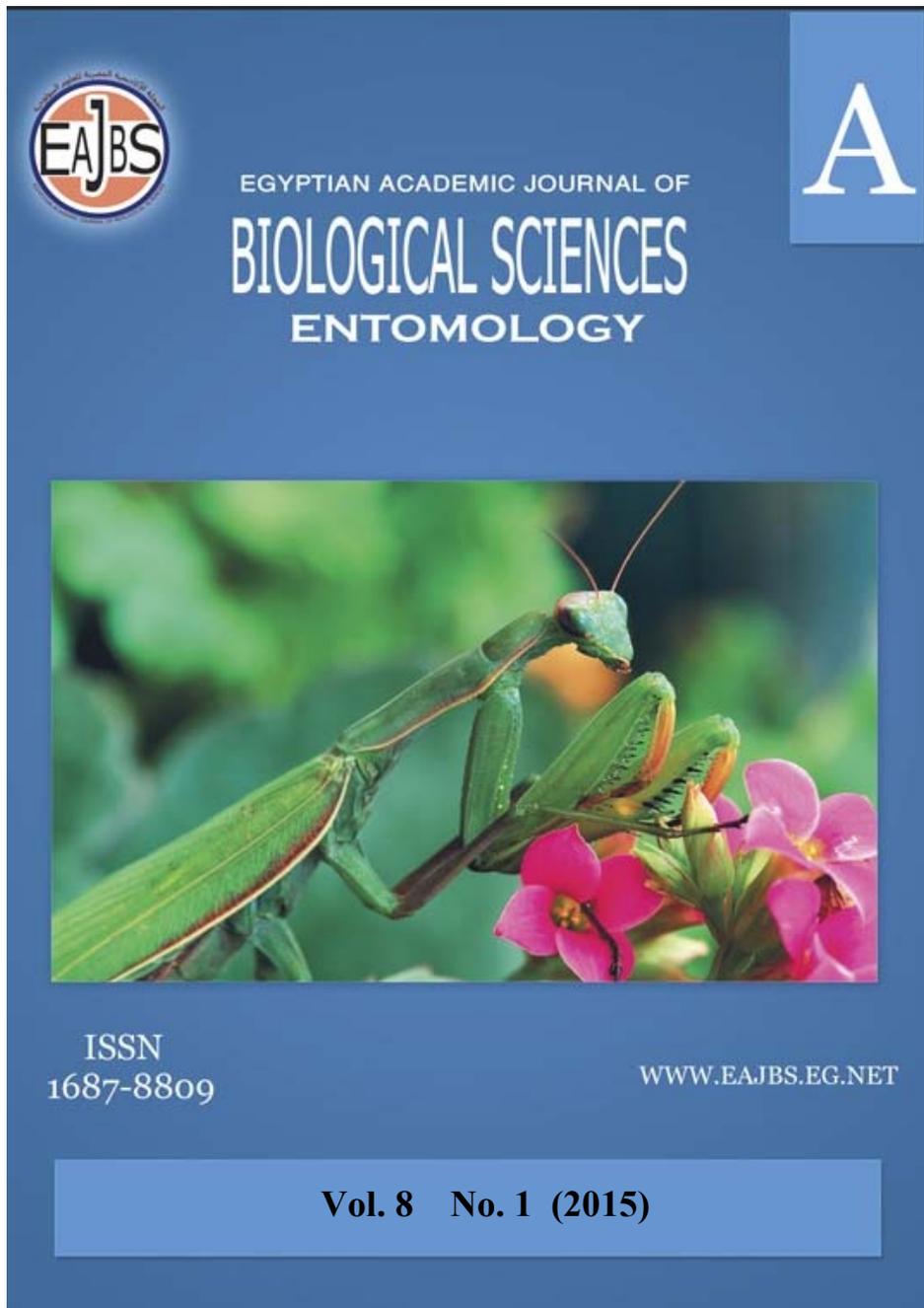


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**Impact of some weather factors, plant age, plant growth stages and sowing date on population fluctuation of some sap-sucking pests attacking fenugreek plants**

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**ABSTRACT**

Field experiments were carried out at Plant Protection Research Station at Qaha, Qalubiya Governorate for two successive seasons (2010/2011-2011/2012) in order to study the effect of some weather factors ,plant age and growth stages of the fenugreek Plant (*Trigonella foenum-graecum* L.) during three sowing dates (Oct.31<sup>st</sup>, Nov.15<sup>th</sup> and Nov.30<sup>th</sup>) on population fluctuation of three aphid species [pea aphid, *Acyrtosiphon pisum* (Harris); cotton aphid , *Aphis gossypii* (Glover) and Leguminous aphid , *Aphis craccivora* Koch and cotton thrips, *Thrips tabaci* Lind. In the first season, population of *Aphis* spp. had four, two and three peaks in the first, second and third sowing dates, respectively. The four peaks of aphid population during first sowing date recorded mean numbers of 2.0, 9.0, 4.0 and 10.67 insects / 20 buds on Nov., 29<sup>th</sup> 2010, Jan.,17<sup>th</sup>, Feb., 14<sup>th</sup> and Feb., 28<sup>th</sup> 2011, at 29,78, 106 and120 days from sowing date ,respectively. In respect to, second sowing date the first peak of 2.33 moving stages / 20 buds, occurred on Jan., 24<sup>th</sup> 2011 at 70 days from sowing date, the second one with mean numbers of 6.0 individuals / 20 buds were recorded on the Feb., 28<sup>th</sup> 2011 at 105 days (plant age). While three peaks through third sowing date represented by mean numbers of 1.0, 3.33 and 2.0 insects per 20 buds on Jan., 10<sup>th</sup>, Feb., 21<sup>st</sup> and March, 14<sup>th</sup> at 41, 83 and 104 days from sowing date , respectively. In the second season, the peak numbers and account of aphids/20buds were recorded slightly differences. Pea aphid was insignificantly positive correlated with plant age for all sowing dates during two study seasons except for first date in the first season was significantly positive correlated. Also, pea aphid was the more dominant aphid species through three sowing dates during two seasons. Population fluctuation of *T.tabaci* had two, five and four peaks at the three sowing dates, respectively, in the first season. But in the second season *T.tabaci* recorded three, five and four peaks at first, second and third sowing dates, respectively. The three tested sowing dates arranged descending, where the *T. tabaci* population recorded as 7.29, 4.49 and 3.27 insects / 20 buds, respectively, in the first season. The general trend of *T. tabaci* infestation in the second season recorded gradually increasing, characterized with significant differences between vegetative, flowering and fruiting stages in the three sowing dates. Also the fruiting stage in the three sowing date is the most stage infested by *T. tabaci*.

Statistical analysis of results for the two seasons was indicated that, the suitable date for fenugreek cultivation in Qualibia ,Governorate , Egypt Nov.,15<sup>th</sup> where recorded mean numbers 1.67 ; 2.13 aphids / 20 buds and 4.49 ; 3.31 thrips / 20 buds in the first and second seasons , respectively, compared with other sowing dates. Also, the fruiting stages in the three sowing dates during two seasons is the most stage infested by *T. tabaci* followed by flowering and vegetative growth stages expect of, third date in the first season

**INTRODUCTION**

The fenugreek are medicinal plants and important in human life where it is used as a drink or feeding them directly and feeding on the green stage.

In addition to, Afsah and Hanafy (2010) recorded that fenugreek plants infested by *Acyrtosiphon pisum*, *Aphis gossypii*, *Aphis craccivora*, *Thrips tabaci*, *Bemisia tabaci*, *Myzus persicae*, *Autographa gamma* and *Liriomyza* spp. Agricultural practices are considered as an important safe method for pest control and play a significant role in increasing the quantity and quality of crops. Singh and Saxena (1982) demonstrated that grain yields were significantly affected by date of planting, the highest yield was recorded with planting between Oct. 30<sup>th</sup> and Nov., 15<sup>th</sup>. In Egypt, Ahmed and Ali (2002) recorded that, the heaviest weight of seed yield of fenugreek plants were detected due to sowing date on Nov.15<sup>th</sup> compared with the early sowing date of October, 30<sup>th</sup> or late (November, 30). Also they found that, the early sowing date of October, 30<sup>th</sup> significantly increased fixed oil and mucilage percentage of seeds compared to medium (November15) or late (November, 30) one.

The present work was carried out to study the effect of some weather factors, sowing dates plant age and growth stages on the incidence, seasonal population fluctuation and population density of some insect pests on fenugreek plants.

## MATERIALS AND METHODS

Field experiments were carried out at Plant Protection Research Station at Qaha, Qalubia Governorate for two successive seasons (2010/2011-2011/2012) at three sowing dates (Oct.,31<sup>st</sup>, Nov.,5<sup>th</sup> and Nov., 30<sup>th</sup>) per season according to Ahmed and Ali, 2002, the fenugreek seeds (Cultivar. Giza 30) were obtained from Department of Medicinal and Aromatic plants, Horticulture Research Institute, A. R. C. The experimental area for each sowing date (525m<sup>2</sup>), was divided into three replicates (175 m<sup>2</sup> for each). Treatments were distributed in completely randomized blocks design. All agricultural practices were done without pesticide treatments. With regard to, the primary five inspections from plant life as period of vegetative growth then followed by six inspections as a flowering stage and the last six inspections as fruiting stage, this tactic agrees with Omezzine *et al.* (2014). Weekly samples of 20 buds / replicate were taken at random after foliage appearance and continue for 17 weeks (Afsa and Hanafy (2010) they mentioned that, pea aphid, cotton aphid, Leguminous aphid and cotton thrips harbored on the fenugreek buds). Each sample was placed in paper bags and examined in laboratory by using stereomicroscope at the same day. Weekly means of maximum & minimum temperature (c<sup>o</sup>), maximum and minimum relative humidity (R.H. %) and weekly average of wind velocity (meter /S.) were obtained from Central Laboratory for Agriculture Climate (Table 1) to show the effect explained variance. The statistical analyses of the obtained data were carried out by using SAS program Computer including F. test (SAS Institute, 2003).

Table 1: Tested weather factors, obtained from Central Laboratory for Agriculture Climate 2011 / 2012 – 2012 / 2013

First season						Second season					
Date	Max. Tem.	Min. Tem.	Max RH%	Min. R.H.%	Ave. SPEED/ S	Date	Max. Tem.	Min. Tem.	Max RH%	Min. R.H.%	Ave. SPEED/ S
15/11/2010	29.16	18.69	81.44	38.10	4.64	15/11/2011	25.03	12.29	83.95	46.58	2.52
22/11/2010	27.21	18.76	84.26	48.10	6.04	22/11/2011	26.81	13.39	84.09	41.85	1.99
29/11/2010	26.33	15.24	82.66	38.90	5.53	29/11/2011	25.12	12.52	84.00	43.22	2.64
06/12/2010	28.04	14.91	75.04	26.63	5.49	06/12/2011	20.91	8.73	84.81	46.68	2.18
13/12/2010	20.29	12.83	81.51	51.06	8.26	13/12/2011	19.56	6.46	84.45	47.30	2.64
20/12/2010	21.13	11.66	72.39	35.20	6.99	20/12/2011	20.34	7.86	83.99	47.49	2.11
27/12/2010	23.17	13.11	84.87	44.37	7.07	27/12/2011	18.96	7.81	81.26	44.24	2.26
03/01/2011	17.73	14.74	69.39	56.68	4.24	03/01/2012	18.16	6.29	82.14	44.71	3.07
10/01/2011	18.14	5.46	87.39	47.86	2.68	10/01/2012	17.18	5.56	82.79	48.73	2.82
17/01/2011	19.24	5.93	85.79	45.83	2.79	17/01/2012	16.52	5.21	74.84	39.43	3.81
24/01/2011	17.90	6.01	88.25	52.46	2.89	24/01/2012	16.20	4.14	85.05	45.99	2.89
31/01/2011	20.06	7.04	82.76	36.92	4.18	31/01/2012	17.90	7.19	80.16	45.99	2.72
07/02/2011	19.73	9.79	84.95	48.71	4.08	07/02/2012	18.58	5.84	76.38	38.10	3.28
14/02/2011	16.81	6.11	68.71	34.22	2.20	14/02/2012	18.46	5.92	73.01	29.55	2.38
21/02/2011	23.12	7.47	76.63	28.76	2.68	21/02/2012	18.69	6.90	79.84	39.51	3.16
28/02/2011	22.56	6.93	74.48	29.90	3.42	28/02/2012	20.64	6.61	81.93	37.36	2.99
07/03/2011	22.50	8.56	84.59	41.56	3.99	06/03/2012	18.83	7.23	80.43	41.81	4.26
14/03/2011	19.91	5.54	83.06	39.39	5.06	13/03/2012	24.79	11.00	77.13	33.46	3.29
21/03/2011	23.58	8.21	78.62	37.26	4.97	20/03/2012	20.42	7.54	80.09	40.86	4.02
28/03/2011	23.32	10.04	83.54	43.40	3.95	27/03/2012	21.97	6.70	84.54	42.77	3.40
04/04/2011	24.39	8.72	83.81	39.09	3.63	03/04/2012	23.85	9.25	84.60	38.43	3.25

## RESULTS AND DISCUSSION

Studies on the seasonal population fluctuation and effecting of sowing dates and growth stage on some insects that attack buds of fenugreek plants during two successive growing season (2010/2011)- (2011/2012). The obtained results tabulated in Tables (2 and 3) and can be clarified:

### 1- Aphids population:

#### 1-1 population fluctuation throughout three different sowing dates.

##### The first season:

Table (2) contained, mean numbers of aphid population species, when the age of plant were 22 days by mean numbers of 0.67 aphid / 20 buds during first sowing date . In respect to the second sowing date, the initial infestation was recorded on the Dec.27<sup>th</sup> 2010 after 42 days with 0.33 aphids / 20 buds, in the third sowing date, the first appearance on Jan., 10<sup>th</sup> 2011 when the plant age was 41 days with 1.0 aphid / 20 buds. As obviously, the population had four, two and three peaks in the first, second and third sowing dates, respectively. Four peaks of aphid population during first sowing date recorded mean numbers of 2.0, 9.0, 4.0 and 10.67 nymphs and adults / 20 buds on Nov., 29<sup>th</sup> 2010, Jan., 17<sup>th</sup>, Feb., 14<sup>th</sup> and Feb., 28<sup>th</sup> 2011, at 29, 78, 106 and 120, respectively. In respect to, second sowing date the first peak of 2.33 moving stages / 20 buds, occurred on Jan., 24<sup>th</sup> 2011 at 70 days from sowing date, the second one with mean numbers of 6.0 individuals / 20 buds were recorded on the Feb., 28<sup>th</sup> 2011 at 105 days (plant age).

While three peaks through third sowing date represented by mean numbers of 1.0, 3.33 and 2.0 insects per 20 buds on Jan., 10<sup>th</sup>, Feb., 21<sup>st</sup> and March, 14<sup>th</sup> at 41, 83 and 104 days from sowing date, respectively.

Regardless for studying total population of aphid species, in the Tables 2 and 3 revealed the three aphid species *i.e.* *A. pisum*; *A. gossypii* and *A. craccivora* during three growth stages at different three sowing dates.

In Table (2), *A. craccivora* appeared at Nov., 22<sup>th</sup> 2010 after 22 days from sowing date (vegetative growth) with mean numbers of 0.67 individuals / 20 buds

followed by *A. gossypi* with weekly mean number of 0.33 aphid/ 20 buds after 36 days from sowing on the Dec., 6<sup>th</sup> 2010 and followed by *A. pisum* with mean numbers of 2 individuals / 20 buds after 64 days from sowing date through flowering stage in the first sowing date. In the second sowing date *A. craccivora* was appeared in the last flowering stage (0.67insect /20 buds) but *A. gossypi* was appeared early in the last stage of vegetative (0.33 moving stages / 20 buds) and followed by *A. pisum* (0.67 aphid / 20 buds) in the early of flowering stage.

Table 2: Population fluctuation of three aphid species infesting fenugreek buds through growth stages and effect of sowing dates on their population density during first season of 2010 / 2011 at Qaha, Qalubia Governorate.

Growth stages	Mean numbers of three aphid species through three sowing dates																	
	Weekly mean numbers of insects during first sowing date						Weekly mean numbers of insects during second sowing date						Weekly mean numbers of insects during third sowing date					
	Inspec. dates	A. p.	A. g.	A. c.	A. spp.	P. a	Inspec. dates	A. p.	A. g.	A. c.	A. spp.	P. a	Inspec. dates	A. p.	A. g.	A. c.	A. spp.	P. a
Vegetative stage	Nov., 15 <sup>th</sup> 2010	0.00	0.00	0.00	0.00	15	Nov., 29 <sup>th</sup> 2010	0.00	0.00	0.00	0.00	14	Dec., 13 <sup>th</sup> 2010	0.00	0.00	0.00	0.00	13
	22 <sup>nd</sup>	0.00	0.00	0.67	0.67	22	Dec., 06 <sup>th</sup>	0.00	0.00	0.00	0.00	21	20 <sup>th</sup>	0.00	0.00	0.00	0.00	20
	29 <sup>th</sup>	0.00	0.00	2.00	2.00	29	13 <sup>th</sup>	0.00	0.00	0.00	0.00	28	27 <sup>th</sup>	0.00	0.00	0.00	0.00	27
	Dec., 06 <sup>th</sup>	0.00	0.33	1.00	1.33	36	20 <sup>th</sup>	0.00	0.00	0.00	0.00	35	Jan., 03 <sup>rd</sup> 2011	0.00	0.00	0.00	0.00	34
	13 <sup>rd</sup>	0.00	0.67	0.33	1.00	43	27 <sup>th</sup>	0.00	0.33	0.00	0.33	42	10 <sup>th</sup>	1.00	0.00	0.00	1.00	41
	Mean numbers / stage	0.0c	0.20b	0.80a	1.0b		Mean no. / stage	0.0c	0.07b	0.00b	0.07c		Mean no. / stage	0.20b	0.0b	0.0a	0.2b	
Flowering stage	20 <sup>th</sup>	0.00	0.67	0.33	1.00	50	Jan., 03 <sup>rd</sup> 2011	0.67	0.33	0.00	1.00	49	17 <sup>th</sup>	0.33	0.00	0.00	0.33	48
	27 <sup>th</sup>	0.00	1.33	0.33	1.67	57	10 <sup>th</sup>	1.00	0.33	0.00	1.33	56	24 <sup>th</sup>	0.33	0.00	0.00	0.33	55
	Jan., 03 <sup>rd</sup> 2011	2.00	3.00	0.33	5.33	64	17 <sup>th</sup>	1.00	0.33	0.00	1.33	63	31 <sup>st</sup>	1.00	0.00	0.00	1.00	62
	10 <sup>th</sup>	2.00	6.00	0.67	8.67	71	24 <sup>th</sup>	1.33	1.00	0.00	2.33	70	Feb., 07 <sup>th</sup>	2.33	0.00	0.00	2.33	69
	17 <sup>th</sup>	3.67	4.00	1.33	9.00	78	31 <sup>st</sup>	0.33	1.33	0.00	1.67	77	14 <sup>th</sup>	3.00	0.00	0.00	3.00	76
	24 <sup>th</sup>	3.00	2.00	1.00	6.00	85	Feb., 07 <sup>th</sup>	0.67	0.33	0.67	1.67	84	21 <sup>st</sup>	3.33	0.00	0.00	3.33	83
	Mean numbers / stage	1.78b	2.83a	0.67a	5.28a		Mean no. / stage	0.83b	0.61a	0.11b	1.56b		Mean no. / stage	1.72a	0.0b	0.0a	1.72a	
Fruiting stage	31 <sup>st</sup>	1.33	0.67	0.33	2.33	92	14 <sup>th</sup>	0.67	0.33	1.00	2.00	91	28 <sup>th</sup>	1.33	0.00	0.00	1.33	90
	Feb., 07 <sup>th</sup>	0.33	1.33	0.00	1.67	99	21 <sup>st</sup>	4.00	0.00	1.67	5.67	98	March., 07 <sup>th</sup>	0.33	1.00	0.00	1.33	97
	14 <sup>th</sup>	1.67	2.33	0.00	4.00	106	28 <sup>th</sup>	3.33	0.00	2.67	6.00	105	14 <sup>th</sup>	0.67	1.33	0.00	2.00	104
	21 <sup>st</sup>	1.67	0.33	0.00	2.00	113	March., 07 <sup>th</sup>	2.00	0.00	0.67	2.67	112	21 <sup>st</sup>	0.00	0.67	0.00	0.67	111
	28 <sup>th</sup>	10.67	0.00	0.00	10.67	120	14 <sup>th</sup>	1.00	0.00	0.33	1.33	119	28 <sup>th</sup>	0.00	0.00	0.00	0.00	118
	March., 07 <sup>th</sup>	7.67	0.00	0.00	7.67	127	21 <sup>st</sup>	1.00	0.00	0.00	1.00	126	April., 4 <sup>th</sup>	0.00	0.00	0.00	0.00	125
	Mean numbers / stage	3.89a	0.78b	0.06b	4.72a	-	Mean no. / stage	2.00a	0.06b	1.06a	3.11a		Mean no. / stage	0.39b	0.50a	0.0a	0.89b	
F. test for effect of three growth stages / sowing date		**	**	*	**		F. test	**	**	**	**		F. test	**	**	N.S.	**	
L.S.D for effect of three growth stages / sowing date at (0.05)		1.452	1.054	0.536	1.772		L.S.D	0.643	0.277	0.465	0.983		L.S.D	0.628	0.315	0.00	0.782	
Average numbers / date		2.0 A	1.33A	0.49A	3.82 A	-	Ave. no. / date	1.0 B	0.25B	0.41A	1.67B		Ave. no. / date	0.80 B	0.18 B	0.0 B	0.98B	
F. test for effect of sowing dates / insect		On: A. p. = ** - A. g. = ** - A. c. = ** - A. spp. = **																
L.S.D for effect of sowing dates at (0.05) / insect		Par : A. p. = 0.735 - A. g. = 0.403 - A. c. = 0.257 - A. spp. = 0.839																

*A. p.* refers to *Acyrtosiphon pisum* - *A. c.* refers to *Aphis craccivora* - *A. g.* refers to *Aphis gossypii*. - *A. spp.* refers to of *Aphis spp.* as a total population for three species - P.a refers to Plant age\* = Significant diff. (0.05) - \*\* = Highly significant diff. (0.01) - Average followed by the same letters are not significant different at 0.05 level of probability.

In the third sowing date, it is obvious that, fenugreek plants were free from any *A. craccivora* and except. *A. gossypi* appeared at the short time from 7<sup>th</sup> to March, 21<sup>th</sup>, but *A. pisum* was appeared at last of vegetative stage to medium of fruiting stage from Jan., 10<sup>th</sup> 2011 to March, 14<sup>th</sup> 2011.

It is to monition that, pea aphid has two peaks in the first and second sowing dates, but in the third sowing dates recorded three peaks. *A. gossypii* recorded two peaks at first sowing date and one peak at second one, but this aphid appeared through three inspections only during fruiting stage at third sowing date with low mean numbers recording one peak. But in case *A. craccivora* represented by two and one peaks at first and second sowing date, respectively.

### The second season:

Generally, the sowing and inspection dates during two seasons were typically, Table (3) stated that, the first appearance for *Aphis spp.* at the three sowing dates was after 36, 42, and 34 days from sowing. Aphid population recorded 6.33, 0.33 and 1.0 aphids / 20 buds at the 6<sup>th</sup>, Dec., 27<sup>th</sup> 2010 and Jan., 3<sup>rd</sup> 2011, respectively. In respect to, population fluctuation of aphid were recorded four, five and four peaks, respectively. The value of the four peaks at the first sowing date were 6.33, 9.33, 19.0

and 3.33 aphids / 20 buds at the date Dec., 6<sup>th</sup> 2011, Jan., 10<sup>th</sup>, 31<sup>th</sup> and Feb., 21<sup>st</sup> 2012, respectively. The five peaks in the second sowing date were 0.67, 1.67, 5.0, 10.67 and 4.33 aphids / 20 buds at 3<sup>rd</sup>, 17<sup>th</sup>, Jan. 31<sup>st</sup>- 14<sup>th</sup> and Feb. 28<sup>th</sup> 2012, At the third sowing date recorded four peaks at the date Jan., 24<sup>th</sup>; 7<sup>th</sup>& Feb., 21<sup>st</sup> and March, 6<sup>th</sup> 2012, With mean numbers 11.33, 11.0, 16.0 and 20 aphids /20 buds, respectively.

Table 3: Population fluctuation of three aphid species infesting fenugreek buds through growth stages and effect of sowing date on their population density during second season of 2011 / 2012 at Qaha, Qalubia Governorate.

Growth stages	Mean numbers of three aphid species through three sowing dates																	
	Weekly mean numbers of insects during first sowing date					Weekly mean numbers of insects during second sowing date					Weekly mean numbers of insects during third sowing date							
	Inspec. dates	A.p.	A.g	A.c	A.spp	P.a	Inspec. dates	A.p.	A.g	A.c	A.spp	P.a	Inspec. dates	A.p.	A.g	A.c	A.spp	P.a
Vegetative stage	Nov.,15 <sup>th</sup> 2011	0.00	0.00	0.00	0.00	15	Nov., 29 <sup>th</sup> 2011	0.00	0.00	0.00	0.00	14	Dec.,13 <sup>th</sup> 2011	0.00	0.00	0.00	0.00	13
	22 <sup>nd</sup>	0.00	0.00	0.00	0.00	22	Dec.,06 <sup>th</sup>	0.00	0.00	0.00	0.00	21	20 <sup>th</sup>	0.00	0.00	0.00	0.00	20
	29 <sup>th</sup>	0.00	0.00	0.00	0.00	29	13 <sup>th</sup>	0.00	0.00	0.00	0.00	28	27 <sup>th</sup>	0.00	0.00	0.00	0.00	27
	Dec.,06 <sup>th</sup>	0.33	4.00	2.00	6.33	36	20 <sup>th</sup>	0.00	0.00	0.00	0.00	35	Jan.,03 <sup>rd</sup> 2012	0.33	0.00	0.67	1.00	34
	13 <sup>th</sup>	1.00	3.00	0.67	4.67	43	27 <sup>th</sup>	0.33	0.00	0.00	0.33	42	10 <sup>th</sup>	2.00	0.00	1.00	3.00	41
Mean numbers / stage	0.27b	1.40a	0.53a	2.20b	4.33	Mean no. / stage	0.07b	0.0a	0.0b	0.07c		Mean no. / stage	0.47b	0.0b	0.33a	0.80b		
Flowering stage	20 <sup>th</sup>	3.00	0.67	0.67	4.33	50	Jan.,03 <sup>rd</sup> 2012	0.67	0.00	0.00	0.67	49	17 <sup>th</sup>	3.33	0.00	1.67	3.00	48
	27 <sup>th</sup>	4.67	1.33	0.00	6.00	57	10 <sup>th</sup>	0.33	0.00	0.00	0.33	56	24 <sup>th</sup>	6.33	5.00	0.00	11.33	55
	Jan.,03 <sup>rd</sup> 2012	7.00	1.67	0.00	8.67	64	17 <sup>th</sup>	1.67	0.00	0.00	1.67	63	31 <sup>st</sup>	4.00	4.00	0.00	8.00	62
	10 <sup>th</sup>	2.00	7.33	0.00	9.33	71	24 <sup>th</sup>	1.00	0.00	0.00	1.00	70	Feb.,07 <sup>th</sup>	10.00	1.00	0.00	11.00	69
	17 <sup>th</sup>	5.67	1.67	0.00	7.33	78	31 <sup>st</sup>	5.00	0.00	0.00	5.00	77	14 <sup>th</sup>	5.00	2.33	0.00	7.33	76
24 <sup>th</sup>	10.00	1.00	0.00	11.00	85	Feb.,07 <sup>th</sup>	3.33	0.00	0.00	3.33	84	21 <sup>st</sup>	8.67	7.33	0.00	16.00	83	
Mean numbers / stage	5.39a	2.28a	0.11ab	7.78a	17.00	Mean no. / stage s	2.0a	0.0a	0.0b	2.0b		Mean no. / stage s	6.22a	3.28a	0.28a	9.78a		
Fruiting stage	31 <sup>st</sup>	18.67	0.33	0.00	19.00	92	14 <sup>th</sup>	10.00	0.00	0.67	10.67	91	25 <sup>th</sup>	11.67	2.00	0.00	13.67	90
	Feb., 07 <sup>th</sup>	16.33	0.67	0.00	17.00	99	21 <sup>st</sup>	1.67	0.00	0.67	2.33	98	March.,06 <sup>th</sup>	19.00	1.00	0.00	20.00	97
	14 <sup>th</sup>	2.00	0.67	0.00	2.67	106	28 <sup>th</sup>	4.00	0.00	0.33	4.33	105	13 <sup>th</sup>	18.00	0.67	0.00	18.67	104
	21 <sup>st</sup>	3.33	0.00	0.00	3.33	113	March.,06 <sup>th</sup>	3.00	0.00	0.00	3.00	112	20 <sup>th</sup>	2.00	2.33	0.00	4.33	111
	28 <sup>th</sup>	1.33	0.00	0.00	1.33	120	13 <sup>th</sup>	2.00	0.00	0.33	2.33	119	27 <sup>th</sup>	2.00	0.00	0.00	2.00	118
March.,06 <sup>th</sup>	1.33	0.00	0.00	1.33	127	20 <sup>th</sup>	1.67	0.00	0.00	1.67	126	April.,3 <sup>rd</sup>	1.00	0.00	0.00	1.00	125	
Mean numbers / stage	7.17a	0.28b	0.00b	7.44a	-	Mean no. / stage	3.72a	0.0a	0.33A	4.06a		Mean no. / stage	8.94a	1.0b	0.0a	9.94a		
F. test for effect of three growth stages / sowing date	**	**	*	**	-	**	N.S.	**	**	**		**	**	N.S.	**	**	**	
L.S.D for effect of three growth stages / sowing date at (0.05)	3.573	1.019	0.431	3.926		1.814	-	0.201	1.862			3.798	1.154	0.406	3.936			
Average numbers / date	4.51A	1.31A	0.20A	6.02A	-	Ave. no. / date	2.04B	0.00B	0.12A	2.16B		Ave. no. / date	5.49A	1.51A	0.20A	7.20A		
F. test for effect of three sowing dates / insect	Per: A.p.= ** A.g= ** A.c= ** A.spp= **																	
L.S.D for effect of three sowing dates at (0.05) / insect	Per: A.p.= 1.454 A.g= 0.612 A.c= 0.195 A.spp.=1.491																	

In respect to three aphids, data in Table 3 showed that, the three aphid species were appeared during three sowing dates except of *A. gossypii* disappeared in the second sowing date. It is obvious that, three aphid species were appeared at the same time on Dec.6<sup>th</sup> 2011 at 36 days from sowing date in the first sowing date. *A. pisum* appeared early than *A. craccivora* in the second sowing date but in the third date *A. pisum* and *A. craccivora* appeared at the same time after 34 days from sowing date, but in case of *A. gossypii* was appeared late (Jan., 24<sup>th</sup> 2012).

It is obvious that, pea aphid recorded two, five and three peaks during first, second and third sowing dates, respectively. *A. gossypii* recorded three peaks for both first and third sowing dates. *A. craccivora* appeared on fenugreek plants with low mean numbers at fruiting stage in the second sowing date, also in vegetative and flowering stages for both the first and the third sowing dates.

The obtained results during two seasons agreed with those obtained by Meena and Bhargava (2001) in India, recorded the same result where the highest population of *A. pisum* on fenugreek was in the first week of February, Kalra *et al.* (2004) in India, recorded that pea aphid and *A. craccivora* population was observed from the third week of February to the first week of March on fenugreek plants and Afsah (2005) recorded that, *A. gossypii* started to appearance on guar leaves after 37 and 51 days from sowing date recording three and two peaks in the first and second seasons, respectively. Also, Afsah (2009) in Egypt, showed that, the initial infestation on fenugreek plants of *A. craccivora*, *A. pisum* and *M. persicae* took place after about 8-11 and 8 weeks from sowing dates, respectively.

## 1-2 Effect of some climatic factors and plant age on the population fluctuation of the aphids

Statistical analysis of explained variance (EV%) of plant age, Max ., Min. Temperature , Max , Min R.H.% and wind velocity on the three sowing dates in the first season were recorded different degree effect of E.V.% according to sowing dates (Table 4). Min. temperature , Wind velocity and Min. R.H. % proved to be the most effective factors on the population of aphid species during first, second and third sowing dates having the highest values of E.V.% of 44.36, 29.59 and 36.86 % in the first season , respectively. At the second season, Max. Temp. (28.04), Max. R.H. % (51.4) and Min. R.H. % (12.3) had the greatest effect through first, second and third sowing dates, respectively.

Table 4: Effect of some climatic factors and plant age on the population fluctuation of three aphid species during 2010/2011 and 2011/2012 season at Gaha, Qalubia Governorate First season

Sowing dates	First sowing date								Second sowing date								Third sowing date								
	<i>A. pisum</i>		<i>A. gossypii</i>		<i>A. craccivora</i>		<i>Aphis spp.</i>		<i>A. pisum</i>		<i>A. gossypii</i>		<i>A. craccivora</i>		<i>Aphis spp.</i>		<i>A. pisum</i>		<i>A. gossypii</i>		<i>A. craccivora</i>		<i>Aphis spp.</i>		
Tested factors	r	E.v %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	
Plant age	0.606*	36.84	0.060	0.36	-0.152	2.30	-0.598	35.72	0.450	20.21	0.162	2.61	-0.054	0.29	0.482	23.25	0.106	1.13	-	-	-	-	-	0.189	3.58
Max. Temp.	0.338	11.42	-0.636*	40.41	0.140	1.97	-0.481*	23.14	0.438	19.15	-0.295	8.71	0.210	4.41	0.296	8.78	0.005	0.00	-	-	-	-	-	0.016	0.03
Mini. Temp.	-0.268	7.16	-0.425*	18.05	-0.111	1.24	-0.666*	44.36	-0.275	7.53	-0.321	10.33	-0.121	1.47	-0.368	13.57	-0.189	3.57	-	-	-	-	-	-0.319	10.16
Max.R.H.%	-0.118	1.4	0.281	7.90	0.199	3.95	0.095	0.91	-0.216	4.65	0.413	17.06	-0.517	26.76	-0.150	2.25	-0.326	10.62	-	-	-	-	-	-0.295	8.70
Mini.RH%	-0.344	11.86	-0.533*	28.42	-0.162	2.62	0.110	1.20	-0.575*	33.09	0.221	4.90	-0.0597	35.66	-0.520	27.00	-0.331	28.23	-	-	-	-	-	-0.607*	36.86
Wind velocity	-0.217	4.71	-0.458	20.96	-0.198	3.91	-0.618*	38.15	-0.426	18.16	-0.166	2.75	-0.608	36.91	-0.544*	29.59	-0.506	25.62	-	-	-	-	-	-0.273	7.46
Pooled E.V.%		94.76		75.72		40.02		80.06		77.54		45.80		93.26		75.84		79.97							62.30

Sowing dates	First sowing date								Second sowing date								Third sowing date								
	<i>A. pisum</i>		<i>A. gossypii</i>		<i>A. craccivora</i>		<i>Aphis spp.</i>		<i>A. pisum</i>		<i>A. gossypii</i>		<i>A. craccivora</i>		<i>Aphis spp.</i>		<i>A. pisum</i>		<i>A. gossypii</i>		<i>A. craccivora</i>		<i>Aphis spp.</i>		
Tested factors	r	E.v %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	r	E.V. %	
Plant age	0.249	6.20	-0.289	8.38	-	-	0.062	0.38	0.393	15.46	-	-	-	-	0.409	16.75	0.334	11.18	-0.277	7.68	-	-	-	0.280	7.85
Max. Temp.	-0.438	20.96	-0.210	4.41	-	-	-0.530	28.04	-0.002	0.0	-	-	-	-	0.024	0.06	0.241	5.82	-0.378	14.27	-	-	-	0.091	0.82
Mini. Temp.	-0.354	12.51	-0.218	4.75	-	-	-0.415	17.19	-0.095	0.90	-	-	-	-	-0.076	0.57	0.293	8.57	-0.208	4.33	-	-	-	0.165	2.73
Max.R.H.%	-0.266	7.07	0.291	8.49	-	-	-0.136	1.86	-0.647	41.91	-	-	-	-	-0.652	42.52	-0.274	7.49	0.264	6.96	-	-	-	0.266	7.09
Mini.RH%	0.027	0.07	0.458	20.97	-	-	0.241	5.79	-	0.689*	47.53	-	-	-	-0.717	51.40	-0.401	16.08	0.268	7.20	-	-	-	0.351	12.30
Wind velocity	0.132	1.77	-0.084	0.70	-	-	0.015	0.02	-0.093	0.87	-	-	-	-	-0.104	1.09	0.371	13.80	-0.41	17.05	-	-	-	0.308	9.51
Pooled E.V.%		37.28		41.35		-		52.73		80.34		-		-		83.63		37.28		71.09					38.28

-Refers to insect species that appeared during five inspections and / or with low mean numbers and not subjected to statistical analyses

Data in Table, 4 showed that, mean numbers of pea aphid was insignificantly positive correlated with plant age for all sowing dates during two study seasons except for first date in the first season was significantly positive correlated. The other factors showed different relationship according to sowing date and insect species. Meena and Bhargava (2001), in India, found that, there was a negative correlation between temperature and pea aphid population and disagree in case of relative humidity were the correlation was positive.

## 1-3 Effect of growth stages and sowing dates on population density of the aphids

Data in (Table 2) showed the effect of sowing dates and growth stages of fenugreek plants on the aphid population (aphid species as a total population) in the first growing season. Flowering stage of plants In the first sowing date, received the highest mean number of aphid population (5.28 mean no. of aphids /20 buds) followed by fruiting stage (4.72 mean no. of aphids / buds) without significant differences between their mean numbers whereas the vegetative growth received low mean number of aphid population(1.0 mean no. of aphids /20 buds). In the second sowing date, statistical analyses showed significant differences between means for the population of aphid species in the growth stages of fenugreek plants, fruiting stage

received highest mean number of aphid species (3.11 mean no. of aphids /20 buds) followed by flowering stage (1.56 insects/20 buds) and vegetative growth (0.07 insects/20 buds), respectively. The population of aphid in the third sowing date, declined greatly, flowering stage received higher mean number of aphid species (1.72 insects/20 buds) whereas fruiting and vegetative growth stage received low mean numbers (0.89 & 0.20 insects/20 buds) of aphid population without differences average, respectively.

Statistical analyses (Table2) showed significant differences mean numbers for aphid population in growth periods of fenugreek plants at three sowing dates. The first sowing date came in the first order (3.82 average numbers of aphids / 20 buds) whereas second sowing date (1.67 average no. of aphids / 20 buds) and third sowing date (0.98 average no. of aphids /20 buds) came in the second and third orders without significant difference between means.

In the second growing season (Table, 3), flowering and fruiting growth stages of plants received the highest averages number of aphid population (7.78 and 7.44 average no. of aphids. / buds) in the first sowing date, respectively, without significant differences followed by fruiting growth stage (2.20 average no. of aphids. / 20 buds) in last order.

In the second sowing date, growth stages of fenugreek plants had low mean numbers of aphid population with differences among means i.e. 0.07, 2.0 and 4.06 insects/20 buds for vegetative; flowering and fruiting stages, respectively. In the third sowing date, the population of aphid specie were higher on the fruiting and flowering growth stages came in the first and second order without significant differences between means (9.94 and 9.78 insects/20 terminal buds), respectively. Vegetative growth stage had lower number and came in the last order (0.80 insects/ 20 buds).

Statistical analyses showed significant differences among average numbers of total aphid's population through three sowing dates. The third and first sowing dates received the highest mean numbers (7.20 and 6.02 insects/20 buds) of aphid population without differences, respectively. Whereas second sowing date received lowest average numbers (2.16 insects/20 buds).

With regard to three aphid species, data in Tables (2&3) reveal the effect of three different sowing dates on the infestation of fenugreek with the three aphid species for each species separately during the growing seasons of 2010/2011 and 2011/2012, results can be desiccation as following:

### **1-3-1-pea aphid, *A. pisum***

In the first season, pea aphid showed varied mean numbers on the growth stages of plants, in first sowing date, it occurred with highly insect mean numbers during fruiting growth stage (3.89 insect/20 buds) decreased to 1.78 insects /20 buds in flowering stage whereas no records were observed for *A. pisum* in vegetative growth stage. In the second sowing date, the average number of *A. pisum* on plants has the same trend. The fruiting stage received highest means number of *A. pisum* (2.0 insect/20 buds) followed by flowering stage (0.83 insect/ 20 buds). In the third sowing date, the mean numbers of *A. pisum* decreased during growth periods in both vegetative and fruiting stages than the flowering stage of fenugreek plant.

Statistical analyses (Table, 2) showed significant differences between means for *A. pisum* population in growth periods of plants vegetative (0.0), flowering (1.78) and fruiting (3.89). The first sowing date came in the first order (2.0 insects/ 20 buds) whereas the second sowing date (1.0 insects / 20 buds) and third sowing date (0.80) came in the second and third orders without differences between average numbers during second and third sowing dates. The obtained results revealed that, the

fenugreek plants sowing in first date (Oct., 31<sup>st</sup>) received the highest portion of infestation with Pea aphid in the fruiting and flowering growth stages than in the second sowing and third sowing dates.

In the second growing season, pea aphid occurred with higher mean numbers than the first season. In the first sowing date, the population was highest on the fruiting growth stage of fenugreek plants (7.17 insects / 20 buds) following by the flowering growth stage (5.39 insects/20 buds) without differences between their mean numbers while vegetative growth stage has less population and came in the last order. In the second sowing date it had the same trend with moderate population on growth stages of fenugreek plants, fruiting growth stage harbored higher mean number (3.72 insect / 20 buds) than flowering growth (2.0 insects /20 buds) without differences between mean numbers whereas the vegetative growth received least average numbers of pea aphid (0.07) and came in the third order. In the third sowing date, the pea aphid population had higher average numbers than the first and second sowing dates. The fruiting growth stage received the highest mean number (8.94 insects/ 20 buds) followed by flowering growth (6.22 insects/20 buds) without differences between their means and vegetative growth stage (0.47 insects/20 buds).

Statistical analyses (Table 3) showed significant differences averages for *A. pisum* population in growth periods of fenugreek plants as well as in the sowing dates.

The third sowing date came in the first order (5.49 insects / 20 buds) followed by the first sowing date (4.51 insects/20 buds) in the second order without differences averages while second sowing date (2.04) came in the last order. The obtained results showed that, fenugreek plants sowing in the third date (Oct., 31) received the higher infestation with Pea aphid, *A. pisum* than first sowing date and the second sowing date.

### **1-3-2-Cotton aphid, *A. gossypii***

In the first season, *A. gossypii* occurred on the three growth stages of fenugreek plants with low population. In the first sowing date, flowering growth stage harbored the highest mean number (2.83 insects/20 buds) of cotton aphid whereas fruiting and vegetative growth stages received lowest mean number of aphid infestation (0.78 & 0.20 insects/20 buds) with insignificant differences between means. In the second sowing date, the growth stages of plants harbored low mean numbers of *A. gossypii* population whereas in the third sowing date the infestation with cotton aphid reduced to minimum on the growth stages of fenugreek plants.

In the second growing season, *A. gossypii* was recorded with lowest mean numbers on the growth stages of fenugreek plants in the first and third sowing dates only. In the second sowing date, no records for infestation with *A. gossypii* were observed on fenugreek plants. Statistical analyses showed insignificant differences between averages for *A. gossypii* recorded on the first sowing date and third sowing date.

### **1-3-3-Legume aphid, *A. craccivora***

In the first growing season, *A. craccivora* was found with few numbers on growth stages of fenugreek plants in the first and second sowing dates only. In the third sowing date no records for legume aphid infestation was observed. Statistical analyses showed that, the differences between average numbers of *A. craccivora* on fenugreek plants in the first and second sowing dates were insignificant (0.49 and 0.41 insects /20 buds). In the second growing season, statistical analyses showed significant differences between mean numbers of *A. craccivora* during three growth stages in the first sowing date , but in the second sowing date differences were highly significant between mean numbers through three growth stages, while in the third

sowing date differences between mean numbers during three growth stages were insignificant. It is obvious that, the effect of three sowing dates showed insignificant between mean numbers of legume aphid.

Data indicated that, pea aphid was the more dominant aphid species through three sowing dates during two seasons

**2- *Thrips tabaci***

**2-1- population fluctuations throughout three different sowing dates**

**The first season:**

Data in Table 5 indicated that, the first appearance of *T. tabaci* was on Nov.29<sup>th</sup>, 6<sup>th</sup> and Dec.13<sup>th</sup> 2010 with 1.0, 1.33 and 1.33 individuals / 20 buds, when the plant age 29, 21 and 13 days on the three sowing dates, respectively. Population fluctuation of *T. tabaci* had two, five and four peaks at the three sowing dates, respectively, the peaks recorded (18.0 and 21.0 individuals /20 buds), (1.33, 5.33, 9.0, 7.33 and 10.67 individuals /20 buds ) and (3.0, 2.67, 7.0 and 6.0 individuals /20 buds) at the dates (7<sup>th</sup> and Feb., 21<sup>th</sup>2012), (6<sup>th</sup>, Dec.,27<sup>th</sup> 2010, Jan.,24<sup>th</sup>, Feb., 7<sup>th</sup> and Feb.,28<sup>th</sup> 2011) and (Dec., 20<sup>th</sup> 2010, Jan.,10<sup>th</sup> , Feb., 7<sup>th</sup> and March ,7<sup>th</sup> 2011), respectively.

Table 5: Population fluctuation of *T. tabaci* infesting fenugreek buds through growth stages and effect of sowing date on their population density during two successive seasons of 2011 / 2012 and 2011 / 2012 at Qaha, Qalubia Governorate.

Growth stages	First season						Second season												
	Inspection dates	First sowing date		Inspection dates	Second sowing date		Inspection dates	Third sowing date		Inspection dates	Fourth sowing date								
		Mean No.	Plant age		Mean No.	Plant age		Mean No.	Plant age		Mean No.	Plant age							
Vegetative	Nov.15 <sup>th</sup> 2010	0.00	15	Nov. 29 <sup>th</sup> 2010	0.00	14	Dec. 13 <sup>th</sup> 2010	1.33	13	Nov.15 <sup>th</sup> 2011	0.00	15	Nov. 29 <sup>th</sup> 2011	0.00	14	Dec. 13 <sup>th</sup> 2011	0.00	13	
	22 <sup>nd</sup>	0.00	22	Dec. 06 <sup>th</sup>	1.33	21	20 <sup>th</sup>	3.00	20	22 <sup>nd</sup>	0.00	22	Dec. 06 <sup>th</sup>	0.00	21	20 <sup>th</sup>	0.00	20	
	29 <sup>th</sup>	1.00	29	13 <sup>th</sup>	1.00	28	27 <sup>th</sup>	2.00	27	29 <sup>th</sup>	0.00	29	13 <sup>th</sup>	0.00	28	27 <sup>th</sup>	1.00	27	
	Dec. 06 <sup>th</sup>	1.33	36	20 <sup>th</sup>	1.00	35	2011 Jan.03 <sup>rd</sup>	2.33	34	Dec. 06 <sup>th</sup>	0.67	36	20 <sup>th</sup>	0.00	35	2012 Jan.03 <sup>rd</sup>	0.67	34	
	13 <sup>th</sup>	1.67	43	27 <sup>th</sup>	5.33	42	10 <sup>th</sup>	2.67	41	13 <sup>th</sup>	1.00	43	27 <sup>th</sup>	0.53	42	10 <sup>th</sup>	1.00	41	
	Mean numbers / stage	0.80c		Mean no. / stage	1.73b		Mean no. / stage	2.27b		Mean numbers	0.33c		Mean no. / stage	0.07c		Mean no. / stage	0.53b		
Flowering	20 <sup>th</sup>	2.33	50	Jan.03 <sup>rd</sup> 2011	2.00	49	17 <sup>th</sup>	2.00	48	20 <sup>th</sup>	2.00	50	Jan.03 <sup>rd</sup> 2012	1.33	49	17 <sup>th</sup>	2.00	48	
	27 <sup>th</sup>	3.00	57	10 <sup>th</sup>	4.00	56	24 <sup>th</sup>	5.00	55	27 <sup>th</sup>	2.00	57	10 <sup>th</sup>	1.00	56	24 <sup>th</sup>	2.00	55	
	Jan.03 <sup>rd</sup> 2011	7.00	64	17 <sup>th</sup>	6.67	63	31 <sup>st</sup>	6.33	62	Jan.03 <sup>rd</sup> 2012	4.67	64	17 <sup>th</sup>	2.33	63	31 <sup>st</sup>	1.00	62	
	10 <sup>th</sup>	7.67	71	24 <sup>th</sup>	9.00	70	Feb.07 <sup>th</sup>	7.00	69	10 <sup>th</sup>	3.67	71	24 <sup>th</sup>	1.00	70	Feb.07 <sup>th</sup>	2.00	69	
	17 <sup>th</sup>	9.00	78	31 <sup>st</sup>	1.33	77	14 <sup>th</sup>	6.00	76	17 <sup>th</sup>	5.33	78	31 <sup>st</sup>	6.33	77	14 <sup>th</sup>	5.00	76	
	24 <sup>th</sup>	9.33	85	Feb. 07 <sup>th</sup>	7.33	84	21 <sup>st</sup>	5.00	83	24 <sup>th</sup>	9.33	85	Feb. 07 <sup>th</sup>	6.00	84	21 <sup>st</sup>	4.33	83	
	Mean numbers / stage	6.39b		Mean no. / stage	5.39a		Mean no. / stage	5.22a		Mean no. / stage	4.50b		Mean no. / stage	3.0b		Mean no. / stage	2.72b		
Fruiting	31 <sup>st</sup>	14.00	92	14 <sup>th</sup>	2.67	91	28 <sup>th</sup>	4.33	90	31 <sup>st</sup>	16.67	92	14 <sup>th</sup>	5.00	91	28 <sup>th</sup>	3.00	90	
	Feb. 07 <sup>th</sup>	18.00	99	21 <sup>st</sup>	7.00	98	March.07 <sup>th</sup>	6.00	97	Feb. 06 <sup>th</sup>	10.67	99	21 <sup>st</sup>	12.33	98	March.06 <sup>th</sup>	24.00	97	
	14 <sup>th</sup>	10.33	106	28 <sup>th</sup>	10.67	105	14 <sup>th</sup>	2.67	104	13 <sup>th</sup>	6.33	106	28 <sup>th</sup>	5.00	105	13 <sup>th</sup>	20.00	104	
	21 <sup>st</sup>	21.00	113	March.07 <sup>th</sup>	6.33	112	21 <sup>st</sup>	0.00	111	20 <sup>th</sup>	12.00	113	March.06 <sup>th</sup>	11.33	112	20 <sup>th</sup>	12.00	111	
	28 <sup>th</sup>	9.67	120	14 <sup>th</sup>	5.67	119	28 <sup>th</sup>	0.00	118	13 <sup>th</sup>	5.00	120	13 <sup>th</sup>	2.33	119	27 <sup>th</sup>	6.00	118	
	March.07 <sup>th</sup>	8.67	127	21 <sup>st</sup>	3.00	126	April. 4 <sup>th</sup>	0.00	125	March.06 <sup>th</sup>	4.67	127	20 <sup>th</sup>	2.00	126	April.3 <sup>rd</sup>	2.00	125	
	Mean numbers / stage	13.61a		Mean no. / stage	5.89a		Mean no. / stage	2.17b		Mean no. / stage	9.22a		Mean no. / stage	6.33a		Mean no. / stage	12.00a		
F. test for effect of three growth stages / sowing date		**		F. test		**		F. test		**		F. test		**		F. test		**	
L.S.D for effect of three growth stages / sowing date at (0.05)		2.839		L.S.D		1.994		L.S.D		1.283		L.S.D		2.710		L.S.D		3.182	
Average numbers / date		7.29A		Ave. no. / date		4.49 B		Ave. no. / date		3.27 B		Ave. no. / date		4.94A		Average numbers / date		5.35A	
F. test for effect of three sowing dates per season				**								**							
L.S.D. for effect of three sowing dates per season at (0.05)				1.437								1.237							

Two peaks in the first sowing date recorded at the fruiting stage when the plant age 99 and 113 days. On the other hand, the second and third sowing dates, the peaks are distributed throughout growth stages. In respect to the highest peaks in the second sowing date was recorded at the fruiting stages at 105 days.

**The second season:**

Data in Table (5) stated that, *T. tabaci* appeared with lowest number in early December in the first sowing date. Three peaks for the seasonal activity were found in early January (4.67 insects/20 buds); late January 2012 (16.67 insects 20 buds) and third peak of February (12.0 insects/20 buds). In the second sowing date, five peaks were found for *T. tabaci* including two highest peaks were 12.33 and 11.33 insects / 20 buds at the fruiting stage. In the third sowing date, four peaks were recorded for *T. tabaci* occurred in the fourth week of December 2011(1.0 insect/20 buds), fourth

week of January (2.0 insects/20 buds), mid-February (5 insects/20 buds) and early March 2012 (24 insects/20 buds). Data showed that, the highest peaks occurred in fruiting stages during two seasons. These results are similar to those obtained by Afash (2005) who found that the initial infestation with *T. tabaci* individuals was recorded early on guar seedling after nine days from sowing date recording three and two peaks in the first and second season respectively.

## 2-2-Effect of some climatic factors and plant age on the population fluctuation of the cotton thrips

### The first season:

Statistical analysis (Table, 6) of some physical factors indicate that the plant age have highly significant effect, while the Min. Temp. and wind velocity have negative significant effect in the first sowing date. On the other hand, the plant age recorded significant effect, but Min. temperature have highly negative effect , while wind velocity showed negative effect on the second sowing date . In respect to the third sowing date the four tested physical factors (three weather factors and plant age) had, not significant differences.

Table 6: Effect of some climatic factors and plant age on the population fluctuation of Thrips tabaci during two successive seasons of 2011/2012 and 2011/2012 at Qaha, Qalubia Governorate.

Tested factors	First season						Second season					
	First sowing date		Second sowing date		Third sowing date		First sowing date		Second sowing date		Third sowing date	
	r	E.V.%	r	E.V.%	r	E.V.%	r	E.V.%	r	E.V.%	r	E.V.%
Plant age	0.806**	64.90	0.591*	34.95	0.256	6.57	0.631*	39.85	0.535*	28.66	0.576*	33.16
Max. Temp.	-0.431	18.57	-0.218	4.74	-0.202	4.10	-0.516	26.67	-0.033	0.11	0.414	17.13
Mini. Temp.	-0.673**	45.29	-0.619**	38.33	-0.307	9.42	-0.431	18.62	0.014	0.02	0.452	20.43
Max. R.H.%	0.009	0.01	0.343	11.75	0.019	0.03	-0.396	15.69	-0.265	7.02	-0.203	4.11
Mini. RH%	-0.154	2.36	0.016	0.03	-0.221	4.86	-0.235	5.52	-0.310	9.59	-0.388	15.04
Wind velocity	-0.689**	47.45	-0.533*	28.41	-0.486	23.61	0.279	7.83	0.400	15.98	0.620*	38.52
Pooled E.V. %.		57.19		53.61		76.13		60.14		54.95		62.74

### The second season:

Statistical analysis of the tested physical factors showed that, the plant age has significant effect in the three tested sowing dates. On the test physical factors recorded insignificant effect at the three sowing dates except the wind velocity at the third sowing date have significant effect.

David and Mark (2002) they indicated that there were negative relationship between min. temperature and infestation of *T. tabaci*. Tantawy (2006) found that the effect of two weather factors (min. and max. temperature and relative humidity) were insignificantly negative on the population density of *T. tabaci* on sweet pea leaves.

## 2-3 Effect of growth stages and sowing dates on population density of the cotton thrips

### The first season:

Table (5) stated that, *T. tabaci* is common pest on growth stages of fenugreek plants at the three sowing dates. In the first sowing date, *T. tabaci* occurred with high mean numbers on the fruiting stage of fenugreek plants (13.61 insects/20 buds)

followed by flowering stage (6.39 insect/20 buds) whereas vegetative growth stage harbored lowest mean number (0.80 insets /20 buds), in the second sowing, the mean number of *T. tabaci* reduced to 5.89 and 5.39 insects /20 buds on the fruiting and flowering growth stages without significant differences between mean numbers whereas vegetative growth stage received less mean numbers (1.73 insects/20 buds). In the third sowing date, thrips population occurred with highly mean numbers on the flowering growth stage (5.22 insects/ 20 buds) compared with lowest mean numbers on the vegetative and fruiting growth stages (2.27 and 2.17 insects/20 buds) without significant differences means, respectively.

The three tested sowing dates arranged descending, where the *T. tabaci* population recorded as 7.29, 4.49 and 3.27 insects / 20 buds, respectively. The present results are in partial agreement with those obtained by Metwally *et al.* (1995), Hanafy (2007) and Afsah (2009) they found that the degree of infestation by *T. tabaci* increased by delaying planting date.

#### **The second season:**

Date in Table (5) was indicated the general trend of *T. tabaci* infestation recorded gradually increasing, characterized with significant differences between vegetative , flowering and fruiting stages in the three sowing dates, the mean no. of *T. tabaci* of the three growth stages in the first date as (0.33, 4.5 and 9.22), in the second sowing date were (0.07, 3.0 and 6.33) , while the third sowing date were (0.53, 4.33 and 12.0 insects / 20 buds), respectively, Statistical analysis showed significant differences among the three growth stages for each sowing date.

Date in table (5) showed that, the fruiting stage in the three sowing date is the most stage infested by *T. tabaci*. In addition to, the sowing date at Nov., 15<sup>th</sup> have the lowest infestation (3.31 insects / 20 buds), while the third sowing date is the highest population (5.35 insect / 20 buds).

These results are partial agree with Metwally *et al.* (1994) and Megahed *et al.* (2005), also, El-Kkayat *et al.* (2010) mentioned that plantation dates had significant effects on the infestation of *T. tabaci* infesting cowpea in Qaluobiya.

### **CONCLUSION**

Statistical analysis of results for the two seasons was indicated that, the suitable date for fenugreek cultivation in Qualibia ,Governorate , Egypt Nov.,15<sup>th</sup> where recorded mean numbers 1.67 ; 2.13 aphids / 20 buds and 4.49 ; 3.31 thrips / 20 buds in the first and second seasons , respectively, compared with other sowing dates. Also, the fruiting stages in the three sowing dates during two seasons is the most stage infested by *T. tabaci* followed by flowering and vegetative growth stages expect of, third date in the first season.

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## ARABIC SUMMERY

تأثير بعض عوامل الطقس، عمر النبات، مراحل نمو النبات وتاريخ الزراعة على تذبذب اعداد بعض الافات الماصه للعصاره التي تصيب نبات الحلبه

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اجريت التجارب بمحطه بحوث قها لوقايه النباتات - معهد بحوث وقايه النباتات -محافظة القليوبيه خلال موسمين زراعيين متتاليين (2010 / 2011 – 2011 / 2012) لدراسه تأثير بعض عوامل الطقس، عمر النبات و مراحل نمو نبات الحلبه خلال ثلاث مواعيد زراعيه (31 اكتوبر، 15 نوفمبر و 30 نوفمبر) فى موسمى الدراسه على تذبذب اعداد بعض انواع المن ( من البسله، ) *Acyrtosiphon pisum* (Harris) ، من القطن *Aphis gossypii* (Glover) ومن البقوليات *Aphis craccivora* Koch وتربس القطن *Thrips tabaci* Lind .

سجلت اعداد المن عموماً أربعه، وأثنين وثلاثة قمم للنمو أثناء ميعاد الزراعة الاول، الثانى والثالث، على التوالي. الاربع قمم نمو للمن بالميعاد الاول هى 2.0، 9.0، 4.0 و 10.67 حشره / 20 برعم بتاريخ 29 نوفمبر 2010، ، 17 يناير 14 فبراير و 28 فبراير 2011 عندما كان عمر النبات 29، 78، 106 و 120 يوم ،على التوالي.. وبالنسبه لميعاد الزراعة الثانى سجلت قمه النمو الاولى متوسط تعداد 2.33 افراد متحركه / 20 برعم بتاريخ 24 يناير 2011 فى عمر 70 يوم، بينما قمه النمو الثانيه ظهرت بمتوسط 6 حشره / 20 برعم بتاريخ 28 فبراير 2011 عندما كان عمر النبات 105 يوم . بينما الثلاث قمم للنمو خلال الميعاد الثالث كانت بمتوسط اعداد 1.0، 3.33 و 2.0 حشره لكل 20 برعم بتاريخ 10 يناير ، 21 فبراير و 14 مارس عندما كان عمر النبات 41، 83 و 104 يوماً على التوالي .

اظهرت النتائج ان العلاقه بين اعداد من البسله وعمر النبات غيرمعنويه موجبہ اثناء مواعيد الزراعة خلال موسمى الدراسه فيما عدا الميعاد الاول فى الموسم الاول حيث كانت العلاقه معنويه موجبہ. واتضح ان من البسله كان اكثر افراد المن عدداً خلال مواعيد الزراعة الثلاثه فى الموسمين .

وقد سجل تذبذب أعداد حشره تربس القطن على نبات الحلبه اثنين، خمسہ واربعة قمم للنمو خلال مواعيد الزراعة : الاول، الثانى والثالث، على التوالي، فى الموسم الاول . بينما فى الموسم الثانى سجلت حشره التربس 3، 5 و 4 قمم للنمو فى ميعاد الزراعة الاول، الثانى والثالث، على التوالي. وقد سجلت حشره التربس عدد 7.29، 4.49 و 3.27 حشره / 20 برعم، على التوالي، فى الموسم الاول . الاتجاه العام للاصابه بالتربس فى الموسم الثانى، زياده تدريجيہ تتميز بوجود اختلافات معنويه بين فتره النمو الخضرى، الثمرى والزهرى خلال الثلاث مواعيد الزراعة . ايضاً فتره النمو الثمرى كانت باكثر الفترات اصابہ بالتربس خلال الثلاث مواعيد زراعيہ .

اظهرت نتائج التحليل الاحصائى على مدار الموسمين ان الميعاد الثانى ( 15 نوفمبر ) كان انسب ميعاد للزراعة حيث اوضحت النتائج ان متوسط تعداد حشره المن فى الموسمين كان 1.67 و 2.13 حشره لكل 20 برعم بالموسم الاول والموسم الثانى، على التوالي وكذلك بالنسبه لحشره التربس فى نفس الميعاد بالموسم الاول والثانى سجل متوسط تعداد وهو 4.49 و 3.31 حشره، على التوالي .