

**SUSCEPTIBILITY OF DIFFERENT TOMATO CULTIVARS
TO INFESTATION WITH *APHIS GOSSYPHII* GLOVER
AT DAMIETTA GOVERNORATE**

M.Z. DAWOOD

*Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza,
Egypt.*

(Manuscript received 19 May 1998)

Abstract

Population densities of *A.gossypii* Glover on five common tomato cultivars, including the two varieties Strain B.V. 145 and Cale Ace varieties and the three hybrids UC 97-3, Petro Pride and Madear, were estimated at the two successive early summer seasons of 1996 and 1997 at Damietta Governorate (northern part of Nile Delta).

Alatae and both apterous and nymphs mean numbers of aphid individuals were determined along with its vertical normal distribution on upper, middle and lower plant parts. Susceptibility of the above mentioned tomato cultivars were also studied.

Differences between mean numbers of *A.gossypii* Glover individuals, alatae and both apterous and nymphs/10 leaves, were significant during both seasons. One peak of aphid population was recorded on 18th and 21st May of the two studied seasons on the five tomato cultivars. Alatae and unwinged (apterous and nymphs) forms induced one peak of the population coincident to that recorded in the individual population.

The higher percentage of both apterous forms and nymphs were obtained on the low susceptible tomato cultivars, in the opposite of a high percentage of alatae population on the most susceptible cultivars. Otherwise, lower leaves of the tested tomato cultivars harboured the highest mean numbers of aphid individuals followed by the middle ones, then the upper ones.

On the other hand, differences of the mean numbers of aphid individuals/10 leaves of the tested tomato varieties and hybrids were significant, during the two successive seasons. Tomato strain B.V.F. 145 variety and UC 97-3 hybrid were the least susceptible, while Petro Pride hybrid was moderately susceptible, and the two cultivars of Cale Ace and Madear were the most susceptible.

INTRODUCTION

In Egypt, tomato is considered one of the main vegetable crops that used as fresh or industrial purposes. Insects with sucking mouth parts viz. aphids are the most destructive pestes on tomato plants (Willcocks, 1992; Shaheen, 1977). *Aphis gossypii* Glover seriously affect the early summer plantation. Its injuries to tomato

plants are not only due to sucking up, but also to diseases transmission and plasmolysis. Heavily infested plants appear stunted and leaves curled down at the edges.

Present work aimed to study some ecological aspects of *A.gossypii* involving population densities, effect of some common tomato varieties and hybrids on inducing alatae and unwinged forms (apterous and nymphs) of aphid individuals, and its vertical distribution on plants. Five common tomato cultivars were tested for susceptibility to aphid infestation.

MATERIALS AND METHODS

Experimental works were carried out with five common tomato cultivars during the summer plantation of the two successive seasons of 1996 and 1998 at Demietta Governorate; northern part of Nile Delta. Tomato cultivars were the two varieties Ace Cale and Strain B.V.F. 145; and the three hybrid UC 97-3, Peto Pride and Madear.

Experimental plots were arranged in a randomized complete blocks design each of about 120 square meters and with 4 replicates. Tested cultivars were cultivated at the beginning of March 1996 and 1997 (Summer plantation). All agricultural procedures were carried out as usual and no insect control measures were practiced. To evaluate the population densities of *A.gossypii*, 10 leaves were collected randomly from each upper, middle and lower leaves of 10 plants on the two diagonals of each plot. Samples were collected in paper bags, and sent directly to laboratory, where the different forms of aphid, viz. alatae, and both apterous and nymphs were recorded. Samples were taken at weekly intervals, starting from 15 days after seedling transplanting till the samples were aphid free. Specimens of alatae and unwinged (apterous and nymphs) forms were mounted in Canada balsam (Dawood, 1978), where identification was assured according to the author's collection, which was confirmed by the British Museum, and carried out by Hall (1926) and Habib El-Kady (1961).

RESULTS AND DISCUSSION

Table 1 shows the mean numbers of *Aphis gossypii* Glover alatae, apterous and nymphs individuals per 10 leaves of five investigated cultivars. Differences between these means were significant. According to the susceptibility of the tested varieties and hybrids to the aphid mean number/10 leaves, they could be arranged

The same tables also, show that population densities of the two different aphid forms viz, winged and unwinged had peak occurrence on 18th of May as that in 1996, with the mean number of 45.2 & 718.0 (strain B.V.F. 145); 59.2 & 709.9 (UC 97-3); 170.2 & 619.3 (Peto Pride Hybrid); 164.2 & 998.3 (Madear Hybride), where it occurred on 25th of May, 1997 at Cale Ace variety with a mean number of 319.1 & 929.9 individuals/10 leaves, respectively.

Mean numbers of aphid individuals on the three studied levels followed similar trend of 1996. Percentage of the aphid individuals infestation on the upper, middle and lower levels were 5.9, 11.7 & 82.4; 4.1, 10.9 & 85.0%; 6.6, 37.0 & 56.3%, 6.8, 54.9 & 38.4% and 17.6, 30.9 & 51.5% on the tomato cultivars of strain B.V.F. 145, UC 97-3, Peto Pride, Madear and Cale Ace, respectively.

Present data clearly indicated that *Aphis gossypii* Glover injuring the five tested tomato cultivars, had one peak that occurred around 18th of May on the lowest susceptible infestation cultivars and delayed to 25th of May on more susceptible ones (Willcocks, 1937; Holdaway, 1941; Khalifa and Sharaf El-Dein, 1964).

Alatae formes of *A.gossypii* appeared in the first account on May 4th of the two studied seasons, then population density increased gradually to reach a peak in nearly the third week of May (18th and 21st) on the tested tomato cultivars during 1996 and 1997 seasons. Then it decreased sharply to record nil on the all tested cultivars on June 22nd., where it moved to other weeds, cotton and cucurbits in late of May (Kozhaeva, 1965).

Population densities of both apterous and nymphs of *A.gossypii* recorded high percentage on the lower susceptible tomato cultivars than the higher ones. It was 91.9 & 93.5%, 90.3 & 92.4%, 78.4 & 75.5%, 83.0 & 81.5% and 77.8 & 73.5 % in 1996 and 1997 on Strain B.V.F. 145 and UC 97-3, and Peto Pride hybrid, Madear hybrid and Cale Ace, respectively. The rest percentage represented the alate forms, which tended to migrate to suitable hosts. The more abundantt aphid population had crowded effect that suitable hosts. The more abundant aphid population had crowded effect that induced formation of alatae individual and on its settling and take-off, (Walt and Dixon, 1981; Walters and Dixon, 1982; Lees, 1967).

The stratified samples (three-leaf method) used in presnet work to estimate the aphid population on the tomato cultivars, helped in avoiding the differences in the aphid distribution on the three plant levels, viz. upper, middle, and lower. This is justified by the fact that the distribution of aphid on these levels was different on

the same tomato plant from one cultivar to another. Population densities of aphid individuals on the tested tomato cultivars represented its highest percentage on the lower plant level followed by the middle and then the upper during the two studied seasons 1996, 1997. It was 83.0 & 82.4 %, 85.7 & 85.0%, 54.6 & 56.2%, 39.0 & 38.4 and 41.9 & 51.5% of the total mean number of aphids that recorded during the two successive seasons, on the lower plant level of strain B.V.F. 145, UC 97-3, Peto Pride hybrid, Madear hybrid and Cale Ace, respectively.

The most abundant period of *A.gossypii* population on all tested tomato cultivars occurred during the period elapsed from 4th of May to 1st of June of the two successive studying seasons, where the most mean number of aphid population on all cultivars was recorded on the lower leaves of the plant levels. Apparently, sunlight was the most important factor; high and low amounts of sunlight both preceded decrease in aphid abundance (Holdaway, 1941).

In general, differences in the mean numbers of *A.gossypii* Glover recorded on the five tested tomato were statistically significant. Likewise, both differences in the mean numbers of each alatae and both apterous forms and nymphs were significant. According to the susceptibility of the tested tomato cultivars to *A.gossypii* infestation, it could be arranged ascendingly as follow: Strain B.V.F. 145, UC 97-3 variety, Peto Pride hybrid, Madear hybrid and Cale Ace variety.

Table 1. Mean number of alatae and both apterous forms and nymphs of *Aphis gossypii* Glover per 10 leaves on each upper, middle and lower plant levels of some common tomato cultivars at Demietta Governorate, 1996.

Inspection date	Cale Ace			Strain B.F. 145			UC-97-3			Peto Pride Hybrid			Madear Hybrid		
	Alatae	Apterous	Total	Alatae	Apterous	Total	Alatae	Apterous	Total	Alatae	Apterous	Total	Alatae	Apterous	Total
May, 4	4.4	13.1	17.5	1.3	12.6	13.9	1.4	12.9	14.3	5.9	16.6	22.5	6.7	13.8	20.5
11	82.9	308.4	391.3	14.7	169.0	183.7	20.5	1827	203.2	45.1	135.0	180.1	51.3	154.0	205.3
18	95.0	401.5	596.5	59.0	622.1	681.1	69.7	649.5	719.2	168.2	655.4	823.6	144.2	1021.7	1165.9
25	233.0	106.3	1296.0	4.3	50.8	55.1	5.1	44.0	49.1	93.4	323.0	416.4	135.5	453.6	589.1
June, 1	3.5	36.5	40.3	19	35.5	37.4	2.9	28.4	31.3	2.3	18.5	20.8	6.3	41.4	47.7
8	5.1	17.0	22.2	0.5	23.0	23.5	1.3	16.2	17.5	3.1	6.5	9.6	4.7	13.5	18.2
15	2.8	3.0	5.8	0.0	17.8	17.8	0.5	10.6	11.1	0.0	2.0	2.0	0.0	1.8	1.8
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	527	1842.5	2369.6	51.7	930.8	10125	101.4	944.3	1045.7	318.0	1157	1475.0	348.7	1699.8	2048.5
%	22.2%	77.8%	-	8.1%	91.9%	-	9.7%	90.3%	-	21.6%	78.4%	-	17.0%	83.0	-

L.S.D. at 5% for:

Total aphid individuals = 41.3*

Alatae form = 23.7*

Apterous form = 17.7*

Table 2. Mean number of *Aphis gossypii* Glover per 10 leaves of each upper, middle and lower plant levels of some common tomato cultivars at Demietta Governorate, during 1996.

Inspection date	Cale Ace			Strain B.F. 145			UC-97-3			Peto Pride Hybrid			Madear Hybrid		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
May, 4	3.9	4.5	9.1	2.1	5.5	6.3	1.1	6.1	7.1	4.2	8.1	10.2	3.5	10.3	6.7
11	71.4	118.5	201.4	7.3	17.3	159.1	7.2	15.8	180.2	13.3	64.9	101.9	20.0	99.3	86.0
18	195.3	342.8	58.4	13.1	77.3	590.7	15.1	70.1	634.0	57.0	321.1	445.5	69.1	662.3	434.5
25	226.1	395.7	674.2	5.0	5.0	45.1	3.2	6.0	39.9	26.9	160.4	229.1	38.2	300.7	250.2
June, 1	6.0	6.8	27.5	2.0	7.5	27.9	1.1	5.1	25.1	23	4.5	14.0	8.0	25.8	13.9
8	3.5	5.5	13.2	7.2	5.3	11.0	5.2	29	9.4	1.5	3.1	5.0	3.0	9.0	6.2
15	0.5	3.8	1.5	14.8	3.0	0.0	9.9	1.2	0.0	0.0	2.0	0.0	1.3	0.0	0.5
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total %	506.7 21.4%	877.6 37.0%	985.3 41.9%	51.5 5.1%	120.9 11.9%	840.1 83.0	42.8 4.1%	107.2 10.3%	895.7 85.7%	105.2 7.1%	564.1 38.2%	805.7 54.6%	143.1 7.0%	1107.4 54.1%	798.0 39.0%
Total mean no.	2369.6*			1012.5*			1045.7*			1475.0*			2048.5*		

Table 3. Mean number of alatae and both apterous and nymphs forms of *Aphis gossypii* Glover per 10 leaves on each upper, middle and lower plant levels of some common tomato cultivars at Demietta Governorate, 1997.

Inspection date	Cale Ace			Strain B.F. 145			UC-97-3			Peto Pride Hybrid			Madedar Hybrid		
	Alatae	Apterous	Total	Alatae	Apterous	Total	Alatae	Apterous	Total	Alatae	Apterous	Total	Alatae	Apterous	Total
May, 4	3.1	10.2	13.3	0.9	8.8	9.7	0.8	14.2	15.0	6.6	18.3	24.9	7.6	15.6	23.2
11	70.0	311.2	381.2	12.2	131.9	144.1	16.9	181.2	198.1	50.9	142.1	193.0	62.5	166.6	229.1
18	212.0	517.3	729.3	45.2	718.0	763.2	59.2	709.9	769.1	170.2	619.3	789.5	164.2	998.3	1162.5
25	319.1	929.9	1249.0	5.1	55.7	60.8	3.3	49.0	52.3	119.9	295.5	415.4	141.5	509.4	650.9
June, 1	4s.2	40.3	88.5	2.0	17.7	19.7	1.0	24.8	25.8	5.5	13.3	18.8	13.5	53.0	66.5
8	3.0	9.7	12.7	0.0	9.3	9.3	0.5	5.0	5.5	2.9	7.0	9.9	7.7	14.5	22.2
15	1.2	3.3	4.5	0.0	0.0	0.0	0.0	3.7	3.7	0.0	1.3	1.3	1.3	2.5	3.8
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	656.6	1821.9	2478.5	65.4	941.4	1006.8	81.7	987.8	1069.5	356.0	1096.8	1452.8	388.3	1759.9	2158.2
%	26.5%	73.5		6.5%	93.5		7.6%	92.4		24.5	75.5		18.5	81.5	

L.S.D. at 5% for:

Total aphid individuals = 81.8*

Alatae form = 20.1*

Apterous form = 53.3*

Table 4. Mean number of *Aphis gossypii* Glover per 10 leaves on each upper, middle and lower plant levels of some common tomatoes to cultivars at Demietta Governorate, during 1997.

Inspection date	Cale Ace			Strain B.F. 145			UC-97-3			Peto Pride Hybrid			Madar Hybrid		
	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower	Upper	Middle	Lower
May, 4	2.8	3.9	6.6	0.5	1.2	8.0	0.8	1.9	12.3	1.8	9.4	13.7	1.6	12.5	9.1
11	68.6	137.2	175.4	7.4	15.9	120.8	7.9	20.6	169.6	13.7	71.4	107.9	16.0	123.7	89.4
18	132.7	220.9	375.7	45.8	91.6	625.8	30.8	84.6	653.7	55.1	300.0	434.4	69.8	639.4	453.3
25	212.3	374.7	662.0	3.7	5.5	51.6	2.6	5.7	44.0	24.9	145.4	245.1	52.0	357.9	241.0
June, 1	15.9	26.5	46.1	0.9	2.6	16.2	1.5	2.3	22.0	1.2	7.5	10.1	4.6	36.6	25.3
8	1.9	3.2	7.6	0.6	1.1	7.6	0.5	0.6	4.4	0.5	3.8	5.6	1.5	12.4	8.3
15	0.6	1.4	2.5	0.0	0.0	0.0	0.0	0.5	3.2	0.0	0.2	1.1	0.3	2.1	1.4
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total %	436.8	767.8	1275.9	58.9	117.9	830.0	44.1	116.2	909.2	97.2	537.7	817.9	145.8	1184.6	827.8
Total mean no.	17.6%	30.9	51.5	5.9	11.7	82.4	4.1	10.9	85.0	6.6	37.0	56.3	6.8	54.9	38.4
		2478.5			1006.8			1069.5		1452.8			2158.2		

REFERENCES

- 1 . Dawood, M.Z. 1979. Studies on hemipterous infesting cucurbitaceous vegetable plants and their role in transmitting plant diseases. Ph. D thesis, Fac. Agric., Cairo Univ.
- 2 . Habib, A. and E. kady 1961. The Aphididae of Egypt (Hemiptera : Homoptera). Bull. Soc . ent. Egypte, 45:104-105.
- 3 . Hall, W.J. 1926. Notes on the Aphididae of Egypt. Tech. Sc. Serv., Min. Agric., Egypt Bull., :17-18 and 48.
- 4 . Holdaway, F. G. 1941. Entomology. Rep. Hawaii Agric. Exp. Sta., 1940: 38-45. (c.F., R.A.E. 1941,p. 650).
- 5 . Khalifa, A. and M. Sharaf El-Dien.1964. Biological and ecological studies on *Aphis gossypii* Glover (Hemiptera., Aphididae) Bull. Soc. Ent. Egypt, 48 :131 -153.
6. Kozhaeva, v. 1965. The melon aphid on cotton (in Russian). Zashch. Rast. Vredit. Volez., :36-37 (c.f. R.A.F. 1967, P.426).
7. lees, A. D. 1967. The production of apterous and alatae forms on the aphid *Megoura vicia* Buckton with special reference to the role of crowding . J. insect physiol., 13 : 289 -318 .
8. shaheen, A. H. 1977. Survey pests attacking tomato in Egypt with some ecological notes. Agric. Rev., Cairo, 55 : (1) 49 - 57.
9. Walters, K.F. A. and A. F. G. Dixon. 1982. The effect of host quality and crowding on the settling and take-off of cereal aphids. Ann. appl. Biol ., 101 (2): 211 - 218 .
10. Walt, A.D. and A.F.G . Dixon. 1981. The role of cereal growth stage and crowding in the inducing of alatae forms in *Sitobion avenae* and its consequences for population growth. Ecol. Ent. 6:441 -447 .
11. Willcocks, F. C. 1922. A survey of the more important economic insects and mites of Egypt. Solt. Agric. Soc., Cairo, Bull. 1, 482 pp.

**قابلية بعض أصناف وهجن الطماطم الشائعة للإصابة
بحشرة من القطن في محافظة دمياط
محمد نكي دواد**

معهد بحوث وقاية النبات - مركز البحوث الزراعية - الدقي - جيزه.

تمت دراسة الكثافة العددية لحشرة من القطن والبطيخ ، على خمسة أصناف وهجن من الطماطم الشائع زراعتها في منطقة دمياط خلال موسمى ١٩٩٦ ، ١٩٩٧ وهي أصناف ستارين بى - فى إف ١٤٥ ، وكال إيس ، ويوسى ٧٩-٣ ، وهجين بيتو برايد ، وهجين مادير . كما إشمملت هذه الدراسة على تعداد أفراد المن المجنح وغير المجنح لهذه الحشرة ، علاوة على دراسة التوزيع الطبيعى لهذه الحشرة على كل من المستويات الرئيسية الثلاث لوضع الاوراق مثل ، الاوراق العلوية ، والاوراق الوسطى ، والاوراق السفلية .

وقد إتضح من هذه الدراسة وجود قمة عددية واحدة لمتوسط تعداد حشرة من القطن والبطيخ ، وذلك على كل الاصناف المختبرة ، حيث حدثت هذه القمة فى ١٨ مايو على الاصناف والهجن الاقل قابلية للإصابة ، وفى ٢٥ مايو للاصناف الاكثر قابلية للإصابة بهذه الحشرة ، وذلك خلال موسمى الدراسة .

كما كان متوسط تعداد الافراد غير المجنحة يمثل أكبر نسبة مئوية من أجمالى التعداد على الاصناف الاقل قابلية للإصابة ، وعلى العكس من ذلك ، كان متوسط تعداد الافراد المجنحة يمثل نسبة مئوية من متوسط التعداد على الاصناف الاكثر قابلية للإصابة .

وقد كانت الاختلافات فى متوسط التعداد لكل من الافراد المجنحة والافراد غير المجنحة / ١٠ ورقات ، هى إختلافات معنوية ، وذلك خلال موسمى الدراسة .

وقد كان كل من الصنف ستارين بى - فى إف ١٤٥ ، والصنف يوسى ٩٧-٣ أقل الاصناف والهجن المختبرة إصابة ، بينما كان الهجين بيتو برايد متوسط فى درجة الإصابة فى حين كان الهجين مادير ، والصنف كال إيس هما الاكثر إصابة .