governorate

As well as, general weekly mean number of the WFT *F. occidentalis* were higher abundant on Cantaloupe, cucumber and eggplant (37a, 24ab and 23ab individual WFT / 50 flowers) follow by pepper, Cucumis and Zucchini in few numbers (15b, 10b and 1b individual WFT / 50 flowers). The statistical analysis of the total mean number of WFT showed significant difference at 0.05% whereas F. Value between vegetables equal (2.22* and L.S.D. = 6.88).Fig (3).

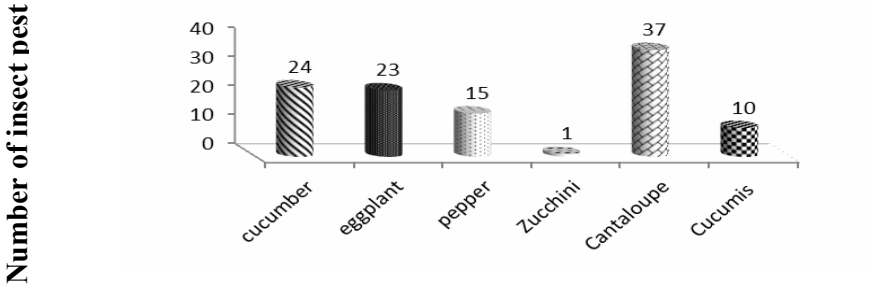

Fig. 3. Population density of WFT *F. occidentalis* infesting flowers of some vegetables in Kafr El Sheikh Governorate throughout two successive seasons 2016 and 2017.

3- The combined effect of some weather factors:

Statistical analysis for the effect of the three selected weather factors (Max. temp., Min. temp. and R.H%) on the population density of WFT *F. occidentalis* during both seasons in Qalubiya and Kafr El Sheikh Governorates are given in Tables (2&3).

- **Qalubiya Governorate**

These results revealed insignificant negative effects of maximum and minimum temperature on the seasonal fluctuations of *F. occidentalis* throughout in both seasons on (eggplant, tomato and pepper) where "r" values were -0.12,-0.09,-0.70,-0.65,-0.26 and -0.24, while in watermelon found insignificant positive effects of maximum and minimum temperature where "r" values were 0.54 and 0.54 during both seasons, respectively. The mean percentages of relative humidity indicated that insignificant positive effect in both seasons in (eggplant and tomato) where "r" values = 0.71 and 0.29, respectively. But found in pepper plants had insignificant negative effect in both seasons where "r" value = -0.35. while in watermelon found significant positive effect in both seasons where "r" value =0.84.

The combined effect (explained variance (E.V) of these ecological factors on *F. occidentalis* showed that these factors were responsible as a group for 56 %, 57%, 48% and 84 % effects of (eggplant, tomato, pepper and watermelon) throughout both seasons, respectively.

Table 2. Simple correlation and partial regression values of the three weather factors on WFT *F. occidentalis* and corresponding percentages of explained variance on vegetable crops in Qalubiya Governorate during 2016 & 2017 seasons.

				2016 & 2017			
Plant	**Weather factors**	**r**	**P**	**B**	**P**	**E.V%**	**F**
Eggplant	Max.Temp	-0.12	0.80	2.69	0.78	56%	0.87
	Min.Temp	-0.09	0.85	-3.91	0.82		
	R.H	0.71	0.10	-2.32	0.26		
Tomato	Max.Temp	-0.70	0.11	-5.19	0.49	57%	0.89
	Min.Temp	-0.65	0.16	6.91	0.60		
	R.H	0.29	0.57	-0.26	0.83		
Pepper	Max.Temp	-0.26	0.61	-2.32	0.54	48%	0.50
	Min.Temp	-0.24	0.64	3.44	0.61		
	R.H	-0.35	0.49	-0.63	0.38		
Watermelon	Max.Temp	0.54	0.25	-1.43	0.48	84%	3.55
	Min.Temp	0.54	0.26	3.03	0.43		
	R.H	0.84	0.03	-0.78	0.12		

Max. temp. = Maximum temperature, Min. temp.= Minimum temperature R.H%= Relative Humidity, r = simple correlation coefficient, p = probity of correlation, b= the regression coefficient , p = probity of regression, E.V= explained variance

- **Kafr El Sheikh Governorate**

These results revealed insignificant negative effects of maximum temperature on the seasonal fluctuations of *F. occidentalis* throughout in the both seasons on (cucumber, pepper and cantaloupe) where "r" values were -0.265, -0.511and -0.327, respectively. While in eggplant found significant negative effects of maximum temperature where "r" value was -0.900 during both seasons, but in Zucchini insignificant positive effects of maximum temperature where "r" value was 0.878 during both seasons. As well as found in Cucumis significant positive effects of maximum

temperature where "r" value was 0.613 during both seasons. The minimum temperature indicate that in cucumber insignificant negative effects where "r" value was -0.494during both seasons. While in (eggplant, pepper, Zucchini, cantaloupe and Cucumis) insignificant positive effects where "r" value were 0.013,0.377,0.049,0.590 and 0.270, respectively. The mean percentages of relative humidity indicated that insignificant positive effect in both seasons on (cucumber, eggplant, cantaloupe and Cucumis) where "r" values = 0.284, 0.021, 0.674 and 0.235, respectively. But found in pepper plants and Zucchini had insignificant negative effect in both seasons where "r" values = -0.673 and -0.354, respectively.

The combined effect (E.V) of these ecological factors on *F. occidentalis* showed that these factors were responsible as a group for 41 %, 97%, 99%, 98%, 50% and 97% effects on (cucumber, eggplant, pepper, Zucchini, cantaloupe and Cucumis) throughout both seasons, respectively.

Table 3. Simple correlation and partial regression values of the three weather factors on WFT *F. occidentalis* and corresponding percentages of explained variance on vegetable crops in Kafr El Sheikh Governorate during 2016 & 2017 seasons.

		2016 & 2017					
Plant	**Weather factors**	**R**	**P**	**B**	**P**	**E.V**	**F**
cucumber	Max.Temp	-0.265	0.66	-0.777	0.70		
	Min.Temp	-0.494	0.39	-3.57	0.60	41%	0.23
	R.H	0.284	0.64	-0.807	0.76		
Eggplant	Max.Temp	-0.900	0.03	-0.77	0.09		
	Min.Temp	0.013	0.98	-0.870	0.26	97%	14.63*
	R.H	0.021	0.97	-0.4417	0.22		
pepper	Max.Temp	-0.511	0.75	-0.84	0.09		
	Min.Temp	0.377	0.13	0.521	0.43	99%	35.7*
	R.H	-0.673	0.21	-0.786	0.14		
Zucchini	Max.Temp	0.878	-0.22	0.084	0.04		
	Min.Temp	0.049	0.72	-0.222	0.1548	98%	23.9*
	R.H	-0.354	0.55	-0.087	0.05		
Cantaloupe	Max.Temp	-0.327	-0.57	-0.770	0.82		
	Min.Temp	0.590	0.31	-2.125	0.84	50%	0.34
	R.H	0.674	0.21	1.23	0.79		
Cucumis	Max.Temp	0.613	0.05	0.915	0.003		
	Min.Temp	0.270	0.93	2.22	0.005	97%	49.99
	R.H	0.235	0.70	1.08	0.004		

Max. temp. = Maximum temperature, Min. temp.= Minimum temperature R.H%= Relative Humidity, r = simple correlation coefficient, p = probity of correlation, b= the regression coefficient , p = probity of regression, E.V= explained variance

These results were in line with those obtained by (Kirk (2001), El-Wakkad (2007), Galen (2009), M. Kasina (2009), Atakan (2011), Funderburk *etal* (2011))

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الحصر والكثافه العددية لتربس الازهار (Pergande) *Frankliniella occidentalis* التى تصيب بعض ازهار نباتات الخضر

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تم إجراء تجربة حقلية خلال موسمين متتاليين من عامي 2016 و 2017 في محافظتي القليوبية وكفر الشيخ. تهدف هذه الدراسة إلى حصر ودراسة الكثافة العددية لـتربس الازهار (*Frankliniella occidentalis*) التي تصيب ازهار بعض الخضرالمختلفة وتأثير بعض العوامل المناخية على الكثافة العددية لـ (*F. occidentalis*) التى تصيب ازهار بعض الخضر المختلفة. وأظهرت الدراسة تسجيل لـ (*F. occidentalis*) على تسعة انواع من ازهار الخضر المهمة (الباذنجان, الفلفل, الخيار، الكوسة, القثاء،الكنتالوب, الطماطم, البطيخ، الفاصوليا) التى توثر على العائد الاقتصادى . كانت أزهار الباذنجان وازهار الفلفل أكثر الازهار اصابه في معدلات الإصابة خلال موسمين الدراسة 2016 و 2017 في المحافظتين. وكان المتوسط الأسبوعي العام لـ (*F. occidentalis*) في محافظة كفر الشيخ أكثر من تلك المسجلة في محافظة القليوبية خلال موسمين متتاليين 2016 و 2017 على محاصيل الخضر. ولقد أظهرت درجة الحرارة العظمى و الصغرى ومتوسط الرطوبة النسبية تأثريا سلبيا غير معنوى خلال موسمى الدراسة 2016 و 2017 على محاصيل الخضر.