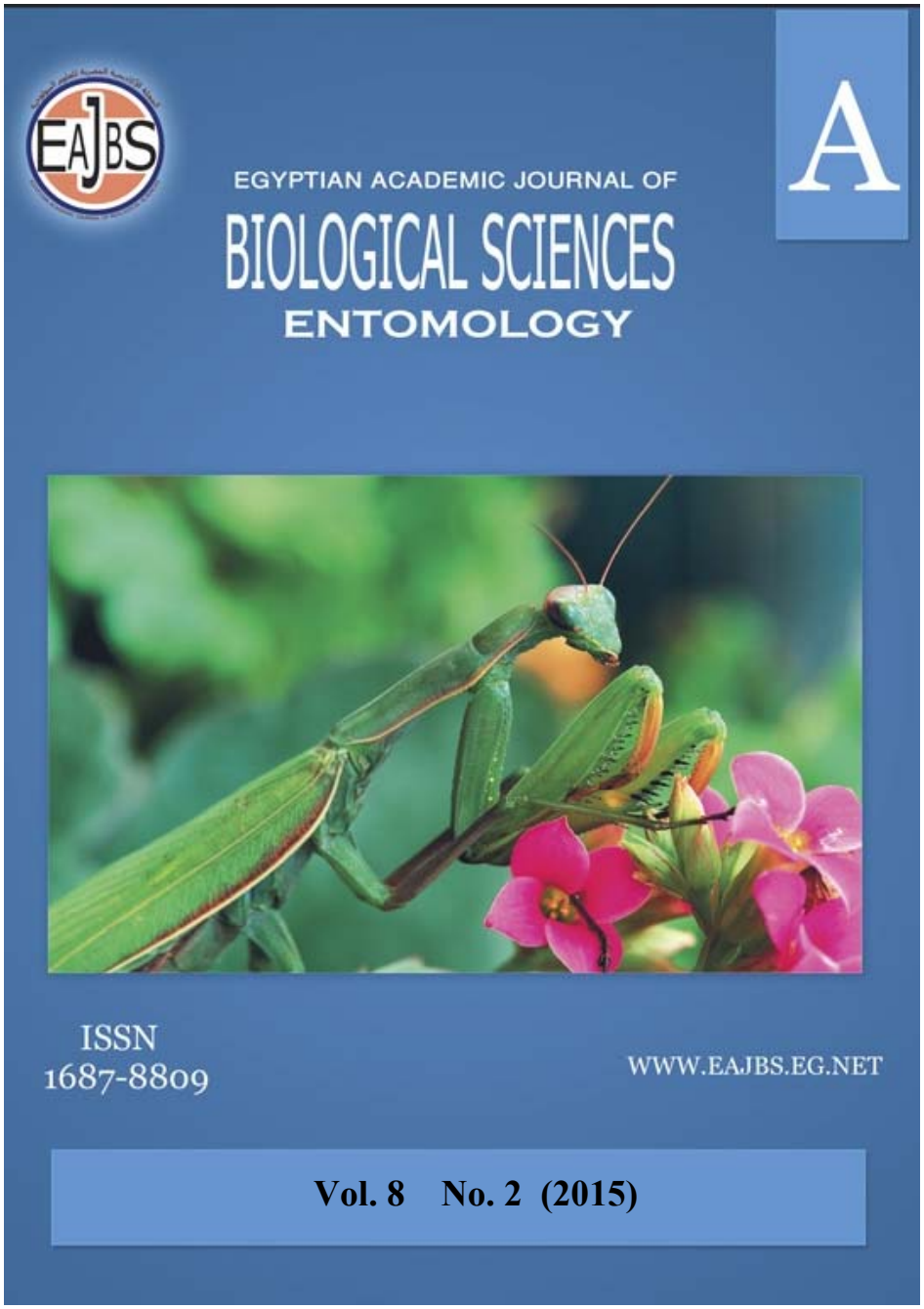

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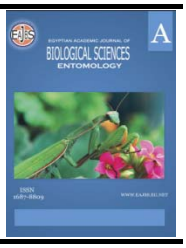

Population Fluctuation, Host Preference, Damage And Control Of Western Flower Thrips, *Frankliniella occidentalis* (Pergande) On Some Vegetable Crops In Egypt.

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ABSTRACT

Four vegetable host plants, cucumber, *Cucumis sativus* L; Squash, *Cucurbita pepo* L; eggplant, *Solanum melongena* L. and kidney bean, *Phaseolus vulgaris* L.were cultivated at Namoul village, Toukh district, Qalyoubia Governorate for two successive summer seasons throughout 2014 and 2015 to study the population fluctuation, host preference, damage percentages and control of western flower thrips, *Frankliniella occidentalis*.

The obtained results revealed that the occurrence of *F. occidentalis* was recorded during the whole period of flowering stage from May, 10th to July,5th and the population density was increased and concentrated from the period between May, 24th to June, 28th on all the four tested crops. The population fluctuation of *F. occidentalis* was differed according to host plant. Two peaks were recorded on squash and kidney bean flowers during the two studied seasons. While, 2&3 peaks were observed on both cucumber and eggplant flowers in both seasons, respectively.

Cucumber flowers was infested by significantly highest numbers of *F. occidentalis* rather than the other three tested crops and considered as the susceptible crop, as the seasonal mean numbers were 8.03 and 7.48 individuals / flower in the two seasons, respectively. On the contrary, kidney bean flowers infested by the significantly lowest numbers of this pest, 1.87 and 3.26 individuals / flower in the two tested seasons, respectively.

During the two tested seasons, *F. occidentalis* caused a significant damage in the flowers of all studied crops. The significantly heaviest damage percentage was recorded on cucumber flowers, being 29.12 and 26.66 % in the two seasons, respectively. While, the lightest damage was determined on kidney bean flowers, showing 6.66 and 11.78% in the two seasons, respectively.

Acetamiprid (Mospilan 20% SP) and Thiamethoxam (Actara 25 % WG) gave the significant highest reduction of *F. occidentalis* infesting cucumber flowers, as the average of their reductions after 14 days of spraying 81.80 and 75.17%, respectively. Carbosulfan (Marshal 20% EC) and Spinosad (Tracer 24 % SC) gave considerable results in reducing the population density of the thrips (68.70 and 67.13% after 14 days, respectively).While, Spinetoram (Radiant 12% SC) gave the significantly lowest reduction after 14 days (60.03%).

INTRODUCTION

Western flower thrips, *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae), as an herbivorous insect, is morphologically adapted to utilize different food sources, *F. occidentalis* is a major horticulture pest worldwide (Kirk and Terry, 2003).

Western flower thrips was first recorded on vegetables in the Antalya province in the Mediterranean region of Turkey (Tunc and Gocmen 1995) and spread to the eastern Mediterranean region within 1 year (Atakan *et al.,* 1998).Western flower thrips, *F. occidentalis* had been recorded on a variety of crop types including pepper (Teulon *et al.,* 2014), bean (Muvea *et al.,* 2014), nectarine (Teulon *et al.,* 2014) and strawberry (Sampson and Kirk, 2013). *F. occidentalis* has become a major best on ornamental and vegetable crops including eggplant, peper, tomato and strawberry (Burgio, *et al.,* 2004).

Moreover, *F. occidentalis* not only cause damage by sucking, but also indirectly by transmetting several viral diseases such as tomato Spotted Wilt Virus (TSWV) and impatiens necrotic spot wilt virus(TNSWV) to several crops (Elimem *et al*.,2014).

The most common species of thrips being the western flower thrips, *F. occidentalis* (Pergande) for three main reasons. First, this pest is difficult to detect because of its small size and its thigmotactic behaviour. Second, this thrips has strong productivity and even parthenogenetically. Third, this pest has developed resistance to most of the chemical control agents available on the market (Jensen, 2000).

In Egypt, El-Wakkad (2007) recorded and identified *F. occidentalis* on the flower of five fruit varieties, apple, citrus, grape, guava and mango. Abd El-Wahab (2011) recorded *F. occidentalis* on 27 species of ornamental plants. Shalaby (2015) recorded this pest on the pepper flowers in greenhouse.

Numerous investigators have studied the population fluctuation, host preference, damage percentages of *F. occidentalis* on different crops and using some IPM aspects, crops; Van Dijken *et al.*, 1994; Dekogel *et al*., 1997; Gonzalez- Zamora and Garcia-Mari, 2003; Deligeorgidis *et al.*, 2005; Isayama *et al.*, 2005; Hyung *et. al.*, 2006; Sengonca *et al.*, 2006; Cloyed, 2009; Feng *et. al* (2010); Zepa *et. al.*, 2010; Atakan, 2011; Yang *et al.* 2011; Shan *et al.*, 2012**;** Gholamy *et al*., 2015 and Shalaby, 2015.

Appropriate integrated pest management strategies for this insect have not been developed because information on its population dynamics in Egypt is insufficient. Therefore, the aim of this study was to find out what kind of role the host plants play in change of western flower thrips populations and estimated their damage percentage on different host plants and use of different groups of chemicals and biochemical compounds to achieve the lowest number of this pest on cucumber fruits.

MATERIALS AND METHODS

Two field experiments were conducted at Namoul village, Toukh district, Qalyoubia Governorate for two successive summer seasons throughout 2014 and 2015 to study the population fluctuation, host preference, damage and control of western flower thrips, *Frankliniella occidentalis* on four vegetable crop, cucumber, *Cucumis sativus* L. (medina cultivar); Squash, *Cucurbita pepo* L. (Skandrany cultivar); eggplant, *Solanum melongena* L. (Balady cultivar) and kidney bean, *Phaseolus vulgaris* L (Pronco cultivar).

The first experiment was conducted to study the population density of *F. occidentalis* on the previously mentioned crops and evaluate its damage to the flowers of the same crops. An area of about 1050 m^2 was cultivated with the four studied crops (cucumber, squash, eggplant and kidney bean) at april,1st in the two studied seasons. The whole area was divided in 12 replicates, (each replicate of 87.5 m^2). Each crop was represented by 3 replicates. All replicates were arranged in a randomized complete block design. All the experimental area received the

recommended and standard cultivation practices. The total area was kept free from any pesticides application.

For study the population fluctuation of *F. occidentalis* (nymphs and adults) and its damage on the four studied hosts, sampling of 50 flowers were randomly taken from each replicate during the flowering period of tested crops from May,10th to july,5th in the two seasons. Each sample was kept in a tightly closed paper bag and transferred to the laboratory in the same day for inspection under stereomicroscope. Adult and nymphs of *F. occidentalis* were counted and preserved in vials containing 70 % ethanol alcohol until identified in the Taxonomy Research Department at Plant Protection Research Institute (Fig. 1).

Ministry of Agriculture
Agricultural Research Center
Plant Protection Research Institute

وزارة الزراعة
مركز البحوث الزراعية
معهد بحوث وقاية النباتات

PPRI

Identified certificate

The insect samples associated with Cucumber, Squash and kidney bean are recorded in Qalubia, Monoufia and Suez Governorates and collected by Dr.Ahmed Ramadan Ibrahim Hanafy (Senior Researcher, Vegetable pests Res. Dep., Plant Prot. Res. Inst.) is identified:

Order: Thysanoptera
Sub. Order: Terebrantia
Fam.: Thripidae
S.N: Frankliniella *occidentalis* (Pergande)

Head of Taxonomy Res. Dep.
Dr. Iman El-Sebaey
Prof Dr. Iman El-Sebaey
27 / 7/ 2015

Head of Plant Prot. Res. Inst.
Prof. Dr. Mortada Ahmed Eissa
27 / 7/ 2015

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7Nadi El Seid Street-Dokki-Egypt-Tel: 33372193 - 37486163 Fax: 33372193 E.Mail.ppri@nile-enal.sci.eg

Fig. 1: Identification certificate of western flower thrips, *F. occidentalis* on some vegetable crops in Egypt.

The second experiment was conducted during the second season 2015 to evaluate the efficiency of five insecticides, Thiamethoxam (Actara 25 % WG with rate of 20 gm/100 liter of water)), Acetamiprid (Mospilan 20% SP with rate of 25 gm/100 liter water), Carbosulfan (Marshal 20% EC with rate of 200 cm^3/ fed.), Spinetoram (Radiant 12% SC with rate of 120 cm^3/ fed) and Spinosad (Tracer 24 % SC with rate of 30 cm^3 /100 liter of water in reducing the population density of *F. occidentalis* on cucumber flowers which infested by the highest numbers of *F. occidentalis* compared with untreated plants (control).An area of about 756 m^2 was cultivated with the cucumber seeds at April,1st. The whole area was divided into 18 replicates (15 replicates for treatments and 3 for control). Each insecticide was represented by three replicates. All treatments were arranged in a randomized complete block design using 3 replicates for each treatment and control. All the normal of agricultural practices for cucumber cultivation were followed except

pesticidal treatment. The chosen pesticides were sprayed on May, 31st by using a 20 l knapsack sprayer with one nozzle. The efficiency of treatments was determined by inspecting 30 randomly flowers from each replicate early in the morning and placed in a tightly closed paper bag then transferred to the laboratory in the same day to microscopically inspected, so the nymphs and adults of *F. occidentalis* was counted and recorded. The relative effectiveness of the tested compounds was determined by inspecting and counting the number of pest individuals immediately before spraying and after 1,3,5,7,10 and 14 days, respectively.

The classification the susceptibility degree of each vegetable crop flowers to infestation with *F. occidentalis* was dependent on the general mean number ($\overline{X}$) of this pest and the standard deviation (SD) as reported by Chiang and Talekar (1980). The crops that had mean numbers more than $\overline{X}$ +2SD, considered highly susceptible (HS); between $\overline{X}$ and $\overline{X}$ +2SD, susceptible (S); between $\overline{X}$ and $\overline{X}$ -1SD, low resistant (LR); between $\overline{X}$ -1SD and $\overline{X}$ -2SD, moderately resistant (MR) and less than $\overline{X}$ -2SD, were considered highly resistant (HR).

Statistical analysis

Statistical tests were performed using SAS program computer including F-test and calculated L.S.D (Least significant difference) to find differences between seasonal mean numbers of *F. occidentalis* on the four studied vegetable crops (SAS Institute, 2003).In the chemical control experiment, the reduction percentages in the population density of *F. occidentalis* were calculated according Henderson and Tilton equation (1955).

RESULTS AND DISCUSSION

Population fluctuation of *Frankliniella occidentalis* on four vegetable crop flowers.

The changes in the population fluctuation of *F. occidentalis* infesting flowers of the four vegetable crops, cucumber, Squash, eggplant and kidney bean was studied from May10th to July 5th in the two studied seasons 2014 and 2015.

The regular weekly inspection of flower of the 4 tested plants (Table 1 and Fig., 2) revealed that the occurrence of *F. occidentalis* was recorded during the whole period of flowering stage from the first inspection at May, 10th to the end of flowering stage on all studied vegetable crops except in squash flowers during the second season, it was disappeared in the first inspection. In the two studied seasons, it is clear that the population density of *F. occidentalis* was increased and concentrated from the period between May, 24th to June,28th in all the 4 tested crops.

The population fluctuation of *F. occidentalis* was differed according to host plant. On cucumber flowers the population density of the pest increased successively up to the end of May (31st) in the two studied seasons. In the first season, two peaks were detected at May, 31st and June,28th showing mean numbers of thrips 12.27 and 11.47 individuals/ flower. In the second season, three peaks were observed during May, 31st, June,14th, and 28th, being 11.47, 10.67 and 10.67 individuals/ flower, respectively.

On squash flowers, two peaks of *F. occidentalis* individuals (nymphs and adults) were recorded in the same days of May, 31st and June, 14th during 2014 and 2015 seasons with mean numbers 7.33 & 7.20 and 9.00 & 9.30 individuals/ flower, in the two seasons, respectively.

Three and two peaks were detected on eggplant flowers during the two studied seasons. In the first season these peaks were recorded at May, 17st &31st and June,

14th with mean numbers 6.40, 8.00 and 6.53 individuals/ flower, respectively. In the second season, the obtained two peaks were determined at May, 24th and June, 21th showing mean numbers of 6.27 and 7.47 individuals/ flower, respectively.

In case of kidney bean, the highest population of *F. occidentalis* (6.13 and 7.20 individuals/ flower) obtained from flowers inspected at June,28th and May,24th during 2014 and 2015 seasons, respectively. Two peaks of this pest were recorded in the two studied seasons, showing mean numbers 1.60 & 6.13 and 7.20 & 2.40 individuals/ flower at June, 7th & 28th and May, 24th & June, 28th in the two seasons, respectively.

Table 1: Population fluctuation of *F. occidentalis* on the flower of different vegetable plants during two successive seasons at Qalyoubia Governorate.

Inspection date	Mean no. of thrips / flower							
	Cucumber		Squash		Eggplant		Kidney bean	
	2014	2015	2014	2015	2014	2015	2014	2015
May,10th	5.07	3.47	0.67	0.00	3.07	3.47	1.07	0.80
17th	5.33	5.07	1.60	1.40	6.40	2.80	0.93	6.13
24th	8.40	9.33	1.87	1.80	3.73	6.27	0.80	7.20
31st	12.27	11.47	7.33	9.00	8.00	5.73	1.07	6.40
June,7th	8.00	6.93	6.40	8.60	5.07	5.20	1.60	2.80
14th	8.67	10.67	7.20	9.30	6.53	4.67	1.33	2.13
21st	6.40	4.67	6.67	9.00	5.07	7.47	0.93	1.07
28th	11.47	10.67	5.07	5.70	2.47	5.13	6.13	2.40
July,5th	6.67	5.07	3.47	4.20	1.10	2.80	2.93	0.40
Mean ± SE	8.03	7.48	4.48	5.44	4.60	4.84	1.87	3.26
Overall mean	7.76 a		4.96 b		4.72 bc		2.57 c	
F value	7.55							
LSD	2.33							

From the statistical analysis of the obtained data in the two seasons altogether, it is clear that the population density of *F. occidentalis* was affected by the chosen host plant in the two studied seasons. The significantly highest seasonal mean numbers of that thrips was observed on cucumber flowers (7.76 individuals/ flower in the two seasonal together) than other vegetable crops. The significantly lowest population was recorded in kidney bean flowers, being 2.57 individuals/ flower in the two seasons together. The moderate population was noticed in squash and eggplant (4.47 and 4.60 individuals/ flower).

The obtained results partially agree with those of Gonzalez-zamera and Garci-Mari (2003) in Spain reported that the populations density of *F. occidentalis* was low until the end of winter but there was a sharp increase in the larvae and adults at the beginning of April and May on strawberry flowers. Deligeorgidis *et.al.*,(2005) in Pakistan found that the population density of *F. occidentalis* on cucumber and tomato was high, mainly during May and June followed by reduction during the fruiting months. Hyung *et. al.*, (2006) in Korean stated that the population density of *F. occidentalis* on red pepper flowers increased in late May then peaked from early July to middle of July. Sengonca *et al.*, (2006) in Germany mentioned that the population density of *F. occidentalis* increased during April and May in nectarin flowers. Atakan (2011) in Turkey stated that the population density of *F. occidentalis* reached to peaks during mid or late May in strawberry flowers. Shalaby (2015) in Egypt mentioned that *F. occidentalis* started to appear in the pepper leaves during the second half of May-early June and reached to peaks during the second half and late June, while, the

infestation trend of that pest in pepper flowers showed low level during the second half of June and reached two peaks during mid- August in both 2013 and 2014 seasons.

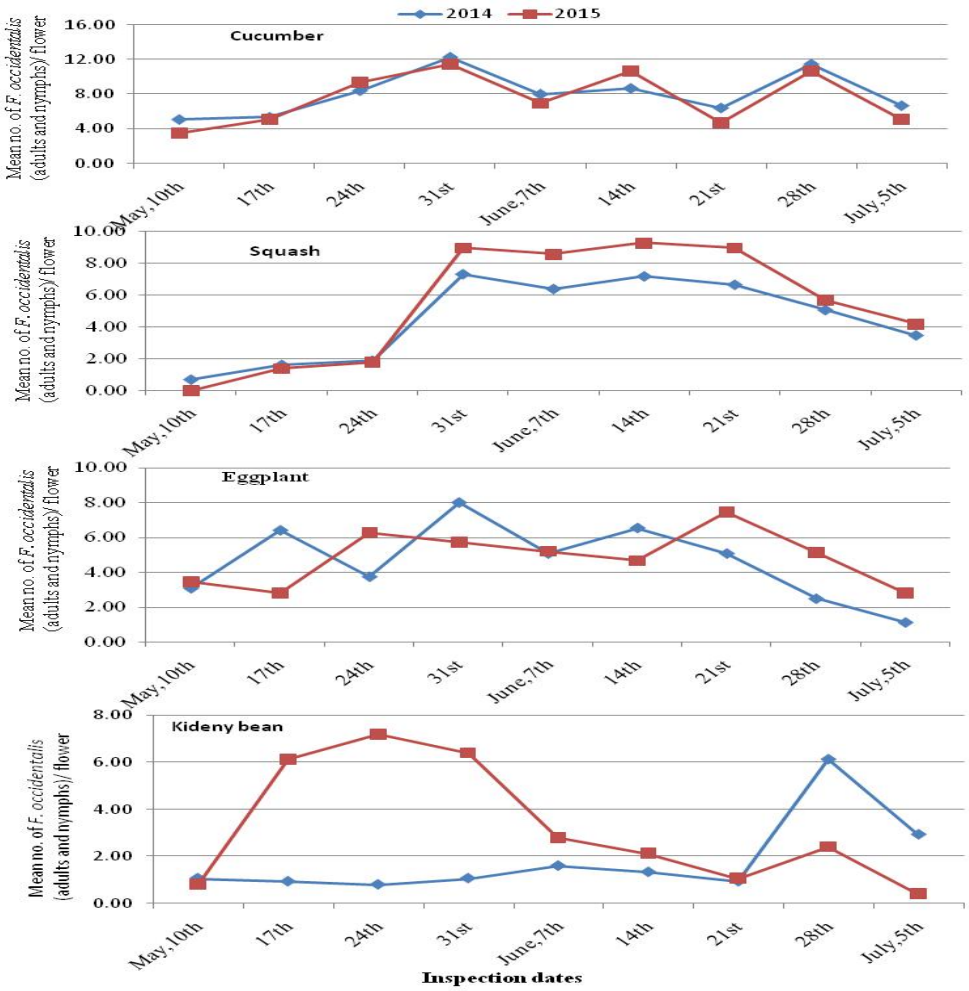

Fig. (2): Weekly mean no. of thrips, *Frankinella occidentalis* per flower on different vegetable plants during flowering stage throughout two successive seasons.

2: Susceptibility degree and host preference of four vegetable crops to the infestation of *F. occidentalis*.

In respect to calculate the susceptibility degree of the four tested vegetable crops to infestation with *F. occidentalis* in their flowers in the two studied seasons 2014 and 2015. Data in the first season revealed that cucumber flower was susceptible (S) to *F. occidentalis* infestation, however squash and eggplant flowers were low resistance (LR). While, the moderate resistance (MR) to that thrips was recorded in kidney bean flowers. During the second season 2015, the same trend was noticed as in the first season, except the kidney bean flowers was low resistance (LR) to western flower thrips according to Chiang and Talekar (1980). (Table 2)

With statistical analysis of the obtained data in the first season, results indicated that, the four tested vegetable plants can be categorized according to the order of infestation levels of *F. occidentalis* to three groups, the first group (a) was susceptible(S) vegetable plant which represented by cucumber flowers (8.03 individuals / flower). The second group (ab) was moderate resistance (MR) on squash and eggplant plants (4.47 and 4.66 individuals/ flower, respectively). The third group (c) which infested by significantly lowest number of *F. occidentalis* and occupied as moderate resistance (MR) was noticed in kidney bean flowers, 1.87 individuals / flower. F and LSD values were 10.91 and 2.20, respectively, Table (2).

In respect to statistical analysis during the second season the tested cultivated plants was classified into three groups, these groups were (a), the susceptible flowers (s) represented by cucumber plants (7.48 individuals / flower) followed by (ab), the low resistance flowers (LR) which included squash and eggplant plants (5.44 and 4.84 individuals/ flower, respectively) and low infested group (b) which recorded by kidney bean flowers(3.26 individuals / flower) and also occupied as low resistance flowers (L R). F and LSD values were 4.36 and 2.75, respectively.

Finally, it could be stated that the western flower thrips, *F. occidentalis* prefer the flowers of cucumber plants than the other three tested vegetable plants.

Table 2: Susceptibility degrees of four vegetable flowers to *F. occidentalis* infestation during two successive seasons at Qalyoubia Governorate.

Vegetable plants	2014		2015	
	Mean no. of thrips	Susceptibility degree	Mean no. of thrips	Susceptibility degree
Cucumber	8.03 [a]	S	7.48 [a]	S
Squash	4.47 [b]	LR	5.44 [ab]	LR
Eggplant	4.60 [b]	LR	4.84 [ab]	LR
Kidney bean	1.87 [c]	MR	3.26 [b]	LR
Mean ± SD	4.74±2.27		5.26±2.75	
F value	10.91		4.36	
LSD	2.20		2.75	

S = Susceptible LR = Low Resistance MR= Moderate Resistance

In the present study *F. occidentalis* prefer cucumber plant rather than other tested cultivar, similarly, Deligeorgidis *et al.*,(2005). However Gonzalez- Zamora and Garcia- Mari, 2003 in Spain reported that this pest prefers cucumber plant than tomato plant. Yang *et al.*, (2011) stated that the host plants could be arranged descendingly according to infestation of *F. occidentalis* to squash, cucumber, capsicum and watermelon. On the Other hand, Dekogel *et al.*, (1997) conducted the resistance of three greenhouse cucumber accessions to WFT, *F. occidentalis*. Feng *et al.*, (2010) in China recorded that eggplant was more attractive to *F. occidentalis* rather than tomato and paper plants in family solanacea.

3: Damage percentage of four vegetable flowers infested with *F. occidentalis*.

The present study (Table 3) recorded the percent damage caused by adults and nymphs of *F. occidentalis* on the flowers of the four tested plants during two growing seasons 2014 and 2015.

Table 3: Damage caused by *F. occidentalis* on different vegetable plants at Qalyoubia Governorate.

Vegetable plants	2014		2015		Overall damage %
	Mean no. of flower damages/ 50 flowers	Damage %	Mean no. of flower damages/ 50 flowers	Damage %	
Cucumber	14.56 [a]	29.12	13.33 [a]	26.66	27.89
Squash	8.00 [b]	16.00	9.44 [ab]	18.88	17.44
Eggplant	8.00 [b]	16.00	8.44 [ab]	16.88	16.44
Kidney bean	3.33 [c]	6.66	5.89 [b]	11.78	9.22
F value	10.68		3.06		
LSD	4.07		5.09		

In both studied seasons, western flower thrips, *F. occidentalis* caused the significantly heaviest damage on the cucumber flowers during the sampling period, as it infested by 14.56 and 13.33 individuals / flower in the two seasons, respectively recording damage percent 29.12 % and 26.66 % in the two seasons, respectively. The intermediate damage caused by that pest was recorded on squash and eggplant flowers which infested by 8.00 & 9.44 and 8.00 & 8.44 individuals / flower in the two seasons, respectively with damage percent 16.00 & 18.88 and 16.00 & 16.88% in squash and eggplant flowers in both seasons, respectively. The significantly lowest damages was recorded in kidney bean flowers by 3.33 and 5.89 individuals / flower in the two seasons, respectively by damages 6.66 and 11.78%, respectively (Table 3).

With respect the overall mean flower damages in all tested vegetable species, damages by adults and nymphs of *F. occidentalis* was the higher on flower of cucumber than the other three tested vegetables, 27.89 % mean percent damage in both seasons together. On the contrary, the lowest damage caused by this thrips was recorded on the kidney bean flowers (9.22 %). On the other hand, squash and eggplant flowers had a moderate damage caused by *F. occidentalis*, 17.44 and 16.44%, respectively (Table 3).

Data showed that western flower thrips, *F. occidentalis* caused direct damage by feeding on cucumber, squash, eggplant and kidney bean plant flowers, these damages may possibly result in economic loss to any open field of different vegetable plants as in plants in the present study, these results agree with Cloyed (2009). Symptoms of *F. occidentalis* feeding including deformation of flowers was recorded in the present study as Van Dijken (1994). Hyung *et al.*, (2006) in Korea recorded that *F. occidentalis* infestation significantly reduced the marketability of pepper fruits. The percentage of damaged fruits was 20.8%. Sengonca *et al*., (2006) in Germany recorded that the damage percentages of nectarine fruits caused by *F. occidentalis* infestation were 27.5 and 37.50 % in 2004 and 2005, respectively. Zepa *et al.*, (2010) reported that *F. occidentalis* affected the quantity and quality of cucumber production. In greenhouses cucumber crops were 80% loss of capacity due to attack by this pest.

4: Efficiency of different compounds for reducing the population density of *F. occidentalis* on cucumber.

The efficiency of different groups of insecticides which included three chemical compounds (Thiamethoxam (Actara 25 % WG with rate of 20 gm / 100 liter of water)), Acetamiprid (Mospilan with rate of 25 gm / 100 liter of water and Carbosulfan (Marshal 20% EC with rate of 200 cm^3/ fed.) and two biochemical compounds, Spinetoram (Radiant 12% SC with rate of 120 cm^3/ fed) and Spinosad (Tracer 24 % SC with rate of 30 cm^3 /100 liter of water) were evaluated in reducing the population density of *F. occidentalis* infesting cucumber plants (Medina variety)under field conditions (Table 4).

One day after treatment by the above mentioned compounds, the population densities of *F.* occidentalis were reduced by 90.10, 94.30, 91.80, 66.10 and 73.80 % than the control counts for treatments of Actara, Mospilan, Marshal, Radiant and Tracer, respectively. These results indicating highest efficacy after 24 hours of spraying by using Mospilan followed by Marshal and Actara, while Radiant and Tracer showed lower efficiency. Statistically the percentage of reduction in numbers of *F. occidentalis*, due to spray of Mospilan, Marshal, and Actara were significantly higher than those recorded after treatments by Radiant and Tracer.

Table 4: Efficacy of some pesticides against *Franekinella occidantalis* adults and nymphs on cucumber plants under field conditions

Treatments		Mean no. of *F. occidantalis* adults and nymphs/ flower							Mean reduction percentage
		Before treatment	After treatment						
			1st day	3rd day	5th day	7th day	10th day	14th day	
Thiamethoxam (Actara 25 % WG)	Mean	10.71	0.91	2.41	5.15	5.10	4.40	10.15	75.17 ab
	R %		90.10 b	88.30 a	72.60 c	70.10 b	71.30 a	58.60 a	
Acetamprid (Mospilan 20% SP)	Mean	9.98	0.49	1.80	2.59	2.18	3.92	8.71	81.80 a
	R %		94.30 a	90.60 a	85.20 a	86.30 a	72.50 a	61.90 a	
Carbosulfan (Marshal 20% EC)	Mean	6.14	0.43	2.81	2.33	3.00	3.42	9.08	68.70 b
	R %		91.80 ab	76.20 b	78.40 b	69.30 bc	61.10 b	35.40 c	
Spinetorum (Radiant 12% SC)	Mean	6.45	1.87	4.30	3.38	3.67	4.14	8.98	60.03 c
	R %		66.10 d	65.30 c	70.20 c	64.30 c	55.10 c	39.20 c	
Spinosad (Tracer 24% SC)	Mean	7.26	1.63	3.29	2.68	4.07	4.08	8.63	67.13 bc
	R %		73.80 c	76.40 b	79.00 b	64.80 bc	60.70 b	48.10 b	
Control		4.35	3.73	8.36	7.64	6.93	6.22	9.96	
F. value			107.31	18.32	13.07	28.37	19.82	33.06	7.21
L.S.D			3.80	7.57	5.13	5.30	5.30	6.37	8.66

R % = Mean reduction percentage

Three days after spraying, reduction percentages due to Mospilan, Actara and Marshal decreased to 90.60, 88.30 and 76.90, respectively. The efficiency of Radiant decreased from 66.10 in the first day to 65.30 in the third day, respectively. On the contrary, the effect of Spinosad in reducing *F. occidentalis* population increased from 73.80 to 76.40% in the 1st day to the 3rd day after application, respectively. Statistical analysis of the obtained data classified the effect of the five tested compounds to the three groups, the first effective group (a) represented by Mospilan and Actara, the second group (b) represented by Marshal and Radiant, the third group (c) occupied by Spinosad compound.

Five days after application, Mospilan appeared the first one in reducing the population density of *F. occidentalis* individuals (85.20%) followed significantly by Tracer and Marshal with reduction percentages 79.00 and 78.40%, respectively. On the other hand, Actara and Radiant gave significantly slight effect against *F. occidentalis*, 72.60 and 70.20%, respectively.

At the 7th days, the efficiency of the five tested compounds could be arranged descendingly as, Mospilane, Actara, Marshal, Tracer and Radiant with reduction percentages 86.30, 70.10, 69.30, 64.80 and 64.30%, respectively. It is clear that Mospilane occupied as the highest effective compound in reducing the population density *F. occidentalis* on cucumber plant.

After 10th day of treatments, the significant maximum reduction percentages, 72.50 and 71.30% were observed by Mospilan and Actara, respectively, while, the minimum significant one (55.10%) was reported by applying Radiant.

At the last inspection day (14th), the efficiency of all the five tested compounds were decreased and reached to minimum effect, as it ranged from 35.40% to 61.90%. Mospilan and Actara occupied as the first effective group with reduction percentages of 61.90 and 58.60%, respectively. On the other hand, Tracer, Radiant and Marshal had slight effect, 48.10, 39.20 and 35.40%, respectively.

The statistical analysis of the allover mean reduction percentages in *F.*

occidentalis population after fourteen days from spraying revealed that there are significant differences in the mortality caused by the tested compounds treatment. The calculated F and L.S.D. values were 7.21 and 8.66, respectively. The tested compounds could be arranged descendingly according to their toxicities and the reduction percentages in *F. occidentalis* population to 81.80, 75.17, 68.70, 67.13, and 60.03% for Mospilan, Actara, Marshal, Tracer and Radiant, respectively. (Table 4).

From the above mentioned results, it is clear that Mospilan and Actara evinced higher reduction in the population density of *F. occidentalis* infesting cucumber flowers. Marshal, and Tracer gave considerable results in reducing *F. occidentalis* when used at the recommended dose. While, Radiant gave the significantly lowest reduction after 14 days from spraying.

In a similar work, Isayama *et al.*, (2005) found that the active ingredient of Pyridalylil more effective against *F. occidentalis* and kills adults with mortality ranging from 80.00 to 90.00 %. Cloyd (2009) stated that Spinosad kill *F. occidentalis* after one to three days, while, Pyridalyl takes at least seven days to kill the majority of this pest. Shan *et al.,* (2012) in China in Laboratory found that Spinosad, Thaiamethoxam, Carboosulfan and Acetamiprid were suitable to reduce the population density of *F. occidentalis* in three bean cultivars. Gholamy *et al*., (2015) in Iran found that Fepronil had the highest efficacy in reducing the population density of *F. occidentalis* on cucumber plants, while Imidacloprid had the Lowest efficacy. Shalaby (2015) in Egypt, stated that the application of Spinetoram gave a significant decrease in the number of *F. occidentalis* on the leaves and flowers of pepper plants.

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ARABIC SUMMERY

التذبذب العددى، التفضيل العوائلى ، الضرر ومكافحة حشرة تربس الأزهار الغربى التى دخلت مصر مؤخرا على بعض محاصيل الخضر.

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أجريت تجربتان فى قرية ناميل - مركز طوخ – محافظة القليوبية خلال موسمى 2.14 و 2015. التجربة الأولى لدراسة التذبذب العددى ، التفضيل العوائلى ونسبة الضرر لحشرة تربس الأزهار الغربي التى دخلت حديثا مصر على أربعة محاصيل خضر هامه هى الخيار، الكوسة، الباذنجان والفاصوليا. أما التجربة الثانية فقد أجريت بهدف مكافحة هذه الأفه على أزهار محصول الخيار التى تعرضت لأعلى إصابه بالحشرة محل الدراسه وذلك باستخدام بعض المبيدات الموصى بها.

بينت نتائج الدراسة للتجربه الأولى تواجد حشرة تربس الأزهار الغربى على أزهار الأربعة محاصيل المختبرة طوال موسم الإزهار بالكامل خلال الفتره من 10 مايو حتى 5 يوليو خلال موسمى الدراسة وتعرضت الأربعة محاصيل المختبرة لأعلى إصابة خلال الفترة من 24 مايو حتى 28 يونيو. تأثر التذبذب العددى لحشرة تربس الأزهار الغربى بإختيار المحصول حيث إختلف ظهور قمة نشاط الحشرة بإختلاف المحصول حيث سجل أعلى قمتين لنشاط للحشره على محصولي الكوسة والفاصوليا خلال الموسمين. أظهرت الحشرة ذروتين للنشاط على أزهار الخيار فى الموسم الأول وثلاث ذروات فى الموسم الثانى للموسمين على الترتيب. أما نشاط الحشرة على أزهار الباذنجان فقد سجل ثلاث قمم فى الموسم الأول وقمتين للنشاط فى الموسم الثانى. بدراسة حساسية أزهار الأربعة محاصيل محل الدراسة للإصابة بحشرة تربس الأزهار الغربى فقد أظهرت النتائج أن أزهار الخيار كانت أكثر حساسية للإصابة بالحشرة المذكورة حيث تعرضت للإصابة بأعلى عدد معنوى بها خلال موسمى الدراسة وهما 8,03 و7,48 فرد / زهره للموسمين على الترتيب وعلى العكس من ذلك فقد تعرضت أزهار الفاصوليا للإصابة بأقل عدد معنوى من حشرة تربس الأزهار الغربى وهو 1,87 و 3,26 فرد / زهره للموسمين على التوالى. سببت الإصابة بحشرة تربس الأزهار الغربى فى حدوث ضرر معنوى للأزهار على الأربعة محاصيل محل الدراسه وسجلت أعلى نسبة ضرر لها على أزهار الخيار التى تعرضت لأعلى إصابة بهذه الحشرة وكانت نسبة الضرر 29,12 و 26,66 % للموسمين على الترتيب فى حين تم الحصول على أقل نسبة ضرر للأفة المذكورة على ازهار الفاصوليا وبلغن نسبة الضرر 6,66 و 11,78 % للموسمين على الترتيب.

بينت نتائج التجربة الثانية والخاصة بمكافحة الحشرات الكاملة والحوريات لحشرة تربس الأزهار الغربى على أزهار الخيار بإستخدام المبيدات أن مبيدى الأسيتامبريد (موسبيلان 25 % SP) والثيوميثوكسام (أكتارا 25% WG) أعطتا أعلى نسبة خفض معنوية لأعداد الحشرة حيث كان متوسط نسبة الخفض بعد 14 يوم 81,80 و 75,17 % للمبيدين على الترتيب. فى حين أن مادتى الكربوسلفان (مارشال 20% EC) والإسبينوساد (تريسر 24 % SC) أعطتا نسبة خفض مناسبه للحشره وكان متوسط نسبة الخفض بعد 14 يوم 68,70 % و 67,13 % على الترتيب. أما مادة الإسبنتورام (رادينت 12 % SC) فقد أعطت أقل نسبة خفض معنوية لحشرة تربس الأزهار الغربى على أزهار الخيار وكان منوسط نسبة الخفض بعد 14 يوم 60,03 %.