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Effect of planting date of cucumber seedlings on the infestation level by *Aphis gossypii* (Hemiptera: Aphididae) and *Bemisia tabaci* (Hemiptera: Aleyrodidae) under plastic greenhouses

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Abstract

A Current study was carried out to show the effect of the planting date of cucumber seedlings *Cucumis sativus* L. on the infestation level by *Aphis gossypii* Glover (Hemiptera: Aphididae) and *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) under plastic greenhouses. The study was carried out throughout a comparison between three planting dates (Periods) of cucumber seedlings; Early summer planting during (January-February), Summer planting during (March-April) and Nile planting during (September- October). Experiments were carried out at two different zones (Governorates); Dokki Zone- Greenhouses of Agricultural Research Center (Giza Governorate) and Tokh (Qaliobya Governorate) during season 2021 under plastic greenhouses. Obtained results show that in both Giza and Qaliobya Governorate the infestation level with *A. gossypii* on cucumber plants at both three successive planting periods was arranged descending as follows, summer planting, early summer planting and Nile planting respectively. While the infestation level with *B. tabaci* on cucumber plants at both three successive planting periods was arranged descending as follows: Nile planting, summer planting and early summer planting respectively. The results obtained were also the same at Qaliobya Governorate. Statistical analysis showed that there were highly significant differences between population numbers of *A. gossypii* and *B. tabaci* on cucumber plants at both the three successive planting dates (Periods) at Giza and Qaliobya Governorates during successive season 2021.

Introduction

Cucumber plants *Cucumis sativus* L. belong to the family Cucurbitaceae is a very economically important crop and it is very popular in Europe, The United States, China and many countries all over the world (Plader *et al.*, 2007). And Zhang *et al.* (2009) indicated that cucumber is an economically important crop and is one of the healthy fruits which have many health benefits. Also, Weng (2021) indicated that cucumber *C. sativus* is a very important vegetable crop worldwide.

Cucumber plants are infested with many different pests, Danna *et al.* (2015) referred to the fact that cucumber is easily

damaged by many pests and aphids. such as Aphis gossypii Glover (Hemiptera: Aphididae) are among the most serious pests in cucumber production and often cause severe loss of yield. Also, Shi *et al*. (2016) referred to A. gossypii as one of the most efficient vectors for CMV and causes serious damage to cucumber crops. And Liang *et al*. (2016) indicated that aphids are one of the most serious cucumber pests and frequently cause serious damage to commercially produced crops.

Whitefly, *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) is one of the most damaging pests of cucumber crops grown in open fields and under protected conditions (Shriram and Sangha, 2021). And Yang *et al*. (2004) studied the hosts preference of whiteflies and *B. tabaci* toward many vegetable crops, results indicated that cucumber plants were the most host preference of *B. tabaci*.

A current study was carried out to show the effect of the planting date of cucumber seedlings *C. sativus* on the infestation level by A. gossypii and *B. tabaci* under plastic greenhouses.

Materials and methods

1. Experimental design:

Experiments were conducted on cucumber plants, *Cucumis sativus* L. under plastic greenhouses in two different areas (Governorates), Dokki - Greenhouses of Agricultural Research Center (Giza Governorate) and Tokh (Qaliobya Governorate) during season 2021. Experiments were carried out in two successive areas under plastic greenhouses. Each plastic greenhouse is divided into two big separate parts, each one isolated from the other by polyethylene wire with holes (0.5 microns). The first part had an artificial infestation with *A. gossypii*, and the second part had an artificial infestation with *B. tabaci*, and each part was divided into five plots (Replicates). The study was carried out at the two successive locations on three different planting times (Periods) of cucumber (Three planting dates); early summer planting during (January-February), summer planting during (March-April) and Nile planting during (September- October). It is proven accurate observations of the infestation by the two successive insects: *A. gossypii* and *B. tabaci* numbers (Adults and nymphs) in random samples of the cucumber plants (Leaves) weekly. Direct counting and laboratory counting were done weekly during both the three planting periods (Dates) of cucumber plants at the two successive locations.

2. Statistical analysis:

In the current study population fluctuation of both two successive insects *A. gossypii* and *B. tabaci* and mean numbers of each one were subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level using SAS program **(SAS Institute, 1988).**

Results and discussion

A Current study was carried out to study the effect of the planting date of cucumber seedlings *C. sativus* on the infestation level by *A.s gossypii* and *B. tabaci* under plastic greenhouses. The study was carried out throughout a comparison between three planting dates (Periods) of cucumber seedlings; early summer planting during (January-February), summer planting during (March-April) and Nile planting during (September- October). Experiments were carried out at two locations (governorates); Dokki - Greenhouses of Agricultural Research Center (Giza Governorate) and Tokh (Qaliobya Governorate) during the season 2021 under plastic greenhouses.

1. Early summer planting:

Results obtained and tabulated in Table (1) show population fluctuation in both *A. gossypii* and *B. tabaci* infesting cucumber seedlings cultivated in Giza and Qaliobya Governorate in the early summer planting (January- February) during season 2021 under greenhouses.

Table (1): Population fluctuations of *Aphis gossypii* and *Bemisia tabaci* on cucumber plants at the early summer planting at Giza and Qaliobya Governorates during season 2021.

Date	Giza Governorate		Qaliobya Governorate	
	Aphis gossypii	*Bemisia tabaci*	*Aphis gossypii*	*Bemisia tabaci*
1/ 1/ 2021	17.5	7.5	14.3	5.3
8/ 1/ 2021	19.3	9.8	16.5	7.2
15/ 1/ 2021	21.6	11.3	17.9	8.5
22/ 1/ 2021	23.5	13.4	19.7	10.4
29/ 1/ 2021	25.7	15.1	21.6	12.3
5/ 2/ 2021	27.9	17.3	23.2	13.8
12/ 2/ 2021	29.2	19.4	25.7	15.9
19/ 2/ 2021	31.5	21.7	27.9	17.5
26/ 2/ 2021	33.6	22.9	29.5	18.9
Total	229.8	138.4	196.3	109.8
Mean	25.5	15.4	21.8	12.2
F $_{(0.05)}$	325.66	431.84	389.52	463.11
L.S.D	1.025	1.037	1.064	1.075

Means within columns bearing different subscripts are significantly different (P< 0.05)

Data obtained show that in Giza Governorate the mean numbers in both *A. gossypii* and *B. tabaci* were (25.5, 15.4 individual/leaf) respectively whereas at Qaliobya Governorate the mean numbers both of *A. gossypii* and *B. tabaci* were (21.8, 12.2 individual/leaf), respectively.

2. Summer planting:

Results obtained and tabulated in Table (2) show population fluctuation in both *A. gossypii* and *B. tabaci* infesting cucumber seedlings cultivated both in Giza and Qaliobya Governorate in the summer planting (March- April) during season 2021 under greenhouses.

Table (2): Population fluctuations of *Aphis gossypii* and *Bemisia tabaci* on cucumber plants at the summer planting at Giza and Qaliobya Governorates during season 2021.

Date	Giza Governorate		Qaliobya Governorate	
	Aphis gossypii	*Bemisia tabaci*	*Aphis gossypii*	*Bemisia tabaci*
1/ 3/ 2021	34.5	23.2	30.5	19.5
8/ 3/ 2021	35.9	24.7	32.7	20.8
15/ 3/ 2021	37.2	25.9	33.9	22.3
22/ 3/ 2021	38.5	27.4	35.4	23.7
29/ 3/ 2021	39.7	28.9	36.9	24.9
5/ 4/ 2021	41.5	30.3	38.3	26.5
12/ 4/ 2021	43.6	31.7	39.8	27.8
19/ 4/ 2021	45.7	32.9	41.5	29.3
26/ 4/ 2021	47.3	34.0	43.2	30.5
Total	**363.9**	**259.0**	**332.2**	**225.3**
Mean	**40.4**	**28.7**	**36.9**	**25.0**
F $_{(0.05)}$	**412.23**	**385.72**	**472.33**	**366.21**
L.S.D	**1.072**	**1.063**	**1.055**	**1.043**

Means within columns bearing different subscripts are significantly different (P< 0.05)

Data obtained show that in Giza Governorate the mean numbers both of *A. gossypii* and *B. tabaci* were (40.0, 28.7 individual/leaf), respectively. Whereas at Qaliobya Governorate the mean numbers both of *A. gossypii* and *B. tabaci* were (36.9, 25.0 individual/leaf) respectively.

3. Nile planting:

Results obtained and tabulated in Table (3) show population fluctuation in both *A.*

gossypii and *B. tabaci* infesting cucumber seedlings cultivated both in Giza and Qaliobya Governorate in the Nile planting (September-October) during season 2021 under greenhouses.

Table (3): Population fluctuations of *Aphis gossypii* and *Bemisia tabaci* on cucumber plants at the nile planting at Giza and Qaliobya Governorates during season 2021.

Date	Giza Governorate		Qaliobya Governorate	
	Aphis gossypii	***Bemisia tabaci***	***Aphis gossypii***	***Bemisia tabaci***
1/ 9/ 2021	7	36.7	5.7	33.5
8/ 9/ 2021	8	37.9	6.9	35.8
15/ 9/ 2021	10	39.5	8.3	37.3
22/ 9/ 2021	12	40.9	9.5	38.9
29/ 9/ 2021	13	42.3	10.9	40.1
6/ 10/ 2021	15	45.5	12.3	41.5
13/ 10/ 2021	17	47.6	14.5	43.7
20/ 10/ 2021	19	48.9	16.7	45.9
27/ 10/ 2021	20	50.3	18.5	47.3
Total	**121.0**	**389.6**	**103.3**	**364.0**
Mean	**13.4**	**43.3**	**11.5**	**40.4**
$F_{(0.05)}$	**275.83**	**344.66**	**378.11**	**288.93**
L.S.D	**1.045**	**1.067**	**1.023**	**1.037**

Means within columns bearing different subscripts are significantly different (P< 0.05)

Data obtained show that in Giza Governorate the mean numbers in both *A. gossypii* and *B. tabaci* were (13.4, and 43.3 individual/leaf) respectively. Whereas at Qaliobya Governorate the mean numbers both of *A. gossypii* and *B. tabaci* were (11.5, 40.4 individual/leaf) respectively.

4. Comparison between the infestation by *Aphis gossypii* and *B. tabaci* on cucumber plants on the successive three planting dates (periods) of cucumber:

Data tabulated in Table (4), Figures (1) and (2) show a comparison between population numbers of *A. gossypii* and *B. tabaci* (Total and mean) on cucumber plants in three successive planting periods at Giza and Qaliobya Governorates during season 2021.

Data obtained showed that at Giza Governorate the infestation level with *A. gossypii* on cucumber plants in the three successive planting dates (Periods) were arranged descending as follows; summer planting, early summer planting and Nile planting respectively. While the infestation level with *B. tabaci* on cucumber plants in the three successive planting dates (Periods) were arranged descending as follows; Nile planting, summer planting and early summer planting respectively. The data was achieved also the same at Qaliobya Governorate.

Statistical analysis shows that were highly significant differences between population numbers of *A. gossypii* and *B. tabaci* on cucumber plants in the three successive planting dates (Periods) at both Giza and Qaliobya Governorates during season 2021.

Table (4): Comparison between population numbers of *Aphis gossypii* and *Bemisia tabaci* on cucumber plants at both three successive planting dates (Periods) at Giza and Qaliobya Governorates during season 2021.

Insect	Early summer planting		Summer planting		Nile planting		$F_{(0.05)}$	L.S.D
	Giza	Qaliobya	Giza	Qaliobya	Giza	Qaliobya		
Aphis gossypii								
Total	229.8	196.3	363.9	332.2	121	103.3	**325.44**	**1.025**
Mean	25.5	21.8	40.4	36.9	13.4	11.5	**423.72**	**1.037**
Bemisia tabaci								
Total	138.4	109.8	259.0	225.3	389.6	364.0	**374.23**	**1.014**
Mean	15.4	12.2	28.7	25.0	43.3	40.4	**428.35**	**1.056**

Means within columns bearing different subscripts are significantly different (P< 0.05)

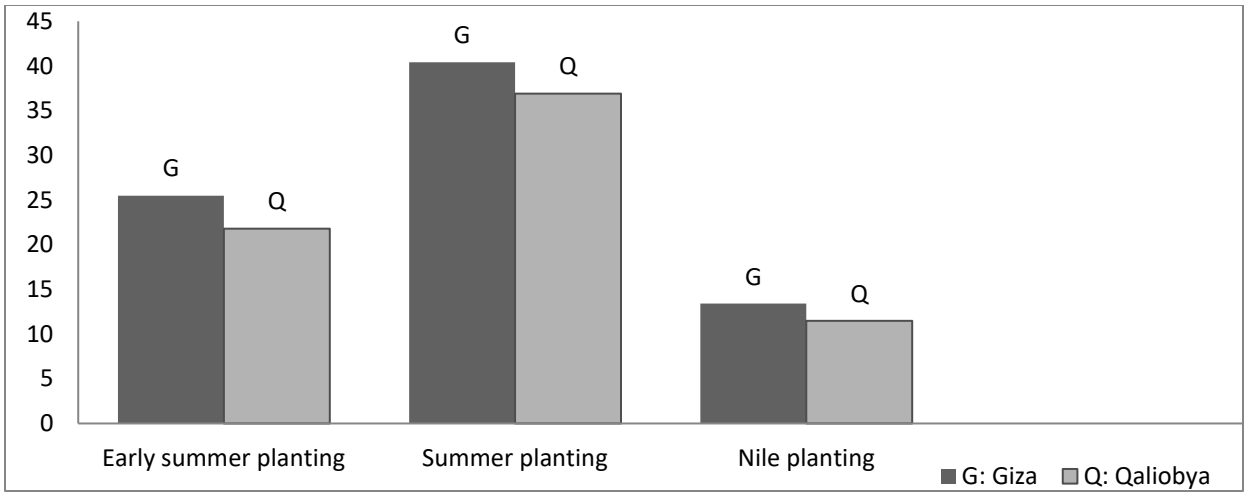

Figure (1): Comparison between population numbers of *Aphis gossypii* on cucumber plants at both three successive planting dates (Periods) at Giza and Qaliobya Governorates during season 2021.

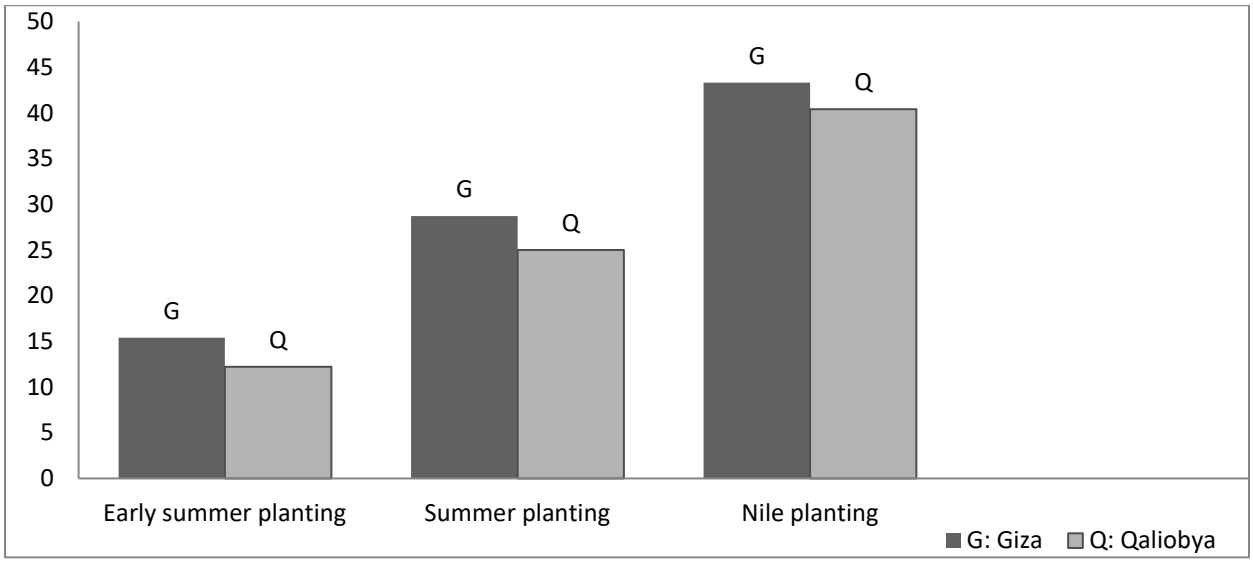

Figure (2): Comparison between population numbers of *Bemisia tabaci* on cucumber plants at both three successive planting dates (Periods) at Giza and Qaliobya Governorates during season 2021.

The obtained results agreed with those obtained by Liang *et al*. (2015) in China who indicated that *A. gossypii* is a serious pest to cucumber plants and it has one peak during March-April. Adriaan *et al*. (1994) indicated that *A. gossypii* is seen as in high population in cucumber crops especially in March and April in the open fields and under glasshouses. Also, Mojtaba *et al*. (2010) indicated the performance and population growth rate of the cotton aphid *A. gossypii* and the yield losses inflicted by that insect, and it has high population numbers during March. Van and Kamh (1995) studied the life history of *A. gossypii* on cucumber plants; the influence of temperature, host plant and parasitism under glasshouses, and indicated that the pest suitable temperature for aphis growing ranged from 25-30˚C.

Mohamed (2012) studied the impact of planting dates, spaces and varieties on the infestation of cucumber plants with whitefly,

B. tabaci, through studied comparison between three times of cultivated of cucumber seedlings on 15th March, 15th April and 15th May and found that planting cucumber seedlings on March month was less infested by *B. tabaci* than April and May. Also, Dilip *et al.* (2021) studied the population buildup of whitefly, *B. tabaci* on parthenocarpic cucumber in relation to weather parameters under the protected environment in Punjab and indicated that September month was more suitable for growing and reproduction whitefly than other months.

Hall (2015) studied methods of controlling whitefly, *Trialeurodes vaporariorum* (Westwood) (Hemiptera: Aleyrodidae) and cotton aphid, *A. gossypii* in glasshouses by two isolates of the fungus, *Verticillium lecanii* and indicated that the whitefly had two peaks of population during September and March months. Amna *et al*. (2012) studied the impact of the type of greenhouse cover sheets on certain major cucumber pests under protected cultivation and indicated that the maximum population of aphid and whitefly were observed during May.

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