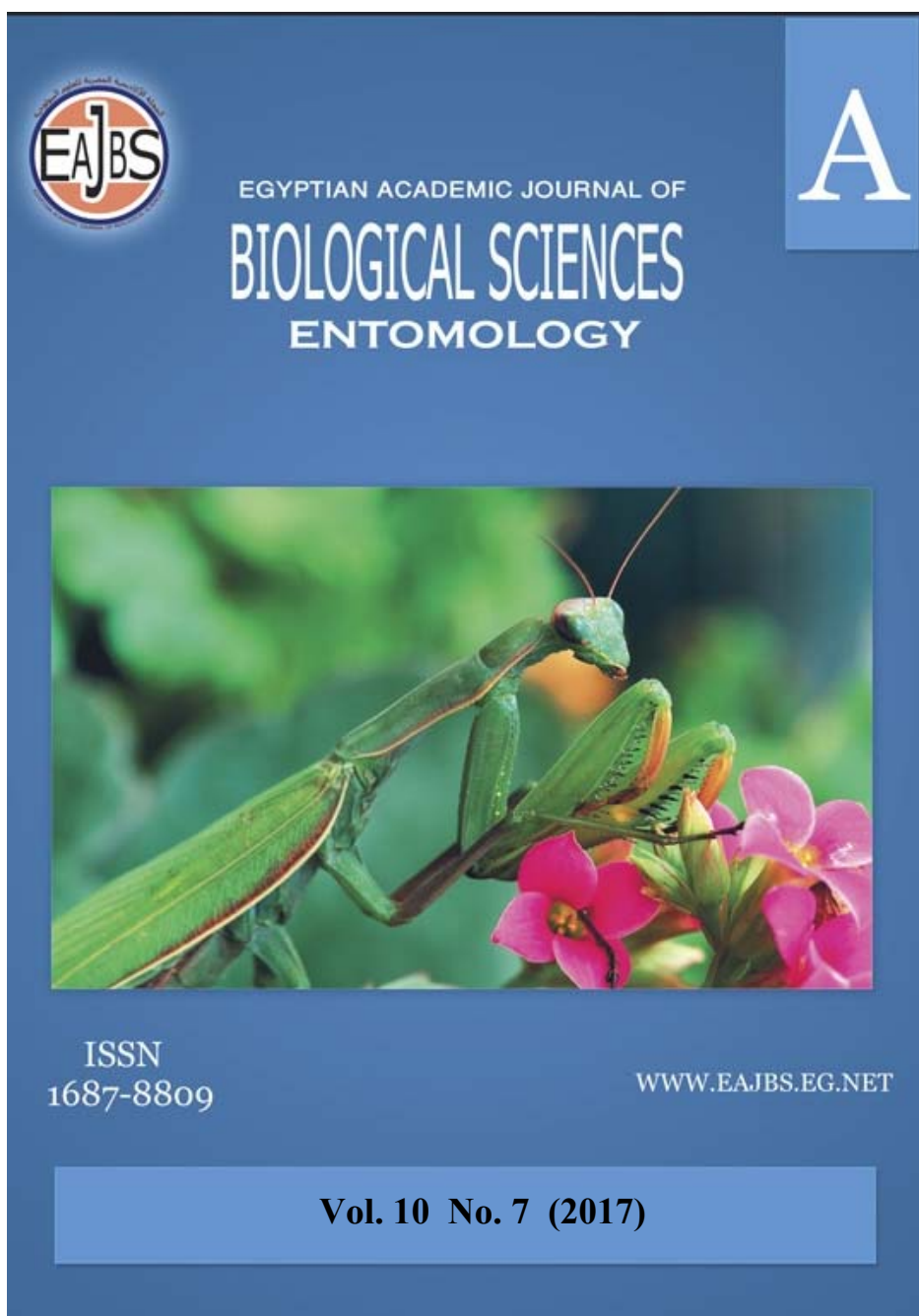
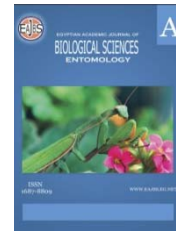


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**Annual Occurrence and Population Dynamics, of Cotton Aphids, *Aphis gossypii* Glover on Specific Host Plants at Sharkia Governorate, Egypt**

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**ABSTRACT**

This study was conducted at Zagazig region, Sharkia Governorate during the period extended from the end of November, 2013 till early December, 2015 to determine host plants list of Cotton Aphid, *Aphis gossypii* Glover, occurrence on hosts, in addition to figure its annual population dynamic on the important economic and weeds/wild plant hosts to employ these information in preparing effective integrated aphids management program. The obtained results revealed that the cotton aphid colonized wide range of 37 economic host plant species and 23 weeds/wild plant species follow 22 plant families. The highest occurrence ratio of 38.9 %, was recorded on the family Malvaceae plants while, the lowest one of 0.069 % recorded on the family liliaceae (garlic plants). The mean numbers of *A. gossypii* were varied as host plant variation where the highest occurrence ratio of 16.81 % was recorded on cotton plants; *Gossypium barbadenc* L. followed by okra plants, *Hibiscus esculentus* L. presented 11.456 %; while the lowest ratio of 0.043 % was recorded on aellen-wild beet, *Beta vulgaris* Perennis. In regarded to the weed/wild plants the highest harboring ratio of 5.023% was recorded on purslane, *Pertulaca oleracea* while the lower ratio of 0.079 % was recorded on yellow weed sorrel, *Oxalis corniculata* plants.

The cotton plants, *G. barbadenc* found harbored *A. gossypii* with longest periods extended from early April till early October during growing season of 2014 and from early- may till mid-October 2015, with the highest peak of 320 individuals / leaf recorded at 15<sup>th</sup> August, 2014; followed by the peak of 270 individuals / leaf recorded at 30<sup>th</sup> July, 2015 on lantana plants.

In regarded to the general annual population dynamic, there were two critical activity periods, where the aphids recorded on limited number of plant hosts and with low numbers, the 1<sup>st</sup> period extended from 6<sup>th</sup> Feb., till 5<sup>th</sup> Apr., 2014 with 16 hosts only and the population density ranged 1 individual/leaf on scarlet pimpernel, *Anagallis avensis* to 47 individual/leaf on little mallow, *Malva parriflora*. The 2<sup>nd</sup> activity period from 2<sup>nd</sup> Jan., till 20<sup>th</sup> Feb., 2015 with 14 host only and the population density ranged from 1 individual/leaf on shepherd purse, *Capsella bursa-pastoris* to 66 individual/leaf on little mallow, *M. parriflora*. That means the obvious hosts play important role in the annual dispersal and dynamic of *A. gossypii* inter between its main and alternative hosts throughout the activity periods.

**INTRODUCTION**

Cotton aphids, *Aphis gossypii* Glover (Homoptera: Aphididae) considered as the most worldwide serious aphid species causes yield loss, directly by sucking cell contents of infested plants parts and indirectly by exert huge amounts of honeydew that eventually promotes development of black sooty mold, which reduces the

photosynthetic efficiency and plant vigor and growth (Jazzar and Hammad, 2003). In Egypt, economic threshold of cotton aphids, *A. gossypii* was varied as insect stages, socio economic judgment and insects environment suitability where it was 4-10 insects/leaf, (Ibrahim, 2001). The cotton aphids infested wide range of cultivated economic crops including crops (Cereals, Pulses and Oilseeds), vegetables, fruits, ornamental plants and weeds/wild plants, wild plants are present as alternative hosts for aphids from which they disperse to economic crops plants, in any case the host range varied as location of investigation (Sánchez *et al.*, (2002); Azize *et al.*, 2008; Blackman & Eastop, 2000). In Egypt, most aphids studies were carried out on cultivated economic hosts and inspect the wild plants as accidentally infested hosts (Willcocks, 1922; Hall, 1926; Habib and El Kady 1961; Attia, 1967; Shalaby, 1974; Harakly 1975) .

The effective integrated pest management program always needs more and more of recent information about the pest's biology, ecology and host rang (economic and alternative plant hosts) to employ these information in forecasting program and took the decision of *A. gossypii* control measures at suitable time.

The present work aimed to determine the *A. gossypii* host rang, occurrence ratio and occurrences periods on each host, in addition to figure its annual population dynamic on the important economic and weeds/wild host plants at Zagazig region to employ these information in preparing effective integrated aphids management program.

## MATERIALS AND METHODS

This study was conducted at Zagazig region, Sharkia Gov. on the all plants or trees (about 200 species of plants and trees) found in the study area during two years extended from the end of November 2013 till early December 2015. The area from Kafer Abd El Aziz to Bany Amer villages were chosen for screening the host range of Cotton Aphid, *Aphis gossypii* Golver, ratio and occurrence periods on hosts , in addition to figure its annual population dynamic on the important economic and weeds/wild host plants.

Weekly randomized samples of ten seedlings in three replicates (at early plants growth period) or ten leaves (of mature plants) or ten shoots of the small plants or ten twigs of trees of inspected plant species. The all plants or trees found in the study area (cultivated economic plants and weeds found interfere this cultivation in addition to the weeds/wild plants found out fields (at road & irrigation canal's banks) were inspected actually in fields early in the morning using hand lens (10X) or took in paper bags to laboratory to examined using binocular stereomicroscope . Aphid's numbers were counted on different inspected plant species and recorded.

The obtained data were subjected to arithmetic curing, population figures illustration (using Excel software computer program) and the obtained results were illustrated in Table (1 a, b) and Figs (1-5) to define host rang , determine ratio and periods of occurrence on host plants, in added to illustrate annual population dynamic of *A. gossypii* on the important hosts. The wild/weeds plants were identified as description made by Boulos and El-Hadidi (1967).

## RESULTS AND DISCUSSION

### Host Range of Cotton Aphid ( CA ), *Aphis gossypii* Golver :

Data in Table (1) revealed that *Aphis gossypii* colonized wide range of 37

economic plant species and 23 weeds/wild plant species follow 22 plants families could be arranged in descending order in accordance to occurrence ratios (%) as follows: Family Malvaceae harbored 38.9, Cucurbitaceae 12.01, Compositae 7.141, Verbenaceae 6.458, Solanaceae 5.036, Pertulacaceae 5.023, Chenopodiaceae 4.46, Cruciferae 3.071, Euphorbiaceae 2.764 Meriaceae 1.939, Lamiaceae 1.908, Leguminaceae 1.775, Polygonaceae 1.249, Araliaceae 1.123, Liliaceae 0.069, Supherbiaceae 0.719, Tiliaceae 0.713, Convelvulaceae 0.649, Graminaceae 0.553, Rosaceae 0.496, Apiaceae 0.469, Ovalidaceae 0.079 % .

Table (1b): Host plants and relative abundance percentages of the cotton aphids, *Aphis gossypii* Glover at Zagazig region during the period extended from end-Nov. 2013 till early-Dec. 2015.

PF	PSN	Common name	GS	TN	RA	AN	PF	PSN	Common name	GS	TN	RA	AN
Solanaceae	<i>Lycopersicon esculantum</i>	tomato	AS	491	1.635	tamatm	Lamiaceae	<i>Mentha spicata</i> ,	Spearmint	P	573	1.908	noanaaa
	<i>Solanum melongena</i>	eggplant	AS	522	1.739	bringal	Araliaceae	<i>Hedra colchica</i> ,	Botgardbin	AS	337	1.123	leblap
	<i>S. nigrum</i>	plack nightshade	AS	403	1.342	enab deep	Pertulacaceae	<i>Pertulaca oleracea</i> ,	Pursalme	AS	1508	5.023	reglh
	<i>Capasicum fruitascens</i>	pepper	AS	96	0.319	felfel	Supherbiaceae	<i>Ricinus communis</i> ,	Castor bean	P	246	0.719	kharooa
Total				1512	5.036		Tiliaceae	<i>Corchorus olitorius</i> ,	Jew,s mallow	AS	214	0.713	melokhia
Chenopodiaceae	<i>Spinacia oleracea</i>	spiach	AW	90	0.299	sbaneh	Convelvulaceae	<i>Convelvulus arvensis</i> ,	Binweed	p	195	0.649	olaih
	<i>Beta vulgaris perennis</i>	aellen-wild beet	AW	13	0.043	salk	Graminaceae	<i>Zea mays</i> ,	Corn	AS	166	0.553	zorh
	<i>Rumex deutatus</i>	dock	AW	375	1.249	hommaid	Convelvulaceae	<i>Ipomoea batatus</i> ,	Sweet potato	AS	164	0.546	batata
	<i>Chenopodium anibrosioides</i>	slender amaranth	AW	508	1.692	zorbah	Umoellifera	<i>Ammimajus</i> ,	Bishop,sweed	AW	141	0.469	khlah
	<i>Amaranthus ascendens lois</i>	livid amaranth	AS	353	1.175	orfediek	Moraceae	<i>Morus alba</i> ,	Mulberry	p	139	0.463	tout
Total				1339	4.46		Acanthaceae	<i>Adhatada vasica</i>	Malabar nuttree	p	149	0.496	bstachia
Liliaceae	<i>Allium sativum</i>	garlic	AW	21	0.069	thom	Ovalidaceae	<i>Oxalis corniculata</i> ,	creeping woodsorrel	A/P	24	0.079	hommaid
Rosaceae	<i>Rosa sp</i>	rose	P	149	0.496	ward							

GS=growth seas on PSN=plant scientific names TN=total numbers RA=rate of abundant PF=plant family AN=Arabic name AS=annual summer AW= annual winter A=P=perennial or annual P=perennial

### Occurrence ratios of the cotton Aphid, *A. gossypii* on economic crops hosts:

The mean numbers of *A. gossypii* infested economic plants were varied as host plans species , recorded highest occurrence rate of 16.81 % (of total numbers found infested all hosts during the whole study period) on *G. barbadenc*, followed by *Hibiscus esculentus* L. presented 11.458 %; *Lantana sabrifota* (6.458%) ; *H. sabdoriffa* (4.144%); *Luffa aegyptiaca*, (3.261%) and *Citrullus vulgaris* (2.774%). The lowest abundance of 0.043% was recorded on *Beta vulgaris* Perennis. The following host plants had colonized percent ranged between 2.195 to 0.069% can be arrange in descending order as, *H.cannabnus*, *Althaea rosa*, *H.Irionum*. *Cucumis melo* var. *cantalupensis*, *C.sativus*, *C. melo*. Var. *flexosus*, *Lycopersicon esculantum*, *Solanum melongena*, *S. nigrum*, *Capasicum fruitascens*, *Spinacia oleracea*, *Beta vulgaris* Perennis, *Allium sativum*, *Rosa sp*, *Helianthus annus* L., *Trifolium alexandarinum*, *Vicia faba*, *Sesanium indicum*, *Sesbania aculeate*, *Lantana sabrifota*, *Salix sub cerrata*, *Psidium guava*, *Mentha spicata* , *Ricinus communis*, *Corchorus olitorius*, *Zea mays*, *Ipomoea batatus*, *Morus alba*,

### Occurrence ratios of the cotton aphid:

The weed/wild plants were varied as *A. gossypii* hosts suitability where the highest abundant percentage of 5.023% was noticed on *Pertulaca oleracea* followed by 4.456 % on *Malva parriflora* and 2.165 % on *Anagallis arvensis*. The relatively lowest abundance ratio of 0.079 % was recorded on *Oxalis corniculata* plants. The following host plants had colonized percentages ranged 1.732-0.096 % can be arrange in descending order as, *capsella bursa*, *Coronopus squamatus* Asch, *Eruca sativum*, *Sisymbrium lrio*, *Brassica rapa*, *B. kaber*, *Cucurbita pepa*, *Citrullus*

*volgaris*, *Rumex deutatus*, *Chenopodium murale*, *Amaranthus ascendens* Lois, *Xanthium strumarium*, *Conyza egyptiaca*, *C. discorides*, *Sonchus deraceus*, *Sichorium endivia*, *Melilotus indica*, *Medicago polymerpha*, *Anagallis arvensis*, *Euphorbia pilulifera*, *Rumex dentatus*, *Hedra colchica*, *Convolvulus arvensis*, *Ammi majus*, *Oxalis corniculata*,

**Population dynamics and occurrence periods *A. gossypii* on Economic crops and weeds/wild plants:**

**Economic crops hosts:**

The seasonal and annual population dynamic of *A. gossypii* will be discussed only on main cultivated economic crops hosts that colonized by 11.458 % to 2.105 % of total numbers of aphids on all investigated hosts at study location as follows:

**Field crops:**

**Cotton, *Gossypium barbadenc* L.:**

The data illustrated in Fig. (1) cleared that the cotton plants, *G. barbadenc* was harboured relatively highest numbers of *A. gossypii* with longest occurrence periods extended from plants emergence till harvest during growing season of 2014; the insect population was oscillated and fluctuated drawing two peaks, the 1<sup>st</sup> one regarded at 22<sup>nd</sup> May with mean numbers of 250 individuals / leaf and the 2<sup>nd</sup> recorded at 15<sup>th</sup> August with mean numbers of 320 individuals/leaf). In the same trend, during the 2<sup>nd</sup> cotton growing season of 2015 the infestation period was extended from early- may till mid-October illustrated tow peaks ; the 1<sup>st</sup> one noticed at 18<sup>th</sup> June with mean number of 231 individuals / leaf and the 2<sup>nd</sup> at 10<sup>th</sup> of September recorded 221 individuals/leaf ).

**Sunflower, *Helianthus annus* L.:**

The sunflower, *H. annus* plants was inspected as wild plants found neighbor cultivated fields, along canals and in waste area. The sunflower plants found harboured *A. gossypii* in five occurrence periods, the 1<sup>st</sup> extended from 2<sup>nd</sup> Jan. till 13<sup>th</sup> Feb. 2014 with one population peak of 24 individuals/ leaf recorded at 23<sup>rd</sup> Jan., The 2<sup>nd</sup> and short period from 21<sup>st</sup> Mar. to 3<sup>rd</sup> May. 2014 with one peak of 13 individuals/ leaf was recorded at 11<sup>th</sup> Apr., and then the population reduced to restart again at the third occurrence period from 27<sup>th</sup> Jun. to 27 Sep. 2014 recorded one peak also at 24<sup>th</sup> Jul. with 37 individuals /leaf. The 4<sup>th</sup> occurrence period of *A. gossypii* on the wild *H.annus* plants was extended from 28<sup>th</sup> Nov.2014 to 17<sup>th</sup> Jan 2015 with only one peak noticed at 26<sup>th</sup> Dec, 2014 with 23 individuals/leaf. The last occurrence period was started from 10<sup>th</sup> Apr. to 22<sup>nd</sup> May 2015 with only one peak at 1<sup>st</sup> May with 25 individuals/leaf

**Vegetable crop:**

**Okra plants, *Hibiscus esculentus* L.:**

The data illustrated in Fig. (1) clear that the okra plants, *H. esculentus* recorded 2<sup>nd</sup> order of *A. gossypii* occurrence ratios and periods after cotton plants. The okra plants found colonized by *A. gossypii* at inspection start time at 28<sup>th</sup> November 2013 with mean number of 62 individuals / leaf then the population decreased to very low mean number of 4 individuals / leaf and disappeared at 2<sup>nd</sup> January 2014. During the growing season of 2014, *A. gossypii* colonized okra plants in two occurrence periods the 1<sup>st</sup>, from 11<sup>th</sup> April till 20<sup>th</sup> September 2014 with moderate population oscillation, fluctuation and drawing two definite peaks, the 1<sup>st</sup> regarded at 31<sup>st</sup> May (73 individuals / leaf) and the 2<sup>nd</sup> one at 1<sup>st</sup> August (60 individuals/leaf); while the 2<sup>nd</sup> occurrence period was extended from 7<sup>th</sup> November till 26<sup>th</sup> December reordering one peak of 22 individuals / leaf at 28<sup>th</sup> November. In the other hand, during the 2<sup>nd</sup> okra growing season of 2015 the aphid recorded relatively high

numbers throughout relatively long infestation period extended from 18<sup>th</sup> April till 3<sup>rd</sup> December, illustrated three defined peaks; the 1<sup>st</sup> one at 28<sup>th</sup> May with 66 individuals / leaf; the 2<sup>nd</sup> at 26<sup>th</sup> June, recorded 260 individuals / leaf and the 3<sup>rd</sup> one at 24<sup>th</sup> September with 139 individuals / leaf.

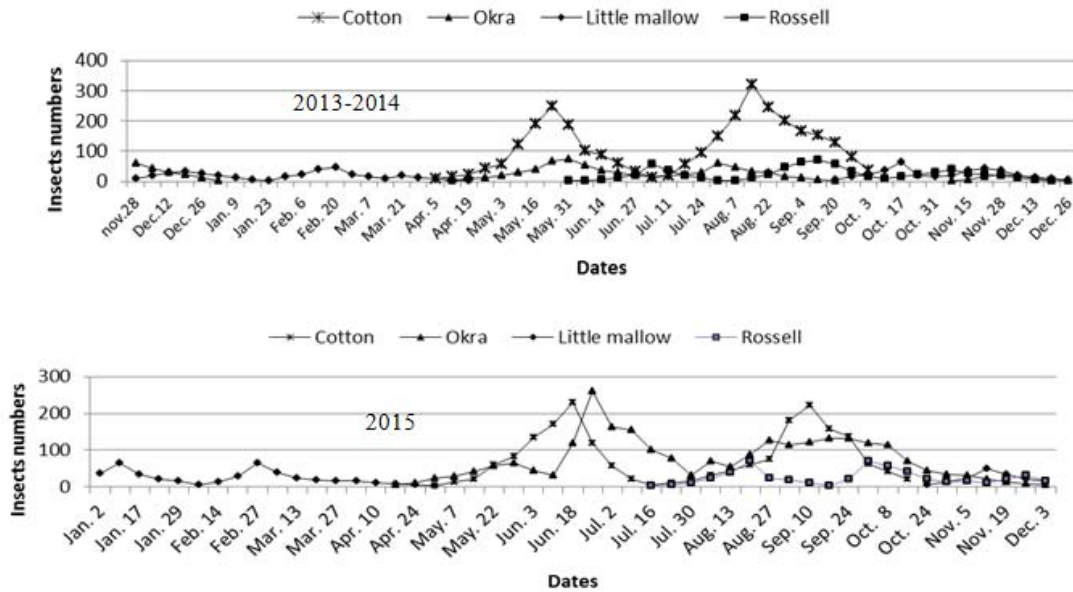


Fig. 1: Population dynamics of cotton aphids on main specific plant hosts at Zagazig region during the period extended from 28, Nov.2013 till 3, Dec. 2015.

### Squash, *Cucurbita pepo* L.:

The data illustrated in Fig. (2) cleared that, the cotton aphids, *A. gossypii* found infested *C. pepo* plants in four occurrence periods; the 1<sup>st</sup> was extended from 21<sup>st</sup> Mar. till 22<sup>nd</sup> May 2014 recorded one peak at 24<sup>th</sup> Apr. 2014 with 58 individuals/leaf. The 2<sup>nd</sup> period was extended from 24<sup>th</sup> Jul. to 29<sup>th</sup> Aug 2014 on *C. pepo* plants with one weak peak of 9 individuals/ leaf recorded at 15<sup>th</sup> Aug., and then the population decline to restart again in the third occurrence period from 10<sup>th</sup> Oct to 5<sup>th</sup> Dec. 2014 recorded one peak at 7<sup>th</sup> Nov. with 32 individuals /leaf. The 4<sup>th</sup> occurrence period of cotton aphids, *A. gossypii* on the *C. pepo* plants was extended from 17<sup>th</sup> Jan. to 3<sup>rd</sup> Jun 2015 with three peaks of 13, 57 and 40 individuals/ leaf recorded at 20<sup>th</sup> Feb, 18<sup>th</sup> Apr and 1<sup>st</sup> May for the three peaks, respectively.

### Snake cucumber, *Cucumis melo* var *flexuosus* L.:

The cotton aphids found infested *C. melo* plants throughout whole growth season of plants in one occurrence periods for each of the two study years Fig. (2). The 1<sup>st</sup> periods extended from 14<sup>th</sup> Jun. till 29<sup>th</sup> Aug 2014, recorded one peak at 7<sup>th</sup> Aug. with 42 individuals /leaf. The second one was extended from 24<sup>th</sup> Jul. to 15<sup>th</sup> Oct. 2015 on *C. melo* plants with two peaks of 46 and 66 individuals/ leaf recorded at 13<sup>th</sup> Aug. and 3<sup>rd</sup> Sep. for the two inspected peaks, respectively.

### Eggplant, *Solanum melongena* L.:

The *A. gossypii* found infested eggplant plants in three occurrence periods Fig. (2), the 1<sup>st</sup> extended from 18<sup>th</sup> Jul. till 20<sup>th</sup> Sep 2014 recorded one peak at 22<sup>nd</sup> Aug.2014 with 50 individuals / leaf. The 2<sup>nd</sup> and short period was extended from 18<sup>th</sup> Apr. to 15<sup>th</sup> May 2015 on *S. melongena* plants with one peak of 17 individuals/ leaf recorded at 1<sup>st</sup> May, then the population decline to restart again in the third

occurrence period from 16<sup>th</sup> Jul to 24<sup>th</sup> Oct. 2015 recorded two peaks at 13<sup>th</sup> Aug and 1<sup>st</sup> Oct. with 38 and 23 individuals/leaf for the two flashed peaks, respectively.

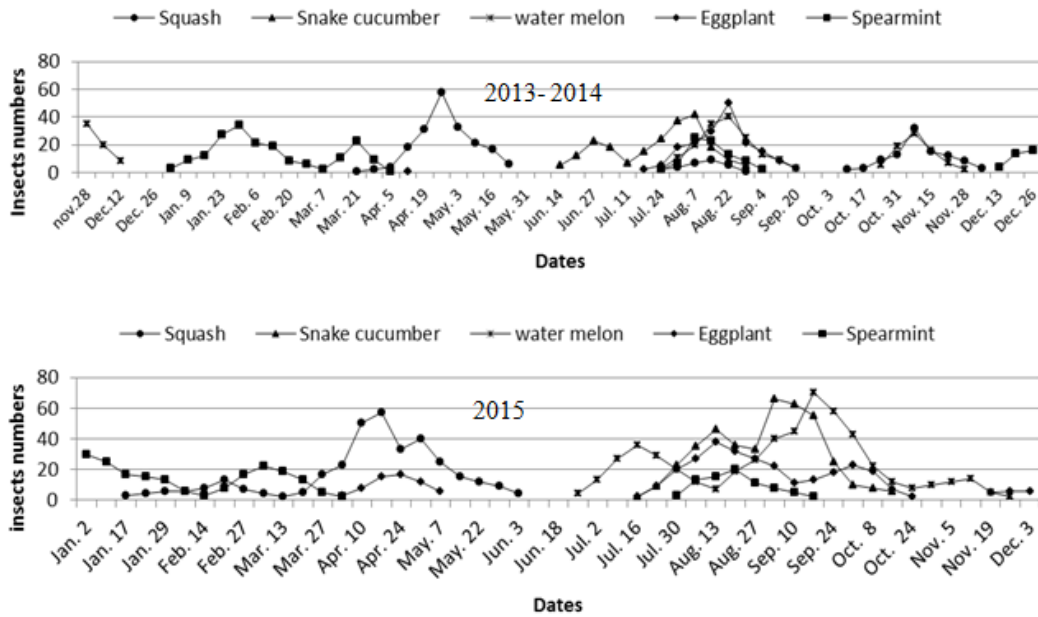


Fig. 2: Population dynamics of cotton aphids on vegetables specific plant hosts at Zagazig region during the period extended from 28, Nov.2013 till 3, Dec. 2015

#### Ornamental plant, lantana, *Lantana sabrifota* L.:

The data figured in Fig. (4) showed that the lantana, *L. sabrifota* was harbored relatively high numbers of *A. gossypii* with five activity periods. The 1<sup>st</sup> one recorded throughout January 2014 with one population peak at mid-Jan. (10 individuals / leaf). The 2<sup>nd</sup> activity period was extended from 24<sup>th</sup> Jul. till 17<sup>th</sup> Jan. 2015 with four peaks. The peaks were recorded at 3<sup>rd</sup> week of Aug., 20<sup>th</sup> Sep., 7<sup>th</sup> Nov. and 26 Dec. with 35, 25, 46 and 24 individuals / leaf for the four peaks, respectively. The third activity period was extended from 14<sup>th</sup> Feb till 7<sup>th</sup> Mar. 2014 with small oscillation with one weak peak of 9 individuals / leaf at 20<sup>th</sup> Feb. The 4<sup>th</sup> period was extended from 10<sup>th</sup> Apr. until 7<sup>th</sup> May 2015 with one peak of 15 individuals / leaf at 24<sup>th</sup> Apr. The last activity period with highest density extended from 2<sup>nd</sup> Jul. until 3<sup>rd</sup> Dec. 2015 illustrated three peaks of 270, 52 and 36 individuals/leaf recorded at 30<sup>th</sup> Jul., 3<sup>rd</sup> Sep. and 29<sup>th</sup> Oct. 2015 for the three peaks, respectively.

#### Medicinal plants:

##### Roselle, *Hibiscus sabdoriffa* L.:

The illustrated data in Fig. (1) cleared that the cotton aphids, *A. gossypii* was infested Roselle plants, *H. sabdoriffa* through the study years with one long term infestation period for each of year. During the 1<sup>st</sup> year of 2014, the infestation started in low numbers at 31<sup>st</sup> May recorded 2 individual/leaf, oscillated and fluctuated till the end of Roselle growth season at 19<sup>th</sup> Dec. recorded three remarked peaks at 5<sup>th</sup> Jul., 12<sup>th</sup> Sep. and 7<sup>th</sup> Nov. with 58, 71 and 39 individuals / leaf for the three peaks, respectively. During 2015 the infestation was delayed to the mid-July but in low numbers also of (2 individual/leaf), then the population increased gradually to record three distinct peaks of 69, 63 and 25 individual/leaf recorded at 20<sup>th</sup> Aug., 1<sup>st</sup> Oct. and at 26<sup>th</sup> Nov. for the three peaks, respectively.

**Spearmint, *Mentha spicata* L.:**

The spearmint plants *M. spicata* found harbored *A. gossypii* in four occurrence periods Fig. (2), the 1<sup>st</sup> was started from 2<sup>nd</sup> Jan. till 5<sup>th</sup> Apr. 2014 with one population peak of 34 individuals/ shots recorded at 30<sup>th</sup> Jan. The 2<sup>nd</sup> period was extended from 24<sup>th</sup> Jul. to 4<sup>th</sup> Sep. 2014 on *M. spicata* plants with one peak of 23 individuals/ shots recorded at 15<sup>th</sup> Aug., then the population reduced to restart again at the 3<sup>rd</sup> period from 13<sup>th</sup> Dec. 2014 to 3<sup>rd</sup> Apr. 2015 recorded two peaks at 2<sup>nd</sup> Jan. and 7<sup>th</sup> Mar. with 30 and 22 individuals/shots for the two inspected peaks respectively. The last activity period of cotton aphids on the spearmint plants was in start from 30<sup>th</sup> Jul. to 17<sup>th</sup> Sep 2015 with only one peak noticed at 20<sup>th</sup> Aug, with 20 individuals/shots.

**Egyptian Luffa, *Luffa aegyptiaca* L.:**

The illustrated data in Fig. (1) showed that, the *A. gossypii* harbored *L. aegyptiaca* plants through the two study years with four occurrence periods, the 1<sup>st</sup> one considered as extension over the previous year infestation where it extended from 28<sup>th</sup> Nov. till 20<sup>th</sup> Dec. 2013 started with relatively high number of 18 individuals / leaf and then come down. The 2<sup>nd</sup> occurrence period was extended from 22<sup>nd</sup> Aug. to 26<sup>th</sup> Dec 2014 recorded two define peaks of 47 and 30 individuals/ leaf recorded at 27<sup>th</sup> Sep. and 15<sup>th</sup> Nov. 2014 for the two peaks, respectively; then the population decline to restart again to record the third occurrence period from 29<sup>th</sup> Jan till 19<sup>th</sup> Mar. 2015 with one weak peak of 18 individuals / leaf. The last period was inspected from 24<sup>th</sup> Jul. to 3<sup>rd</sup> Dec. 2015 recorded three peaks; the highest one of 97 individuals/leaf was recorded 1<sup>st</sup> Oct. 2015.

**Fruit trees; Guava, *Psidium guava* L.:**

The guava, *P. guava* trees was inspected as solitary trees found in cultivated fields and along irrigation canals in the study area. The guava trees found colonized by the cotton aphids, *A. gossypii* in four occurrence periods Fig (4), the 1<sup>st</sup> one was extended from 9<sup>th</sup> Jan. till 31<sup>st</sup> May 2014 with two population peak of 12 and 68 individuals/ leaf recorded at 30<sup>th</sup> Jan. and 25<sup>th</sup> Apr. for the two peaks, respectively. The 2<sup>nd</sup> and shortened occurrence period was extended from 7<sup>th</sup> Aug. to 12<sup>th</sup> Sep. 2014 on guava trees with one weak peak of 13 individuals/ leaf recorded at 22<sup>nd</sup> Aug. then the population reduced to restart again at the 3<sup>rd</sup> occurrence period from 7<sup>th</sup> Mar. to 3<sup>rd</sup> Jun. 2015 recorded one peak also at 1<sup>st</sup> May with 43 individuals/leaf. The last period of *A. gossypii* on the *P. guava* trees was extended from 30<sup>th</sup> Jul. to 3<sup>rd</sup> Sep 2015 with only one peak noticed at 13<sup>th</sup> Aug, with relatively low number of 12 individuals/leaf.

**Weeds and wild plant hosts:**

The occurrence and annual dynamic of *A. gossypii* population will be discussed only on main wild/weeds hosts that colonized by 5.023% to 1.739 % of total numbers of aphids on all investigated hosts at study location as follows:

**Common purslane, *Pertulaca oleracea*:**

The cotton aphids, *A. gossypii* found infested purslane plants in five occurrence periods Fig (3), the 1<sup>st</sup> one extended from 28<sup>th</sup> Nov. till 26<sup>th</sup> Dec 2013 on old plants and listed one peak at 5<sup>th</sup> Dec. with 18 individuals/shots this period was extension to the last occurrence period of previous year . The 2<sup>nd</sup> period was expanded from 11<sup>th</sup> Apr. to 9<sup>th</sup> May 2014 on purslane plants seedlings with one peak of 22 individuals/ seedling recorded at 25<sup>th</sup> Apr., then the population decline to restart again in the 3<sup>rd</sup> period from 11<sup>th</sup> July to 5<sup>th</sup> Dec. 2014 recorded three peaks at 15<sup>th</sup> Aug., 27<sup>th</sup> Sep. and 15<sup>th</sup> Nov. with 67, 29 and 35 individuals/shots for the three peaks, respectively. The 4<sup>th</sup> period of was extensive from 18<sup>th</sup> Apr. to 15<sup>th</sup> May 2015



with one peak of 15 individuals/ seedling at 1<sup>st</sup> May. The last period extended from 3<sup>rd</sup> Jun. to 3<sup>rd</sup> Dec. 2015 with two equal peaks in numbers of 69 individuals/shots recorded at 26<sup>th</sup> Jun and 3<sup>rd</sup> Sep., respectively. So this plant considered as one of the important plant host of cotton aphids especially during the early and late growth season of purslane plants.

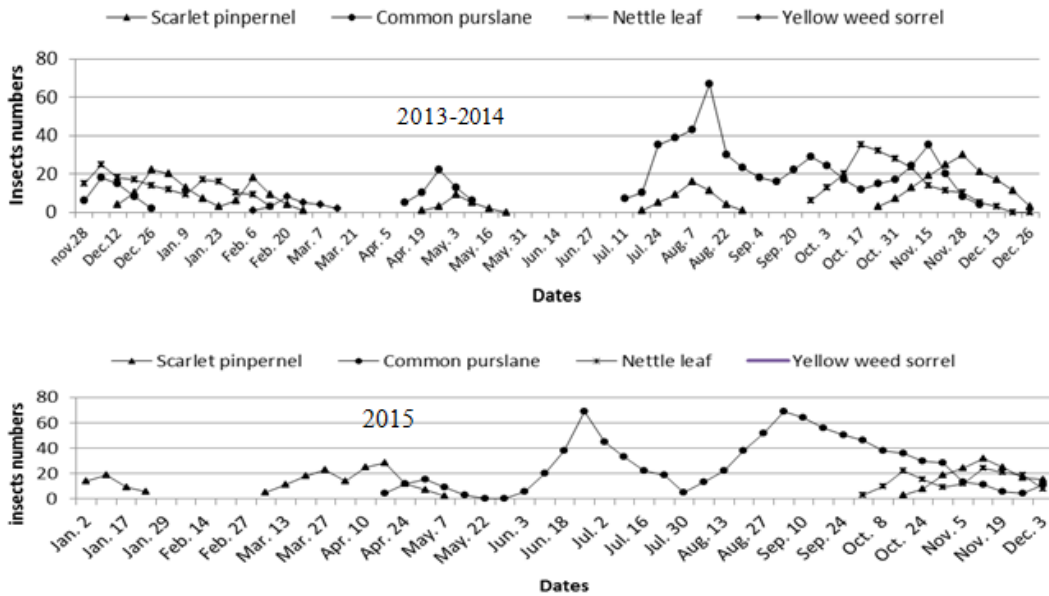


Fig. 3: Population dynamics of cotton aphids on weeds specific plant hosts at Zagazig region during the period extended from 28, Nov.2013 till 3, Dec. 2015.

#### Little mallow, *Malva parriflora*:

The cotton aphids, *A. gossypii* found infested Little mallow plants in three occurrence periods Fig. (1), the 1<sup>st</sup> one expanded from 18 Nov. 2013 till 19 Apr. 2014 and listed three peaks recorded at 20<sup>th</sup> Dec 2013, 20<sup>th</sup> Feb. 2014 and 21<sup>st</sup> March 2014 with 32,47 and 19 individuals/leaf for the three peaks respectively; this period was extension to the last occurrence period of 2013. The 2<sup>nd</sup> period was extended from 20<sup>th</sup> Sep. 2014 to 7<sup>th</sup> May 2015 on *M. parriflora* plants with four peaks of 63, 42, 66 and 65 individuals/ leaf registered at 17<sup>th</sup> Oct., 21<sup>st</sup> Nov.2014, 17<sup>th</sup> Jan. and 7<sup>th</sup> Mar. 2015, respectively; then the population decline to restart again in new growth season to record the 3<sup>rd</sup> occurrence period from 24<sup>th</sup> Oct.2015 to end of study period at 3<sup>rd</sup> Dec. 2015 recorded one peak at 13<sup>th</sup> Nov. with 50 individuals/leaf. So, the little mallow plants considered as one of the important hosts of cotton aphids throughout its growth season.

#### Scarlet pinpernel *Anagallis arvensis*:

The scarlet pinpernel, *A. arvensis* found harbored *A. gossypii* in five activity periods Fig. (3), the 1<sup>st</sup> one expanded from 12<sup>th</sup> Dec. 2013 till 20<sup>th</sup> Feb. 2014 and listed two peaks at 26<sup>th</sup> Dec 2013 and 6<sup>th</sup> Feb.2014 with 22 and 18 individuals/shots for the two peaks, respectively; this period was extension to the last occurrence period of 2013. The 2<sup>nd</sup> period was registered from 19<sup>th</sup> Apr. to 16<sup>th</sup> May 2014 on *A. arvensis* plants with one weak peak of 9 individuals/ shots recorded at 3<sup>rd</sup> May.2014. The 3<sup>rd</sup> period extended from 24<sup>th</sup> Oct.2014 to 23<sup>rd</sup> Jan. listed one peak at 28<sup>th</sup> Nov. 2014 with 30 individuals/shots. The 4<sup>th</sup> period was presented from 7<sup>th</sup> Mar. to 7<sup>th</sup> May 2015 with two peaks of 23 and 28 individuals/ shots recorded at 27<sup>th</sup> March and 18<sup>th</sup> Apr. respectively. The last occurrence period was registered from 15<sup>th</sup> Oct. to

the end of study period at 3<sup>rd</sup> Dec. 2015 down one peak of 32 individuals/ shots at 13<sup>th</sup> Nov. 2015.

**Yellow weed sorrel, *Oxalis corniculata*:**

The perennial weed yellow weed sorrel, *O. corniculata* which grow in the shadow area, found harbored *A. gossypii* in four activity periods Fig. (3), the 1<sup>st</sup> one extended from 5<sup>th</sup> Apr. till 6<sup>th</sup> Jun 2014.on old plants and recorded one peak at 9<sup>th</sup> May. with 17 individuals/shots. The 2<sup>nd</sup> period was expanded from 27<sup>th</sup> Sep. to 15<sup>th</sup> Nov. 2014 with one peak of 18 individuals/ shots listed at 17<sup>th</sup> Oct., then the population decline to restart again in the 3<sup>rd</sup> period from 13<sup>th</sup> Mar. to 22<sup>nd</sup> May. 2015 listed one peak at 18<sup>th</sup> Apr. with 37 individuals/shots. The 4<sup>th</sup> period was expanded from 15<sup>th</sup> Oct. to 26<sup>th</sup> Nov 2015 with one peak at 5<sup>th</sup> Nov. with 16 individuals/shots.

**Ploughman's spikenard. *Conyza discorides* L.:**

The illustrated data in Fig. (4) cleared that the ploughman spikenard, *C. discorides* found harbored cotton aphids, *A. gossypii* in three occurrence periods, the 1<sup>st</sup> one extended from 28 Nov. 2013 till 23 Jan. 2014, recorded one peak at 12<sup>th</sup> Dec 2013 with 52 individuals/leaf; this period was extension to the last activity period of 2013 . The 2<sup>nd</sup> period was expanded from 3<sup>rd</sup> Oct. to 26<sup>th</sup> Dec 2014 with one weak peak of 42 individuals/ leaf recorded at 31<sup>st</sup> Oct.2014. The 3<sup>rd</sup> period was from 29<sup>th</sup> Oct.2014 to 3<sup>rd</sup> Dec 2015 .recorded one peak at 19 Nov. with 34 individuals / leaf.

The *Ch. murale* plants found harbored *A. gossypii* in three activity periods Fig. (4), the 1<sup>st</sup> one which was extension to the last activity period of 2013 recorded from 28<sup>th</sup> Nov. 2013 till 13<sup>th</sup> Feb. 2014 recorded two peaks at 5<sup>th</sup> Dec 2013 And 16<sup>th</sup> Jan 2014 with 25 and 17 individuals/leaf for the two peaks, respectively. The 2<sup>nd</sup> period was from 27<sup>th</sup> Sep. to 13<sup>th</sup> Dec 2014 with one peak at 17<sup>th</sup> Oct. with 35 individuals/ leaf. The 3<sup>rd</sup> period extended from 1<sup>st</sup> Oct. to 3<sup>rd</sup> Dec 2015 .recorded two peaks at 15<sup>th</sup> Oct. and 13<sup>th</sup> Nov. with 22 and 24 individuals / leaf for the two peaks, respectively.

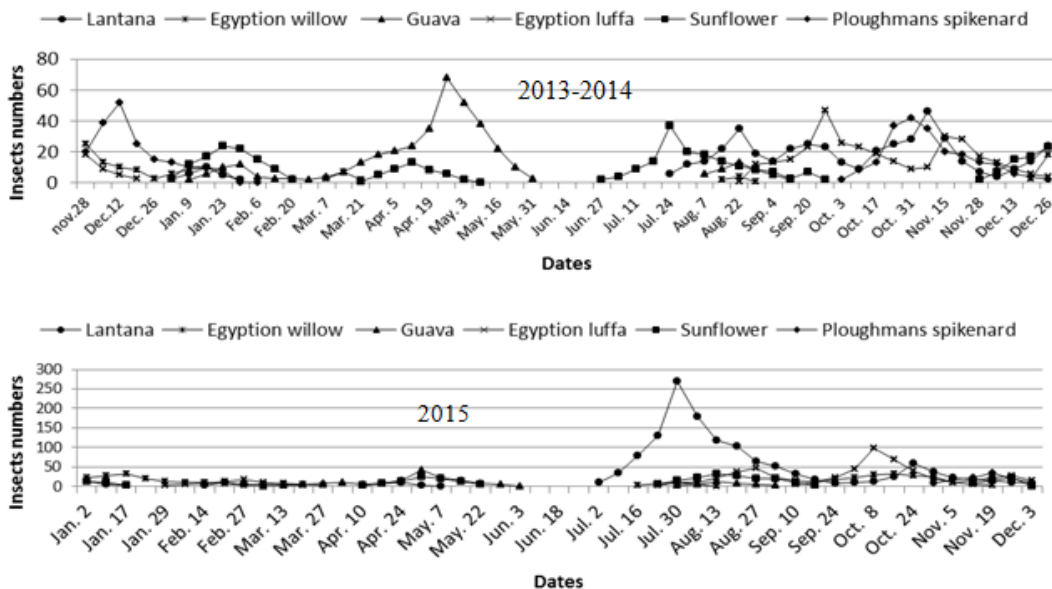


Fig. 4: Population dynamics of cotton aphids on wild specific plant hosts at Zagazig region during the period extended from 28, Nov.2013 till 3, Dec. 2015.

**Nettle leaf or goosefoot, *Chenopodium murale*:****Water melon, *Citrullus vulgaris*:**

The water melon, *C. vulgaris* which inspected as weeds/wild plants found in/out cultivated fields, where it is not cultivated as commercial crop in the study area found infested by *A. gossypii* in four occurrence periods. The 1<sup>st</sup> one was extension to the last occurrence period of 2013 extended till 12<sup>th</sup> Dec. 2013, where 35 individuals/leaf was recorded firstly and then the population decreased. The 2<sup>nd</sup> period was extended from 24<sup>th</sup> Jul. to 20<sup>th</sup> Sep. 2014 with one peak of 40 individuals/leaf recorded at 22<sup>nd</sup> Aug, and then the population reduced to restart again at the third and short occurrence period from 24<sup>th</sup> Oct. to 28<sup>th</sup> Nov. 2014 recorded one peak at 7<sup>th</sup> Nov. with 28 individuals/leaf. The 4<sup>th</sup> occurrence period was extended from 26<sup>th</sup> Jun. to 26<sup>th</sup> Nov 2015 with three peaks noticed at 16<sup>th</sup> Jul, 17<sup>th</sup> Sep. and 13 Nov. with 36, 70 and 14 individuals/leaf for the three peaks, respectively.

**The Egyptian willow trees, *Salix subcerrata*:**

The newly twigs of Egyptian willow, *S. subcerrata* trees found harbored *A. gossypii* in six occurrence periods, the 1<sup>st</sup> one which was extension to the last occurrence period of 2013 till 30 Jan 2014 started with 25 individuals/twig and then oscillated till disappeared at the end of period. The population of *A. gossypii* was oscillated in very low numbers at the two temporary periods (3&4) from 7<sup>th</sup> to 21<sup>st</sup> Mar. 2014 and from 15<sup>th</sup> to 29<sup>th</sup> Aug. 2014 without cleared peaks. The 4<sup>th</sup> period was extended from 19<sup>th</sup> Dec. 2014 to 27<sup>th</sup> Mar. 2015 with two relatively weak peaks of 32 and 8 individuals/ twig listed at 17<sup>th</sup> Jan. and 13<sup>th</sup> Mar. for the two recorded peaks, respectively. The temporary 5<sup>th</sup> occurrence period noticed from 16<sup>th</sup> Jul. to 13<sup>th</sup> Aug. 2015 then the population decline to restart again in the last occurrence period extended from 10<sup>th</sup> Sep. to 19<sup>th</sup> Nov. 2015 with one peak of 32 individuals / twig recorded at 15<sup>th</sup> Oct 2015 on *S. subcerrata* trees.

The obtained results found in harmony with those of Rattanapum, (2012) and Rahman *et al.*, (2009) who recorded *Aphis gossypii* on eggplant (bringal), *Solanum melongena*. Also, Bodlah, *et al.*, (2011) recorded *Rosa* sp, *Gossypium* sp., are within host plants range of *A. gossypii*. Ekukole, (1990), mentioned that the cotton and okra were most seriously infested with *A. gossypii* in Cameron. Godfrey & fuson, (2001), Who reared *A. gossypii* on *cucumis melo* L. sub sp. *Melo* var. *cantalupensis* Naudin with good population growth. Rodriguez and Jeannette, (2007); Liu *et al.*, (2008) and Alikhani, *et al.*, (2010) reported that the two plant families of malvaceae and cucurbitaceae include the major hosts of *A. gossypii*, *Hibiscus trionum*, *Cucurbita* sp., *Cucumis melo*, *C. sativus*, *Malva neglecta*. Satar, *et al.*, (1999), reported that the cotton aphids reared on three malvaceae hosts, *Gossypium hirsutum*, *Malva sylvestris* and *Abelmoschus esculentus* (L.) with significant variation in biological aspects of insects. Hale *et al.*, (2009) recorded that the *A. gossypii* has wide host range, watermelon, cucumber, cantaloupe, squash, pumpkin, asparagus, spinach, bean, beet, cowpea, tomato, pepper, eggplant, okra, citrus, cotton, hibiscus and many weeds such as jimson weed and pigweed. Smith *et al.*, (2006) recorded *A. gossypii* on *Chenopodium* sp. *Citrullus vulgaris*. Attia and El-Hamaky (1992) found *A. gossypii* attacking leaves of the vegetable crops; marrow, okra, watermelon, cantaloupe and cucumber from March to May and guava leaves from March to November. This species migrated to overwinter on marrow and garden purslane weeds. Attia, *et al.*, (1985) recorded that the *A. gossypii* infested guava during February/September. Mohamad- Zeinab (1984) found *A. gossypii* infested *Avena fatua*, *Malva parviflora*, *Portulaca oleracea* and *Convolvulus arvensis* plants. Megahed, (2000) found *A. gossypii* infested *Conyza dioscorides* L., *Portulaca oleracea* L., *Prassica*

*nigra* L., *Solanum nigrum* L., *Rumex dentatus* L. *Cyperus* spp. *Beta vulgaris*, *Chenopodium* spp. *Anagallis arvensis* L., *Daucus carota* L., *Urtica acutum* L. *Oxalis corniculata*.

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## ARABIC SUMMARY

تقلبات تعداد حشرات من القطن *Aphis gossypii* علي العوائل النباتية الاساسية والبديلة في محافظة الشرقية ، مصر

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معهد بحوث وقاية النباتات – مركز البحوث تالزراعية – الدقي- جيزة – مصر

اجريت هذه الدراسة في منطقة الزقازيق محافظة الشرقية علي جميع النباتات والاشجار الموجودة في منطقة الدراسة خلال فترة امتدت من نهاية نوفمبر ٢٠١٣ وحتى بداية ديسمبر ٢٠١٥ لتحديد العوائل النباتية ونسبة وفترات التواجد السنوي لحشرات من القطن علي العوائل النباتية الاقتصادية والنباتات البرية والحشائش للاستفادة من ذلك في اعداد برامج فعالة للادارة المتكاملة لحشرات من القطن .

اوضحت النتائج ان حشرات من القطن وجدت على مدى عوائل واسعة تمثل في ٣٧ نبات اقتصادي و٢٣ نوع من النباتات البرية والحشائش تتبع كلها ٢٢ عائلة نباتية . سجلت اعلي نسبة تواجد ٣٨.٩ % علي نباتات العائلة الخبازية بينما كانت اقل نسبة ٠.٠٦٩ سجلت علي نبات العائلة الزنيقية ( الثوم). اختلفت نسب تواجد حشرات من القطن تبعاً لاختلاف العائل النباتي حيث سجل اعلي نسبة تواجد ١٦.٨١ % علي نباتات القطن تلاها نباتات الباميا ١١.٤٥٦ % بينما سجلت اقل نسبة ٠.٠٤٣ % علي نبات السلق من الحشائش. اما بخصوص نسب التواجد علي النباتات البرية والحشائش فقد سجلت اعلي نسبة ٥.٠٢٣ % علي نباتات الرجلة بينما سجلت اقل نسبة ٠.٠٧٩ % علي نباتات الحميض.

وجد ان اطول مدة لتواجد حشرات من القطن كانت علي نباتات القطن وقد امتدت من بداية ابريل وحتى بداية اكتوبر ٢٠١٤ ومن بداية مايو وحتى منتصف اكتوبر ٢٠١٥ مسجلا اعلي قمة للتعداد ٣٢٠ فرد/ورقة في ١٥ اغسطس ٢٠١٤ تلاها القمة التي سجلت علي نباتات الانتانا ٢٧٠ فرد/ورقة في ٣٠ يوليو .

وجد فترتين من النشاط محددة للحركة السنوية لمجموع حشرات من القطن حيث سجل المن خلالها علي عدد محدود من العوائل وابعاد منخفضة نسبيا ، امتدت الفترة الاولى من ٦ فبراير الي ٥ ابريل ٢٠١٤ وذلك علي ١٦ عائل نباتي فقط وتراوحت الكثافة العددية خلال هذه الفترة علي العوائل من فرد واحد/ورقة علي نباتات حشائش الزغلنت الي ٤٧ فرد/ورقة علي نباتات الخبيزة ، اما الفترة الثانية فقد امتدت من ٢ يناير وحتى ٢٠ فبراير ٢٠١٥ وذلك علي ١٤ عائل فقط وتراوح متوسط كثافة التعداد خلال الفترة من فرد واحد/ورقة علي نباتات حشائش كيس الراعي الي ٦٦ فرد/ورقة وهذا يعني ان هذه العوائل المتواجد عليها المن خلال هذه الفترات تلعب دورا هاما في عملية البعثرة والحركة السنوية لمجموع حشرات من القطن فيما بين العوائل الاساسية والبديلة خلال فترات النشاط.