

THE CHANGES IN POPULATION DENSITY OF APHIDS ATTACKING SOME MEDICINAL AND AROMATIC PLANTS IN EGYPT

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Abstract

In recent years, cultivation of the medicinal and aromatic plants in sothern Egypt has noticeably increased. These plants are infested with several pests, of which aphids are considered to be the most serious pests and caused serious reduction in the annual yield.

The aim of the present study is to survey aphids infestation on Fennel, *Foeniculum vulgare* L., Valerian, *Valeriana officinalis*, Nigella, *Nigella sativa* L. and roselle, *Hibiscus sabdariffa* plants.

Also, seasonal variations of temperature and humidity on aphids fluctuations were also studied. The results revealed that the previous plants were infested during vegetative stage with aphids; valerian and nigella plants with *Myzus persicae* Sulzer, while Fennel and Roselle plants with *Brevicoryne brassicae* L. and *Aphis gossypii* Glover, respectively. Fennel plants were also attacked during the flowering and fruiting stage by *Hyadaphis coriandri* Das.

Statistical analysis showed that temperature had negative effect on the population density of *M.persicae* and *A.gossypii*, while humidity had a positive effect. On the other hand, temperature was positively correlated with the population density of *H.coriandri* and *B.brassicae*, while relative humidity was negatively correlated.

INTRODUCTION

Aphids are one of the most serious pests in the world infesting agronomic horticultural and ornamental plants. Several authors studied these different plants; e.g. giving notes on the Aphididae of Egypt, Hall (1926) mentioned that *Hyalopterus obscurus* was a common species on fennel plants in the spring and *M.persicae* was also one of the commonest species that caused serious damage to certain ornamental plants. Habib and El-Kady (1961) revealed that *Hyadaphis corniandri* Das was firstly recorded in Egypt on fennel under the name *H.obscurus*. Dawood (1971) found that ornamental plants were attacked by many species of aphids including *A.gossypii* Glover, *Aphis craccivora* Koch and *M.persicae*. Sengonca and Klingauf (1973) observed that *B.brassicae* L. increased in number when the temperature raised from 8°C to

32°C. Rizk et al. (1975) reported that the population density of *A.gossypii* increased from June to July, then decreased in August during the cotton growing season. Also, Mesbah et al. (1983) surveyed insects, mites and landsnails at Alexandria. Seedling stage of Roselle was infested with the two homopterous pests, *A.gossypii* and *Bemisia tabaci* Genn., that attacked the foliage. Ahmed (1990) stated that in 1987 season, roselle plants were infested with *A.gossypii* from the fourth week of June and the population increased to reach its peak in August.

The present study was carried out to survey the different aphid species infesting some medical and aromatic plants as well as tracing its seasonal populations for the two successive years.

MATERIALS AND METHODS

Four medicinal plants namely, Fennel (*Foeniculum vulgare* L.), Valerian (*Valeriana officinalis*), Nigella (*Nigella sativa* L.) and Roselle (*Hibiscus sabdariffa*) were cultivated at the Experimental Farm of the biological research station of the National Organization for Drug control and research, Giza, for two successive years, 1990 and 1991. The experimental design was completely randomized block, replicated three times. The plot size was 1/100 feddan. All regular agricultural practices were performed and no insecticides were applied. Samples of 10 leaves each were collected from 10 plants were taken weekly at random from each plot as soon as the newest vegetative growth appeared, the total number of aphids on 30 leaves together were taken as an indication of the population size of aphids at a given date from every tested medicinal plants. Through the flowering and fruiting stages one flower and one fruit sample were taken randomly from 30 selected plants.

Daily mean temperature and relative humidity throughout the experimental periods were obtained from ARC, Giza Station and their weekly means were calculated. Data obtained were subjected to regular statistical analysis and mean comparison were carried out using LSD at 5%.

RESULTS AND DISCUSSION

1. Survey

Survey studies on aphids infesting the four tested medicinal and aromatic plants in Giza for two years proved the following:

a. Fennel, *Foeniculum vulgare* L.

Fennel was infested with the cabbage aphid, *Brevicoryne brassicae* L. which was observed between the main stem and base of the compound leaf during the vegetative stage. In the flowering and fruiting stages, the plants were infested with *Hyadaphis coriandri* Das. These results agreed with the finding of Dawood (1971), who reported that ornamental plants had been attacked by many species of aphids including *A.gossypii* Glover and *M.persicae* Sulzer.

b. Valerian, *Valeriana officinalis*

M.persicae was found to infest the plants during the vegetative stage while no infestation took place by this aphid during flowering and fruiting stages.

c. Nigella, *Nigella sativa* L.

During the vegetative stage, the plants were found to harbour few *Myzus persicae* alatae forms, but without being damaged to the plants. The alatae forms were able to reproduce, but the new born nymphs apparently died few days later. Thus, no colonies of this species were observed on the plants throughout the experimental seasons.

d. Roselle, *Hibiscus sabdariffa*

Aphis gossypii Glover was found during the plant vegetative stage. It attacked the lower surface feeding along the midrib of the infested leaves.

2. Seasonal fluctuation of aphids

a. On Fennel

i. *Brevicoryne brassicae* L.

Table 1 showed the weekly mean numbers of *B.brassicae* infesting the fennel plants and the corresponding weekly mean of temperature and relative humidity during 1990 and 1991 seasons. The annual mean numbers were 5.7 and 6.0 insects per leaf during 1990 and 1991, respectively, with no significant difference between the two years. The weekly mean number reached its peak (11.4 insects/leaf) in the third week of April 1990, and on the first week of May in 1991 (10.2 insects/leaf).

Statistical analysis, Table 1 showed that temperature had positive effect on

the population density of this species, while the relative humidity exhibited a negative effect. It is worth to state that, no investigators before, mentioned presence of aphids on fennel during vegetative stage. Lamb and Lawe (1961) indicated that *B.brassicae* occurred in late summer and spring in New Zealand and severe infestation happened when the weather was warm and dry. In 1973, Sengonce and Klingauf observed that the activity of this aphid species increased when the temperature raised from 8°C to 32°C. Weires and Chiang (1973) found that *B.brassicae* occurred in low levels from late August until harvest of the cabbage plants in Minnesota.

Table 1. Weekly mean number of *Brevicoryne brassicae* L. infesting vegetative stage of fennel (*Foeniculum vulgare*) and the corresponding weekly mean of temperature (°C) and relative humidity during 1990 and 1991 seasons.

Month	Week	Mean number of insects/leaf			Temperature (°C)		Relative humidity (%)	
		1990	1991	Average	1990	1991	1990	1991
February	2 nd	1.000	1.033	1.017	15.5	16.6	52	57
	3 rd	1.461	1.367	1.417	15.5	16.8	52	56
	4 th	4.233	6.567	5.600	13.9	16.8	64	56
March	1 st	5.033	9.667	7.050	15.9	15.9	61	58
	2 nd	6.300	3.100	4.700	16.0	20.6	63	58
	3 rd	6.567	5.500	6.233	18.6	20.1	59	53
	4 th	9.300	7.400	8.350	19.1	21.0	61	65
April	1 st	7.737	8.000	7.863	20.2	21.0	50	50
	2 nd	7.400	7.433	7.417	22.0	21.1	50	48
	3 rd	11.400	7.333	9.367	22.1	22.0	51	50
	4 th	9.500	8.767	9.133	23.4	22.2	52	49
May	1 st	7.933	10.167	9.050	20.9	24.6	51	50
	2 nd	4.400	6.533	5.467	24.6	24.9	48	45
	3 rd	2.367	4.100	3.233	26.0	27.3	48	43
	4 th	1.567	3.400	2.483	27.1	24.3	48	48
Average		5.749	6.038					

Mean temperature °C and relative humidity recorded above are one week earlier.

LSD	0.05	0.01		R. H.	Temp.
Year	NS	NS		Correlation (r ²)	-0.053 0.242
Inspection date	1.5112	2.013		Regression (b)	-0.027 0.191
Year x Inspection date	1.710	2.847			

ii. *Hyadaphis coriandri* Das.

This species infested fennel plants during the flowering and fruiting stages during 1990 and 1991 seasons from the first week of January to the third week of May, then vanished completely in the fourth week of May.

The relationship between both the weekly mean temperature and relative humidity and the population density are shown in Table 2. The results revealed that

there was no significant difference between the two years 1990 and 1991. The mean numbers of aphids were 54.8 and 50.3 insects per plant during 1990 and 1991, respectively. During 1990, the population density reached its peak in the fourth week of April (136.3 insects per leaf), while in 1991 season the peak was reached in the fifth week of March, (126.667 insects per leaf). Afterwards, the population declined and completely disappeared in the fourth week of May.

The results obtained for the simple correlation and regression between weekly mean temperature and relative humidity and population density, Table 2, revealed that temperature had a positive effect while relative humidity had a negative effect.

Table 2. Weekly mean number of *Hyadaphis coriandri* Das infesting vegetative stage of fennel (*Foeniculum vulgare*) and the corresponding weekly mean of temperature and relative humidity during 1990 and 1991 seasons.

Month	Week	Mean number of insects/leaf			Temperature (°C)		Relative humidity (%)	
		1990	1991	Average	1990	1991	1990	1991
January	1 st	1.900	1.800	1.850	14.5	15.0	68	68
	2 nd	18.000	13.467	15.733	14.4	14.5	67	72
	3 rd	22.667	21.600	22.133	12.7	13.2	74	72
	4 th	21.200	15.067	18.133	12.8	12.0	69	66
February	1 st	10.800	11.333	11.067	12.9	12.2	70	67
	2 nd	9.867	17.067	13.467	13.1	16.6	71	57
	3 rd	20.933	21.200	21.067	15.5	16.8	52	56
	4 th	29.733	22.800	26.267	15.5	16.8	52	56
March	1 st	41.200	21.733	31.467	13.9	15.9	64	58
	2 nd	44.933	42.400	43.667	16.5	20.6	61	53
	3 rd	104.667	96.833	100.750	16.0	20.1	63	53
	4 th	106.333	103.200	104.767	16.6	21.0	59	65
	5 th	96.633	126.667	111.650	19.1	21.0	61	50
April	1 st	77.867	74.667	76.267	20.2	21.1	50	48
	2 nd	75.733	67.067	71.400	21.0	22.0	50	50
	3 rd	101.933	102.367	102.150	22.1	22.2	51	49
	4 th	136.333	95.167	115.750	21.4	24.6	52	50
May	1 st	107.200	81.467	94.333	20.9	24.9	51	45
	2 nd	43.600	50.400	47.000	24.6	27.3	48	43
	3 rd	24.400	20.267	22.23	26.0	26.0	48	46
Average	54.767	50.328						

Mean temperature °C and relative humidity recorded above are one week earlier.

LSD	0.05	0.01				
Year	SN	NS		Correlation (r ²)	R.H.	Temp.
Inspection date	7.497	9.945		Regression (b)	-0.567	0.569
Year x Inspection date	10.600	14.07			-2.149	5.067

b. On Valerian *Myzus persicae* Sulzer

The results revealed that no significant difference between the seasonal num-

ber of *M. persicae* during the two seasons. The mean numbers of aphids reached its maximum in the fifth week of January, being 10.6 and 8.2 insects per leaf during 1990 and 1991, respectively, Table 3. Table 3 indicated that temperature was negatively correlated with the population density, while relative humidity had a positive effect.

Table 3. Weekly mean number of *Myzus Sulzer* infesting vegetative (*Valeriana officinalis*) and the corresponding weekly mean of temperature ($^{\circ}\text{C}$) and relative humidity during 1990 and 1991 seasons.

Month	Week	Mean number of insects/leaf			Temperature ($^{\circ}\text{C}$)		Relative humidity (%)	
		1990	1991	Average	1990	1991	1990	1991
January	1 st	1.967	2.667	2.317	14.5	15.0	68	68
	2 nd	3.300	3.800	3.550	14.4	14.5	64	72
	3 rd	5.333	4.433	4.883	12.7	13.2	74	72
	4 th	1.733	4.000	2.867	12.8	12.0	69	66
	5 th	10.600	8.167	9.383	12.9	12.2	70	67
February	1 st	2.967	3.200	3.083	13.1	16.6	71	57
	2 nd	1.133	1.200	1.167	15.3	16.8	52	56
	3 rd	1.900	1.833	1.867	15.5	16.8	52	56
	4 th	0.900	0.867	0.883	13.9	15.9	64	58
March	1 st	1.067	1.133	1.100	16.6	20.6	61	58
	2 nd	0.867	0.833	0.850	16.0	20.1	63	53
	3 rd	1.567	1.167	1.367	18.3	21.0	59	65
	4 th	1.767	0.933	1.350	18.1	21.0	61	50
April	1 st	0.333	0.867	0.600	20.2	21.1	50	48
	2 nd	0.267	0.733	0.500	22.9	22.0	50	50
Average		2.380	2.931					
Mean temperature $^{\circ}\text{C}$ and relative humidity recorded above are one week earlier.								
LSD		0.05	0.01				R.H.	Temp.
Year		NS	NS		Correlation (r^2)		0.614	-0.626
Inspection date		1.047	1.394		Regression (b)		0.179	-4.710
Year x Inspection date		NS	NS					

c. On *Nigella*

Nigella plants were found to be infested with *Myzus persicae* Sulzer during 1990 and 1991 seasons but no colonies were observed on the plants.

d. On *Roselle*

A. gossypii Glover, was the only aphid species that infested roselle plants during the vegetative stage. The aphids started to attack the leaves in the first week of May and vanished in the third week of November for the two seasons, 1990 and 1991.

These results are in agreement with the finding of El-Sayed (1966), who reported that, *A.gossypii* attacked cotton during the first week of April until July and the population disappeared completely in late November. The same results were obtained by Hassanein et al. (1971) and Rizk et al. (1975) who found that, *A.gossypii* rose in number from June to July when fell in August during the cotton growing season. Also, their results agree with the findings of Ahmed (1990), who mentioned that *A.gossypii* appeared on roselle in the fourth week of June and reached its peak during August.

Data in Table 4, showed that aphid population were nearly similar in both 1990 and 1991 seasons. Accumulative averages were 93.9 and 85.6 individuals per leaf during the two years, respectively. The weekly mean numbers reached its peak in the last week of October for both 1990 and 1991 seasons; (451.6 and 353.9 insects per leaf, respectively). Temperature had a negative effect on the population density while relative humidity had a positive one with the population density. This means that this aphid preferred low temperature and high humidity, thus became more abundant in autumn, Table 4.

In general, the statistical analysis of former results revealed that population density of both species *M.persicae* and *A.gossypii* were negatively correlated with temperature, while was positively with relative humidity. This means that these two species need low temperature and high relative humidity for population increase. On the other hand, the population of *H.coriaeder* and *B.brassicae* were negatively affected with temperature and positively affected with relative humidity. Thus, they preferred high temperature and low relative humidity for the increase of populations.

Table 4. Weekly mean number of *Aphis gossypii* Glover infesting vegetative stage of Roselle (*Hibiscus sabdariffa*) and the corresponding weekly mean of temperature and relative humidity during 1990 and 1991 seasons.

Month	Week	Mean number of insects/leaf			Temperature (°C)		Relative humidity (%)	
		1990	1991	Average	1990	1991	1990	1991
May	1 st	5.700	3.633	4.667	20.9	24.9	51	45
	2 nd	9.667	18.033	13.850	24.6	24.3	48	43
	3 rd	29.700	31.967	30.833	26.0	26.0	48	46
	4 th	36.100	20.833	28.407	27.1	22.7	48	51
	5 th	20.333	33.300	26.817	26.0	27.9	49	48
June	1 st	38.700	37.87	38.183	25.6	27.6	50	45
	2 nd	103.733	104.000	103.867	27.5	27.1	51	54
	3 rd	103.400	105.900	107.650	27.6	27.6	56	55
	4 th	40.767	46.767	43.767	28.0	27.0	56	59
July	1 st	20.467	25.867	23.167	28.8	26.0	55	62
	2 nd	26.167	20.833	27.517	28.8	26.2	61	62
	3 rd	32.067	32.933	32.467	27.9	27.0	63	61
	4 th	243.633	236.267	239.950	28.3	28.3	62	60
August	1 st	111.733	118.600	115.167	27.7	28.5	60	60
	2 nd	80.033	72.633	76.333	27.2	28.8	62	61
	3 rd	57.000	64.300	60.650	27.6	28.0	60	59
	4 th	80.367	63.400	71.883	27.0	27.9	60	58
	5 th	5.500	3.233	4.367	27.1	27.3	61	58
September	1 st	5.900	6.467	6.183	26.9	26.0	62	59
	2 nd	5.500	3.300	4.400	26.0	25.9	61	58
	3 rd	2.900	3.100	3.000	25.3	26.6	57	61
	4 th	66.900	55.933	61.417	25.9	25.8	64	61
October	1 st	121.833	90.133	105.983	24.8	24.9	63	62
	2 nd	142.467	105.867	124.667	24.6	24.8	63	58
	3 rd	371.233	276.033	323.633	24.2	24.1	63	64
	4 th	407.867	323.000	365.433	24.0	24.2	60	59
	5 th	451.600	353.967	402.783	23.3	20.0	59	61
November	1 st	72.933	159.133	116.033	20.0	19.67	66	62
	2 nd	28.567	55.600	42.283	19.4	18.70	71	69
Average		93.902	85.575					

Mean temperature °C and relative humidity recorded above are one week earlier.

LSD	0.05	0.01		R.H.	Temp.
Year	5.197	NS		Correlation (r ²)	0.270
Inspection date	11.67	15.43		Regression (b)	4.876
Year x inspection date	16.50	21.2			-10.954

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تغير الكثافة العددية لحشرات المن التي تصيب بعض النباتات الطبية والعطرية في مصر

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تلعب النباتات الطبية والعطرية دوراً هاماً في الاقتصاد القومى حيث تصدر هذه النباتات ومستخرجاتها إلى العديد من بلدان العالم فتزيد من الدخل القومى.

وتتعرض هذه النباتات فى مراحل نموها المختلفة للإصابة بالعديد من الآفات التي تؤثر على إنتاجيتها كما ونوعاً.

وتعتبر حشرات المن إحدى الآفات الحشرية التي تصيب هذه النباتات، لذا كان من الضروري إجراء دراسة فى محاولة لتتبع شدة الإصابة بهذه الآفة لتحديد فترات نشاطها خلال موسم زراعة كل من نباتات الشمر *fennel* و عرق الحلاوة *Valerian* و حبة البركة *nigella* والكرديه *roselle* ومدى ارتباط هذا النشاط بالتغيرات اليومية لكل من درجة الحرارة والرطوبة النسبية.

وقد أوضحت النتائج مايلى:

١. نبات الشمر : يصاب هذا النبات أثناء النمو الخضري بمن الكرنب *Brevicoryne brassicae* حيث تتواجد الحشرات على النبات المصاب بين الساق وقواعد الأوراق المركبة. كما تصاب النباتات أيضا أثناء النمو الزهرى والثمرى بمن *Hyadaphis coriandri* Das.

٢. نبات عرق الحلاوة : تم حصر نوع واحد فقط من المن يصيب القمة النامية للنباتات وهو من الخوخ الأخضر *Myzus persicae*.

٣. نبات حبة البركة : وجد أن النباتات تصاب بمن الخوخ الأخضر *M.persicae* ولكن بأعداد لا تسبب أية أضرار تذكر.

٤. نبات الكركديه : تصاب النباتات أثناء النمو الخضري فقط بمن القطن *Aphis gossypii*.

وقد أوضحت نتائج التحليل الإحصائى وجود علاقة سلبية بين الكثافة العددية لكل من : من الخوخ الأخضر *M.persicae* ومن القطن *A.gossypii* ودرجات الحرارة، بينما كانت العلاقة موجبة بين الكثافة العددية لأنواع المن السابقة والرطوبة النسبية.

إلا أن العلاقة بين الكثافة العددية لكل من أنواع المن *H.coriandri* , *B.brassicae* كانت موجبة مع درجات الحرارة وسالبة مع الرطوبة النسبية.