



EGYPTIAN ACADEMIC JOURNAL OF  
**BIOLOGICAL SCIENCES**  
ENTOMOLOGY

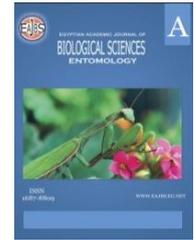
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ISSN  
1687-8809

[WWW.EAJBS.EG.NET](http://WWW.EAJBS.EG.NET)

**Vol. 13 No. 4 (2020)**



## Survey of The Main Pests Infesting Squash Plants and Its Relation with The Planting Dates at Assiut Governorate

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### ARTICLE INFO

#### Article History

Received:25/9/2020

Accepted:10/11/2020

#### Keywords:

Piercing sucking  
pests – Survey –  
Population  
fluctuation –  
Planting dates –  
Squash

### ABSTRACT

Field experiments were conducted in Assiut Governorate during two successive seasons 2018 and 2019; to survey the phytophagous pests inhabiting squash plants, in addition, to study the relationship between the main pests namely; melon aphid, *Aphis gossypii* (Glover); whitefly, *Bemisia tabaci* (Genn.); two-spotted spider mite, *Tetranychus urticae* Koch; Onion thrips, *Trhrips tabaci* (Lind.) and green leafhopper, *Empoasca decipiens* (Paoli) and its infestation of the winter, summer and nili squash plantations during 2018 and 2019 growing seasons.

The results revealed clearly twenty species of phytophagous pests belonging to twelve families and seven orders inhibiting winter, summer, and nili squash plantations were encountered by using the plant samples method. Data also, revealed that the summer squash plantation received a higher average number with the aforementioned main pests, followed by nili and winter squash plantations; also, the whitefly, *B. tabaci* ranked first in the highest average number of individuals followed by a two-spotted spider mite, *T. urticae*; green leafhopper, *E. decipiens*; melon aphid, *A. gossypii*, and onion thrips, *T. tabaci* infestation to winter, summer and nili squash plantations during 2018 and 2019 growing seasons.

It can be concluded that severe injury of the main pests; *A. gossypii*, *B. tabaci*, *T. urticae*, *T. tabaci* and *E. decipiens* to the squash plants can be avoided by using the winter plantation date followed by nili and summer plantation dates.

### INTRODUCTION

Squash (*Cucurbita pepo* L.) is one of the most important vegetable crops used as human food cultivated in Egypt and many countries of the world. The cultivated area with this crop increased during the last two decades especially in new reclaimed regions in both open and protected plantations. Through the growing season, squash plants are suffering from severe infestations with different phytophagous pests from seedling until harvest such as the melon aphid, *A. gossypii* (Glover); the whitefly, *B. tabaci* (Genn.); the two-spotted spider mite, *T. urticae* Koch; the onion thrips, *T. tabaci* (Lind.) and the green leafhopper, *E. decipiens* (Paoli) which caused extensive damage not only by sucking plant juice but also by the transmission of phytopathogenic and in decreased the yield. Confirmed results were reported by some investigators such as; Mohamed (2011), Hassan *et al.* (2013), El-Dars *et al.* (2013), Al-Kiridis (2016), Al-Ghamdi *et al.* (2018), Hegab (2018), and Saad (2020).

## MATERIALS AND METHODS

The experiments were conducted in the graduate youth lands at Arab El-Awamer, Abnoub, Assiut Governorate throughout three successive winter, summer, and nili plantations during 2018 and 2019 growing seasons. An area of about one carat was sown with squash seeds (*Cucurbita pepo* L.) on half January, May and September months for winter, summer and nili plantations respectively during 2018 and 2019 growing seasons. The experimental design used was completely randomized blocks with three replicates. All recommended agricultural practices were applied during the growing seasons except using chemical control. Weekly samples of 10 leaves from each replicate (in addition to observations) were taken randomly about after three weeks from planting date and continued to harvesting time. The collected leaves were transferred to the laboratory into plastic bags for identification of phytophagous pests and counting the numbers of the main pests; aphid (adults and nymphs); whitefly (immature stages); two-spotted spider mite (moving stages); onion thrips (adults and nymphs) and green leafhopper (adults and nymphs) by the aid of a binocular microscope. Obtained data were statistically analyzed by applying the analysis of variance (ANOVA) and the least significant difference (L.S.D.) at a probability level of 0.05.

## RESULTS AND DISCUSSION

### Survey the Phytophagous Pests Inhabiting Squash Plants:

Data Table (1) indicates the presence of 20 species of phytophagous pests belonging to twelve families and 7 orders inhabiting squash plants through the winter, summer and nili plantations during 2018 and 2019 growing seasons. Order Hemiptera (Homoptera and Heteroptera) ranked first in the number of species inhabiting squash plants (8 species), followed by Diptera (4 species), Coleoptera (3 species), Acari & Lepidoptera (2 species/each) and Thysanoptera recorded one species, found on previous three squash plantations during two successive seasons 2018 and 2019.

**Table 1:** A partial taxonomic list of phytophagous pests recovered from squash plants during 2018 and 2019 growing seasons at Assiut Governorate.

Order	Family	Common name	Scientific name
Thysanoptera	Thripidae	Onion thrips	<i>Thrips tabaci</i> (Lind.)
Hemiptera-Homoptera	Aphididae	Melon or cotton aphid green	<i>Aphis gossypii</i> (Glover)
		peach aphid	<i>Myzus persicae</i> (Sulzer)
Hemiptera-Heteroptera	Aleyrodidae	Sweet potato whitefly	<i>Bemisia tabaci</i> (Genn.)
	Cicadellidae	Green leafhopper	<i>Empoasca decipiens</i> (Paoli)
	Miridae	Cotton jassid	<i>Empoasca lybica</i> (de Berg)
		Plant or leaf bug	<i>Campylomma impicta</i> (Wagner)
Diptera	Pentatomidae	British bug	<i>Phytocoris ulmi</i> (L.)
		Stink bug	<i>Nezeraviridula</i> (L.)
	Tephritidae	The cucurbit fruit flies	<i>Dacus ciliates</i> Loew
		Agromyzidae	American serpentine
Breed bean leafminer	<i>Liriomyze congesta</i> Becker		
Lepidoptera	Noctuidae	Tomato leaf miner	<i>Liriomyza bryoniae</i> (Kalt)
		Cotton leafworm	<i>Spodoptera littoralis</i> (Boisd.)
Coleoptera	Gelechiidae	Potato tuber moth	<i>Phthorimaea operculella</i> (Zeller)
	Coccinellidae	Squash beetles	<i>Epilachna borealis</i> (Fab.)
Acari	Tetranychidae	Squash bugs	<i>Anasatristis</i> (De Geer)
		Cotton mealybug	<i>Phenacoccus solenopsis</i> Tinsley
		Two-spotted spider mite	<i>Tetranychus urticae</i> Koch
		Carmine spider mite	<i>Tetranychus cucurbitacearum</i> (Sayed)

The present findings agree with obtained by, Amro (2008) who recorded twenty-one arthropod species belonging to 18 genera, 11 families and four orders were encountered by using the sweeping net method inhabiting sweet melon, cucumber, and squash vegetables during 2005 and 2006 successive seasons, Hagrass *et al.* (2008) who indicated that 56 species of mites belonging to 44 genera and 24 families were collected from cantaloupe and squash vegetables during 2000 and 2001 growing seasons and Ibrahim *et al.* (2017) who recorded ten insect pests belonging to nine families and six orders on cucumber. Also, Habashi & Faris (2005), Allam (2014), Abdel-Rahman *et al.* (2016) and El-Mesawy (2018).

### **The Main Pests Infesting Squash Plants:**

#### **I-Melon Aphid, *A. gossypii* (Glover):**

Data obtained in Table (2) cleared that the infestation of aphid on squash plantations (winter, summer and nili) during two successive seasons, 2018 and 2019.

#### **1- Winter Plantation:**

The infestation of aphid to squash plants started from 1<sup>st</sup> week of February and continued until the 4<sup>th</sup> week of April during the 2018 and 2019 growing seasons. Regardless of squash plants and seasons, the highest average numbers of aphid were recorded on squash plants that occurred on 1<sup>st</sup> and 2<sup>nd</sup> weeks of April (38.00 and 40.67) during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers monthly of *A. gossypii* were 94.67 recorded during April followed by 37.33 in March and 3.00 in February; and 106.00 recorded during April followed by 61.67 in March and 4.67 in February during 2018 and 2019 growing seasons, respectively.

#### **2- Summer Plantation:**

The infestation of *A. gossypii* to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of June and continued until the 4<sup>th</sup> week of August during 2018 and 2019 growing seasons. Also, the highest average numbers monthly of aphid were 104.67 recorded during August followed by 62.99 in July and 5.33 in June; and 118.00 recorded during August followed by 74.66 in July and 7.33 in June during 2018 and 2019 successive seasons, respectively. The highest average numbers of *A. gossypii* recorded on squash plants occurred on the 1<sup>st</sup> and 2<sup>nd</sup> weeks of August (39.00 and 41.67) during 2018 and 2019 growing seasons, respectively.

#### **3- Nili Plantation:**

The infestation of aphid to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of October and continued until the 4<sup>th</sup> week of December during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers of *A. gossypii* were recorded on squash plants that occurred in the 2<sup>nd</sup> week of October (37.33 and 41.67) during the 2018 and 2019 growing seasons, respectively. The highest average numbers monthly of aphid were 109.00 recorded during October followed by 44.33 in November and 4.33 in December, and 121.66 recorded during October followed by 54.01 in November and 5.67 in December during two seasons 2018 and 2019, respectively. These results are in partial agreement with those obtained by, Metwally *et al.* (1995) who recorded that the aphid, *A. gossypii* started to infest summer squash plantation more early when the plants reached two weeks in age during 1991 and 1992 growing seasons, Kamel *et al.* (2000) who indicated that, *A. gossypii* infest cantaloupe summer plantation during 1995 and 1996 successive seasons, Meligi (2009) stated that the aphid increased in the 4<sup>th</sup> week of August and 1<sup>st</sup> week of September during nili plantation 2004 season, and increased in the 2<sup>nd</sup> week of May during 2005 season in summer plantation, El-Lakwah *et al.* (2011) who indicated that the infestation of aphid on cucumber plants were reach its maximum on 28<sup>th</sup> October and 10<sup>th</sup> November during 2007 and 2008 seasons, respectively, Ghallab *et al.* (2011) who indicated that the population dynamic of *A. gossypii* on cucumber plants are exhibited one peak on May 25<sup>th</sup> during 2009 season, Mohamed (2011) who revealed that the population density of *A. gossypii* (nymphs and

adults) on squash plants increased by delaying planting date (May, 1<sup>st</sup>) during the two successive seasons, 2009 and 2010, Shalaby *et al.* (2013) recorded that the highest relative abundance of aphid individuals on cucumber on October 15<sup>th</sup> during 2008 and 2009 seasons, Awadalla *et al.* (2018) who stated that the aphid recorded highest seasonal abundance on squash plants in the 3<sup>rd</sup> week of March and 2<sup>nd</sup> week of June during 2014 and 2015 seasons and Ismail (2018) who stated that aphid occurred in the 4<sup>th</sup> week of July and August during the first season, 2015 and in the second season 2016 it peaked in the 4<sup>th</sup> week of July and 3<sup>rd</sup> week of August on Okra plants.

It could be concluded from the aforementioned obtained results, the highest general mean numbers of *A. gossypii* recorded on squash plants were (172.99 and 199.99) in summer plantations followed by (157.66 and 181.34) in nili plantations and (135.00 and 172.34) in winter plantations.

**Table 2:** Average numbers of the melon aphid, *Aphis gossypii* (Glover) (adult & nymph) inhabiting winter, summer and nili squash plantations during 2018 and 2019 growing seasons.

Season 2018						Season 2019					
Winter plantation		Summer plantation		Nili plantation		Winter plantation		Summer plantation		Nili plantation	
Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.
Feb. 5	0.33	June 6	0.67	Oct. 7	29.00	Feb. 6	0.67	June 8	1.33	Oct. 9	41.67
12	0.33	13	1.00	14	37.33	13	0.67	15	1.67	16	32.33
19	0.67	20	1.33	21	22.00	20	1.00	22	1.33	23	24.33
26	1.67	27	2.33	28	20.67	27	2.33	29	3.00	30	23.33
<b>Mean</b>	<b>3.00</b>	<b>Mean</b>	<b>5.33</b>	<b>Mean</b>	<b>109.00</b>	<b>Mean</b>	<b>4.67</b>	<b>Mean</b>	<b>7.33</b>	<b>Mean</b>	<b>121.66</b>
March 5	2.67	July 4	8.33	Nov. 4	17.00	March 6	8.00	July 6	10.33	Nov. 6	19.67
12	6.33	11	11.00	11	11.00	13	12.67	13	14.00	13	13.67
19	11.00	18	18.33	18	9.33	20	18.67	20	21.33	20	11.67
26	17.33	25	25.33	25	7.00	27	22.33	27	29.00	27	9.00
<b>Mean</b>	<b>37.33</b>	<b>Mean</b>	<b>62.99</b>	<b>Mean</b>	<b>44.33</b>	<b>Mean</b>	<b>61.67</b>	<b>Mean</b>	<b>74.66</b>	<b>Mean</b>	<b>54.01</b>
April 2	38.00	Aug. 1	39.00	Dec. 2	2.33	April 3	31.33	Aug. 3	38.33	Oct. 4	3.33
9	29.00	8	34.67	9	1.00	10	40.67	10	41.67	11	1.67
16	19.67	15	22.00	16	0.67	17	23.33	17	25.67	18	1.00
23	8.00	22	9.00	23	0.33	24	10.67	24	12.33	25	0.67
<b>Mean</b>	<b>94.67</b>	<b>Mean</b>	<b>104.67</b>	<b>Mean</b>	<b>4.33</b>	<b>Mean</b>	<b>106.00</b>	<b>Mean</b>	<b>118.00</b>	<b>Mean</b>	<b>5.67</b>
<b>G. mean</b>	<b>135.00</b>	<b>G. mean</b>	<b>172.99</b>	<b>G. mean</b>	<b>157.66</b>	<b>G. mean</b>	<b>172.34</b>	<b>G. mean</b>	<b>199.99</b>	<b>G. mean</b>	<b>181.34</b>

LSD<sub>0.05</sub> 3.861

4.591

## II-Whitefly, *B. tabaci* (Genn.):

Average numbers of the whitefly, *B. tabaci* infesting squash plantations (winter, summer and nili) during 2018 and 2019 growing seasons were represented in Table (3).

### 1- Winter Plantation:

As shown in Table (3), the infestation of *B. tabaci* to squash plants started from 1<sup>st</sup> week of February and continued until the 4<sup>th</sup> week of April during 2018 and 2019 growing seasons. Also, the highest average numbers of whitefly were recorded on squash plants occurred on the 2<sup>nd</sup> and 3<sup>rd</sup> weeks of April (172.00 and 179.00) during 2018 and 2019 growing seasons, respectively, and the highest average numbers monthly of *B. tabaci* were 529.67 recorded during April followed by 239.67 in March and 37.00 in February; and 558.33 recorded during April followed by 251.68 in March and 45.00 in February during 2018 and 2019 growing seasons, respectively.

### 2- Summer Plantation:

The infestation of whitefly to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of June and continued until the 4<sup>th</sup> week of August during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers monthly of *B. tabaci* were 547.33 recorded during August followed by 259.33 in July and 45.34 in June; and 596.67 recorded in August

followed by 277.01 in July and 55.33 in June during 2018 and 2019 growing seasons, respectively. The highest average numbers of whitefly recorded on squash plants occurred on the 1<sup>st</sup> and 3<sup>rd</sup> weeks of August (184.33 and 193.00) during 2018 and 2019 growing seasons, respectively.

### 3. Nili Plantation:

The infestation of whitefly to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of October and continued until the 4<sup>th</sup> week of December during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers of *B. tabaci* were recorded on squash plants that occurred in the 3<sup>rd</sup> and 2<sup>nd</sup> weeks of October (173.00 and 180.00) during 2018 and 2019 growing seasons, respectively. The highest average numbers monthly of *B. tabaci* were 535.00 recorded during October followed by 242.00 in November and 37.99 in December; and 562.33 recorded during October followed by 255.68 in November and 49.00 in December during two seasons 2018 and 2019, respectively.

**Table 3:** Average numbers of the whitefly, *Bemisia tabaci* (Genn.) immature stages) inhabiting winter, summer and nili squash plantations during 2018 and 2019 growing seasons.

Season 2018						Season 2019					
Winter plantation		Summer plantation		Nili plantation		Winter plantation		Summer plantation		Nili plantation	
Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.
Feb. 5	2.33	June 6	3.67	Oct. 7	111.33	Feb. 6	3.33	June 8	5.33	Oct. 9	180.00
12	3.00	13	4.67	14	140.67	13	4.67	15	6.67	16	147.33
19	11.00	20	14.00	21	173.00	20	13.33	22	16.33	23	121.00
26	20.67	27	23.00	28	110.00	27	23.67	29	27.00	30	114.00
<b>Mean</b>	<b>37.00</b>	<b>Mean</b>	<b>45.34</b>	<b>Mean</b>	<b>535.00</b>	<b>Mean</b>	<b>45.00</b>	<b>Mean</b>	<b>55.33</b>	<b>Mean</b>	<b>562.33</b>
March 5	27.33	July 4	30.67	Nov. 4	101.00	March 6	29.67	July 6	34.00	Nov. 6	105.67
12	42.67	11	47.33	11	70.00	13	45.67	13	50.67	13	72.67
19	68.67	18	81.00	18	43.67	20	71.67	20	85.67	20	46.67
26	101.00	25	100.33	25	27.33	27	104.67	27	106.67	27	30.67
<b>Mean</b>	<b>239.67</b>	<b>Mean</b>	<b>259.33</b>	<b>Mean</b>	<b>242.00</b>	<b>Mean</b>	<b>251.68</b>	<b>Mean</b>	<b>277.01</b>	<b>Mean</b>	<b>255.68</b>
April 2	115.67	Aug. 1	184.33	Dec. 2	21.00	April 3	120.00	Aug. 3	126.00	Oct. 4	24.67
9	142.00	8	156.67	9	11.33	10	146.33	10	162.00	11	14.33
16	137.67	15	108.00	16	3.33	17	179.00	17	193.00	18	5.67
23	104.33	22	98.33	23	2.33	24	113.00	24	115.67	25	4.33
<b>Mean</b>	<b>529.67</b>	<b>Mean</b>	<b>547.33</b>	<b>Mean</b>	<b>37.99</b>	<b>Mean</b>	<b>558.33</b>	<b>Mean</b>	<b>596.67</b>	<b>Mean</b>	<b>49.00</b>
<b>G. mean</b>	<b>806.34</b>	<b>G. mean</b>	<b>852.00</b>	<b>G. mean</b>	<b>814.99</b>	<b>G. mean</b>	<b>855.01</b>	<b>G. mean</b>	<b>929.01</b>	<b>G. mean</b>	<b>867.01</b>

LSD<sub>0.05</sub> 20.506

21.978

These results are in partial agreement with those obtained by some investigators such as; Metwally *et al.* (1995) who recorded that the immature stages of *B. tabaci* occurred in high numbers on nili squash leaves through all the period of its growing seasons, 1991 and 1992 showing two peaks of population activity, and whitefly started to infest summer squash more early when the plants reached two weeks in age during the two seasons; Kamel *et al.* (2000) who indicated that *B. tabaci* infest cantaloupe summer plantation whereas peak occurred during the 4<sup>th</sup> week of May, 3<sup>rd</sup> week of June and 3<sup>rd</sup> week of July during 1995 and 1996 growing seasons; El-Khayat *et al.* (2010) recorded that the numbers of *B. tabaci* were increased in April, 30<sup>th</sup> on cowpea plants during 2007 and 2008 growing seasons; El-Lakwah *et al.* (2011) indicated that the infestation with whitefly on cucumber plants were reach its maximum on 28<sup>th</sup> October and 20<sup>th</sup> October during 2007 and 2008 successive seasons, respectively; Abdalla and Al-Habshy (2013) who stated that the *B. tabaci* showing two peaks occurred in the 2<sup>nd</sup> week of March and 4<sup>th</sup> week of April on broad bean plants during 2011 and 2012 growing seasons; Shalaby *et al.* (2013) who indicated that the whitefly obviously clear that the heaviest infestation rates on cucumber on September 15<sup>th</sup> during 2008 and 2009 successive seasons; Awadalla *et al.* (2018) who recorded that the *B. tabaci* reached highest

numbers in August during 2014 and 2015 growing seasons, and Ismail (2018) stated that whitefly showed four peaks in the 1<sup>st</sup> and 4<sup>th</sup> weeks of July and in the 1<sup>st</sup> week of August and September during 2015 season, in the second season 2016 it peaked in the 1<sup>st</sup> week of August and September on okra plants.

It could be concluded from the previously obtained results, the highest general mean numbers of whitefly recorded on squash plants were (852.00 and 929.01) in summer plantation followed by (814.99 and 867.01) in nili plantation and (806.34 and 855.01) in winter plantation.

### **III-The Two-Spotted Spider Mite, *T. urticae* Koch:**

Data obtained in Table (4) cleared that the infestation of mite on squash plantations (winter, summer, and nili) during 2018 and 2019 successive seasons.

#### **1. Winter Plantation:**

The infestation of *T. urticae* to squash plants started from 1<sup>st</sup> week of February and continued until the 4<sup>th</sup> week of April during 2018 and 2019 growing seasons. Regardless of squash plants and seasons, the highest average numbers of mite were recorded on squash plants that occurred on the 1<sup>st</sup> and 2<sup>nd</sup> weeks of April (81.33 and 93.00) during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers monthly of *T. urticae* were 230.34 recorded during April followed by 154.01 in March and 10.00 in February; and 285.00 recorded during April followed by 163.34 in March and 13.00 in February during 2018 and 2019 seasons, respectively.

#### **2. Summer Plantation:**

The infestation of mite to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of June and continued until the 4<sup>th</sup> week of August during 2018 and 2019 seasons, respectively. Also, the highest average numbers monthly of *T. urticae* were 297.33 recorded during August followed by 174.67 in July and 12.00 in June; and 316.33 recorded during August followed by 191.66 in July and 18.68 in June during two seasons, 2018 and 2019 respectively. The highest average numbers of the mite recorded on squash plants occurred on the 1<sup>st</sup> and 2<sup>nd</sup> weeks of August (98.00 and 101.33) during the 2018 and 2019 growing seasons, respectively.

#### **3. Nili Plantation:**

As shown in Table (4) the infestation of *T. urticae* to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of October and continued until the 4<sup>th</sup> week of December during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers of mite were recorded on squash plants occurred on the 3<sup>rd</sup> and 2<sup>nd</sup> weeks of October (91.00 and 94.00) during 2018 and 2019 seasons, respectively, and the highest average numbers monthly of the mite were 304.67 recorded during October followed by 128.33 in November and 10.67 in December; and 316.00 recorded during October followed by 140.34 in November and 17.00 in December during 2018 and 2019 seasons, respectively.

Similar results were obtained by Ahmed (2003) who stated that the two-spotted spider mite, *T. urticae* infest squash plants from October 2000 to August 2001; Meligi (2009) who indicated that the population density of *T. urticae* increased in the 4<sup>th</sup> week of August during 2004 season in nili plantation, increased in 1<sup>st</sup> and 2<sup>nd</sup> weeks of May during 2005 season, in the summer plantation and increased in 2<sup>nd</sup> and 3<sup>rd</sup> weeks of August during 2005 season in the summer plantation; El-Khayat *et al.* (2010) indicated that the numbers of different stages of *T. urticae* were increased by delaying the planting date on April 30<sup>th</sup> on cowpea plants during 2007 and 2008 successive seasons; Ghallab *et al.* (2011) who revealed that the population density of spider mite on cucumber exhibited two peaks, at the end of April and in the mid of May during 2009 season; Shalaby *et al.* (2013) who indicated that the average numbers of *T. urticae* recorded the highest relative abundance on October 15<sup>th</sup> on cucumber during 2008 and 2009 growing seasons, and Abou El-Saad (2015) who revealed that the two mites, *T. urticae* and *T. cucurbitacearum* inhabiting squash plants and peaked on 4<sup>th</sup> week of

April during 2013 and 2014 successive seasons.

It could be concluded from the aforementioned obtained results, the highest general mean numbers of *T. urticae* recorded on squash plants were (484.00 and 526.67) in summer plantation followed by (443.67 and 473.34) in nili plantation and (394.35 and 461.34) in winter plantation.

**Table 4:** Average numbers of the two-spotted spider mite, *Tetranychus urticae* Koch (moving stages) inhabiting winter, summer and nili squash plantations during 2018 and 2019 growing seasons.

Season 2018						Season 2019					
Winter plantation		Summer plantation		Nili plantation		Winter plantation		Summer plantation		Nili plantation	
Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.
Feb. 5	1.00	June 6	1.33	Oct. 7	62.33	Feb. 6	1.67	June 8	2.67	Oct. 9	94.00
12	1.67	13	2.67	14	68.67	13	2.33	15	3.67	16	85.33
19	3.00	20	3.67	21	91.00	20	4.00	22	5.67	23	69.00
26	4.33	27	4.33	28	82.67	27	5.00	29	6.67	30	67.67
<b>Mean</b>	<b>10.00</b>	<b>Mean</b>	<b>12.00</b>	<b>Mean</b>	<b>304.67</b>	<b>Mean</b>	<b>13.00</b>	<b>Mean</b>	<b>18.68</b>	<b>Mean</b>	<b>316.00</b>
March 5	17.00	July 4	17.33	Nov. 4	44.00	March 6	18.67	July 6	21.33	Nov. 6	46.00
12	28.67	11	36.00	11	38.00	13	31.67	13	39.33	13	42.00
19	42.67	18	52.67	18	30.33	20	45.00	20	57.33	20	32.67
26	65.67	25	68.67	25	16.00	27	68.00	27	73.67	27	19.67
<b>Mean</b>	<b>154.01</b>	<b>Mean</b>	<b>174.67</b>	<b>Mean</b>	<b>128.33</b>	<b>Mean</b>	<b>163.34</b>	<b>Mean</b>	<b>191.66</b>	<b>Mean</b>	<b>140.34</b>
April 2	81.33	Aug. 1	98.00	Dec. 2	4.33	April 3	84.33	Aug. 3	93.00	Oct. 4	6.00
9	62.67	8	88.67	9	2.67	10	93.00	10	101.33	11	5.00
16	49.67	15	73.67	16	2.00	17	66.67	17	77.33	18	3.33
23	36.67	22	37.00	23	1.67	24	41.00	24	44.67	25	2.67
<b>Mean</b>	<b>230.34</b>	<b>Mean</b>	<b>297.33</b>	<b>Mean</b>	<b>10.67</b>	<b>Mean</b>	<b>285.00</b>	<b>Mean</b>	<b>316.33</b>	<b>Mean</b>	<b>17.00</b>
<b>G. mean</b>	<b>394.35</b>	<b>G. mean</b>	<b>484.00</b>	<b>G. mean</b>	<b>443.67</b>	<b>G. mean</b>	<b>461.34</b>	<b>G. mean</b>	<b>526.67</b>	<b>G. mean</b>	<b>473.34</b>

LSDo.o5 10.961

12.116

#### IV-Onion Thrips, *T. tabaci* (Lind.)

Data obtained in Table (5) cleared that the infestation of thrips on squash plantations (winter, summer and nili) during two successive seasons 2018 and 2019.

##### 1. Winter Plantation:

As shown in Table (5), the infestation of *T. tabaci* to squash plants started from 1<sup>st</sup> week of February and continued until the 4<sup>th</sup> week of April during two successive seasons. Also, the highest average numbers of thrips were recorded on squash plants occurred on 1<sup>st</sup> and 2<sup>nd</sup> weeks of March (24.67 and 28.00) during 2018 and 2019 growing seasons, respectively, and the highest average numbers monthly of onion thrips were 67.01 recorded during March followed by 30.00 in February and 21.00 in April; and 76.33 recorded during March followed by 39.01 in February and 28.01 in April during 2018 and 2019 growing seasons, respectively.

##### 2- Summer Plantation:

The infestation of onion thrips to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of June and continued until the 4<sup>th</sup> week of August during 2018 and 2019 seasons, respectively. Also, the highest average numbers monthly of *T. tabaci* were 92.67 recorded during July followed by 42.67 in June and 26.00 in August; and 102.67 recorded in July followed by 53.33 in June and 34.00 in August during 2018 and 2019 successive seasons, respectively. The highest average numbers of thrips recorded on squash plants occurred on the 1<sup>st</sup> and 2<sup>nd</sup> weeks of July (33.67 and 36.00) during 2018 and 2019 growing seasons, respectively.

##### 3- Nili Plantation:

The infestation of *T. tabaci* to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of October and continued until the 4<sup>th</sup> week of December during 2018 and 2019 seasons, respectively. Also, the highest average number of thrips was recorded on squash plants that

occurred in the 3<sup>rd</sup> and 2<sup>nd</sup> weeks of October (26.00 and 29.00) during 2018 and 2019 growing seasons, respectively. The highest average numbers monthly of onion thrips were 72.66 recorded during October followed by 37.33 in November and 17.34 in December; and 84.67 recorded during October followed by 44.67 in November and 26.01 in December during growing seasons, 2018 and 2019 respectively.

Similar results were obtained by some investigators such as, Metwally *et al.* (1995) recorded that the *T. tabaci* started to infest summer squash more early when the plants reached two weeks in age during 1991 and 1992 growing seasons; Kamel *et al.* (2000) who revealed that, three peaks of thrips were recorded by late May-early June, the 2<sup>nd</sup> half of June and 2<sup>nd</sup> half of June and 2<sup>nd</sup> & 3<sup>rd</sup> weeks of July on squash summer plantation during 1995 and 1996 successive seasons; Meligi (2009) who stated that incidence of *T. tabaci* on cucumber and squash plants, whereas the population density increased in 4<sup>th</sup> week of August during 2004 season in the nili plantation, increased in the 1<sup>st</sup> week of June during 2005 season in the summer plantation and increased in the 3<sup>rd</sup> week of September during 2005 season in the nili plantation; Ghallab *et al.* (2011) who indicated that the population dynamic of thrips showed two active periods on 6 April and 26 April during 2009 season; Mohamed (2011) who revealed that the *T. tabaci* recorded highest infestation on May, 1<sup>st</sup> during 2009 and 2010 seasons; Awadalla *et al.* (2018) who stated that the highest relative abundance of onion thrips occurred in March plantation on squash plants during 2014 and 2015 seasons, and Ismail (2018) who revealed that the *T. tabaci* peaked in the 4<sup>th</sup> week of August and 2<sup>nd</sup> week of September during 2015 season and in the second season 2016 it peaked in the 5<sup>th</sup> week of August on okra plants.

It could be concluded from the previously obtained results, the highest general mean numbers of *T. tabaci* recorded on squash plants were (161.34 and 190.00) in summer plantation followed by (127.33 and 155.35) in nili plantation and (118.01 and 143.35) in winter plantation.

**Table 5:** Average numbers of the onion thrips, *Thrips tabaci* (Lind.) (adult & nymph) inhabiting winter, summer, and nili squash plantations during 2018 and 2019 growing seasons.

Season 2018						Season 2019					
Winter plantation		Summer plantation		Nili plantation		Winter plantation		Summer plantation		Nili plantation	
Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.
Feb. 5	3.00	June 6	3.00	Oct. 7	13.00	Feb. 6	4.00	June 8	5.00	Oct. 9	29.00
12	6.67	13	11.00	14	15.33	13	8.67	15	14.00	16	21.00
19	7.00	20	12.67	21	26.00	20	8.67	22	15.00	23	18.67
26	13.33	27	16.00	28	18.33	27	17.67	29	19.33	30	16.00
<b>Mean</b>	<b>30.00</b>	<b>Mean</b>	<b>42.67</b>	<b>Mean</b>	<b>72.66</b>	<b>Mean</b>	<b>39.01</b>	<b>Mean</b>	<b>53.33</b>	<b>Mean</b>	<b>84.67</b>
March 7	24.67	July 4	33.67	Nov. 4	12.00	March 6	20.00	July 6	30.00	Nov. 6	14.33
12	18.00	11	26.67	11	9.00	13	28.00	13	36.00	13	9.67
19	12.67	18	18.33	18	9.00	20	15.00	20	20.67	20	11.00
26	11.67	25	14.00	25	7.33	27	13.33	27	16.00	27	9.67
<b>Mean</b>	<b>67.01</b>	<b>Mean</b>	<b>92.67</b>	<b>Mean</b>	<b>37.33</b>	<b>Mean</b>	<b>76.33</b>	<b>Mean</b>	<b>102.67</b>	<b>Mean</b>	<b>44.67</b>
April 2	8.00	Aug. 1	9.33	Dec. 2	5.67	April 3	10.00	Aug. 3	11.67	Oct. 4	7.67
9	5.00	8	7.00	9	5.33	10	6.67	10	9.00	11	7.67
16	5.00	15	6.00	16	3.67	17	6.67	17	8.00	18	5.67
23	3.00	22	3.67	23	2.67	24	4.67	24	5.33	25	5.00
<b>Mean</b>	<b>21.00</b>	<b>Mean</b>	<b>26.00</b>	<b>Mean</b>	<b>17.34</b>	<b>Mean</b>	<b>28.01</b>	<b>Mean</b>	<b>34.00</b>	<b>Mean</b>	<b>26.01</b>
<b>G. mean</b>	<b>118.01</b>	<b>G. mean</b>	<b>161.34</b>	<b>G. mean</b>	<b>127.33</b>	<b>G. mean</b>	<b>143.35</b>	<b>G. mean</b>	<b>190.00</b>	<b>G. mean</b>	<b>155.35</b>

LSD<sub>0.05</sub> 3.372

4.051

### V-The Green Leafhopper, *E. decipiens* (Paoli):

Data obtained in Table (6) cleared that the infestation of *E. decipiens* on squash plantations (winter, summer and nili) during 2018 and 2019 successive seasons.

#### 1- Winter Plantation:

The infestation of *E. decipiens* to squash plants started from 1<sup>st</sup> week of February and continued until the 4<sup>th</sup> week of April during 2018 and 2019 growing seasons. Regardless of squash plants and season, the highest average numbers of *E. decipiens* were recorded on squash plants that occurred on the 3<sup>rd</sup> and 4<sup>th</sup> weeks of March (39.00 and 42.00) during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers monthly of the green leafhopper were 133.01 recorded during March followed by 79.33 in April and 34.34 in February; and 145.00 recorded during March followed by 90.34 in April and 42.00 in February during 2018 and 2019 seasons, respectively.

#### 2- Summer Plantation:

The infestation of *E. decipiens* to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of June and continued until the 4<sup>th</sup> week of August during 2018 and 2019 successive seasons, respectively. Also, the highest average numbers monthly of *E. decipiens* were 171.68 recorded during July followed by 89.67 in August and 46.34 in June; and 184.67 recorded during July followed by 118.33 in August and 56.67 in June during 2018 and 2019 successive seasons, respectively. The highest average numbers of the leafhopper recorded on squash plants occurred in the 3<sup>rd</sup> and 4<sup>th</sup> weeks of July (53.67 and 56.67) during the 2018 and 2019 growing seasons, respectively.

#### 3- Nili Plantation:

As shown in Table (6), the infestation of *E. decipiens* to squash plants started from the 1<sup>st</sup> and 2<sup>nd</sup> weeks of October and continued until the 4<sup>th</sup> week of December during 2018 and 2019 growing seasons, respectively. Also, the highest average numbers of the green leafhopper were recorded on squash plants occurred on 3<sup>rd</sup> and 2<sup>nd</sup> weeks of October (40.67 and 43.00) during 2018 and 2019 growing seasons, respectively, and the highest average numbers monthly of *E. decipiens* were 146.67 recorded during October followed by 93.67 in November and 28.66 in December; and 156.00 recorded during October followed by 106.00 in November and 37.00 in December during 2018 and 2019 successive seasons, respectively. The present results are in harmony with those obtained by, Metwally *et al.* (1995) stated that the initial appearance of the green leafhopper, *E. decipiens* varied from one year first and second seasons, 1991 and 1992 on squash plants, the seasonal activity of jassid was restricted in the second half of summer squash growing season of 1992; Abdalla & Al-Habashy (2013) who indicated that, one peak occurred at the 2<sup>nd</sup> week of March for jassid on the broad bean during 2011 and 2012 seasons; Awadalla *et al.* (2018) who stated that the highest relative abundance of *E. decipiens* occurred in March plantation on squash plants during 2014 and 2015 successive seasons, and Ismail (2018) who revealed that the jassid *E. lybica* peaked in the 3<sup>rd</sup> week of July, 4<sup>th</sup> week of August and 2<sup>nd</sup> week of September during 2015 growing season, while in the season of 2016 it peaked in the 2<sup>nd</sup> week of August and 1<sup>st</sup> week of September occurred on okra plants.

It could be concluded from the aforementioned results, the highest general mean numbers of *E. decipiens* recorded on squash plants were (307.69 and 359.67) in summer plantation followed by (269.00 and 299.00) in nili plantation and (246.68 and 277.34) in winter plantation.

All in all, in the two seasons of study, the highest infestation with whitefly for winter, summer, and nili squash plantations ranked first followed by the mite, green leafhopper, aphid, and thrips. Also, the summer plantation had the highest population density of the previous main pests followed by nili and winter plantations during two seasons of the study. Therefore, severe injury of the previous main pests to squash plants can be avoided by using

the winter plantation followed by nili and summer plantation.

**Table 6:** Average numbers of the green leafhopper, *Empoasca decipiens* (Paoli) (adult & nymph) inhabiting winter, summer and nili squash plantations during 2018 and 2019 growing seasons.

Season 2018						Season 2019					
Winter plantation		Summer plantation		Nili plantation		Winter plantation		Summer plantation		Nili plantation	
Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.	Date	Av. num.
Feb. 5	2.33	June 6	2.67	Oct. 7	34.00	Feb. 6	3.33	June 8	4.67	Oct. 9	43.00
12	3.67	13	4.67	14	37.33	13	4.33	15	7.00	16	41.00
19	10.67	20	15.33	21	40.67	20	13.67	22	18.33	23	36.33
26	17.67	27	23.67	28	34.67	27	20.67	29	26.67	30	35.67
<b>Mean</b>	<b>34.34</b>	<b>Mean</b>	<b>46.34</b>	<b>Mean</b>	<b>146.67</b>	<b>Mean</b>	<b>42.00</b>	<b>Mean</b>	<b>56.67</b>	<b>Mean</b>	<b>156.00</b>
March 5	24.67	July 4	31.67	Nov. 4	32.33	March 6	27.67	July 6	35.00	Nov. 6	36.33
12	32.67	11	39.67	11	26.00	13	35.33	13	44.33	13	28.67
19	39.00	18	53.67	18	18.67	20	40.00	20	48.67	20	21.67
26	36.67	25	46.67	25	16.67	27	42.00	27	56.67	27	19.33
<b>Mean</b>	<b>133.01</b>	<b>Mean</b>	<b>171.68</b>	<b>Mean</b>	<b>93.67</b>	<b>Mean</b>	<b>145.00</b>	<b>Mean</b>	<b>184.67</b>	<b>Mean</b>	<b>106.00</b>
April 2	32.67	Aug. 1	42.67	Dec. 2	12.33	April 3	34.67	Aug. 3	48.67	Oct. 4	14.67
9	22.33	8	20.33	9	10.33	10	25.67	10	30.33	11	12.67
16	15.33	15	14.00	16	3.67	17	18.33	17	23.33	18	5.33
23	9.00	22	12.67	23	2.33	24	11.67	24	16.00	25	4.33
<b>Mean</b>	<b>79.33</b>	<b>Mean</b>	<b>89.67</b>	<b>Mean</b>	<b>28.66</b>	<b>Mean</b>	<b>90.34</b>	<b>Mean</b>	<b>118.33</b>	<b>Mean</b>	<b>37.00</b>
<b>G. mean</b>	<b>246.68</b>	<b>G. mean</b>	<b>307.69</b>	<b>G. mean</b>	<b>269.00</b>	<b>G. mean</b>	<b>277.34</b>	<b>G. mean</b>	<b>359.67</b>	<b>G. mean</b>	<b>299.00</b>

LSD<sub>0.05</sub> 6.826

7.761

### Acknowledgment

The authors wish to express their thanks to the owners for supplying with study land area and allow to us not using pesticides.

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### ARABIC SUMMARY

#### حصر الآفات الرئيسية التي تصيب نباتات الكوسة وعلاقتها بمواعيد الزراعة في محافظة أسيوط

أيمن كامل أبو السعد – ماجد زاهي إمبرك- علاء الدين عبد القادر أحمد  
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تعتبر الكوسة من أهم محاصيل الحقل القرعية، حيث تزرع في الحقل المفتوح وفي الصوب البلاستيكية، وقد ازدادت المساحة المنزرعة بها في السنوات الأخيرة خاصة في أراضي الاستصلاح الجديدة وذلك من أجل الاستهلاك المحلي.

تصاب الكوسة بالعديد من الآفات الرئيسية مثل المنّ، الذبابة البيضاء، الأكاروس، التربس والجاسيد، وتسبب هذه الآفات خسائر تؤثر على جودة المحصول النهائي.

أظهرت الدراسة الحالية خلال الموسمين 2018 و2019 والتي أجريت في أراضي شباب الخريجين – أبنوب – أسيوط حصر لمفصليات الأرجل المتواجدة على الكوسة، بالإضافة إلى العلاقة بين هذه الآفات الرئيسية وعروات الكوسة الشتوية والصيفية والنبيلية، وكان ملخص النتائج كالتالي:

أظهرت نتائج الحصر لمفصليات الأرجل، تواجد عشرون نوعاً يتبع 12 عائلة تابعة لسبعة رتب حشرية متواجدة على عروات الكوسة الثلاثة خلال عامي الدراسة.

كما أظهرت الدراسة أن نباتات الكوسة في العروة الصيفية سجلت أعلى متوسط إصابة بالآفات الرئيسية، يليها العروة النبيلية ثم العروة الشتوية سجلت أقل إصابة.

كما لوحظ أن الذبابة البيضاء سجلت أعلى متوسط تعداد يليها الأكاروس، الجاسيد، المنّ والتربس سجل أقل تعداد خلال عروات الكوسة الثلاثة في عامي 2018 و2019.

ومن النتائج المتحصل عليها يجب أن تؤخذ في الاعتبار عند وضع برامج مكافحة متكاملة لهذه الآفات الرئيسية التي تصيب نباتات الكوسة.