

SEASONAL ABUNDANCE OF SOME INSECT PESTS AND ASSOCIATED NATURAL ENEMIES ON FENUGREEK PLANTS

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Abstract

The effect of environmental conditions on population of some insect pests and associated natural enemies on fenugreek plants was studied during the two successive seasons of 2006/2007 and 2007 / 2008. *Thrips tabaci* recorded one peak on the second week of March and terminal buds harboured the highest numbers. During the first season, simple correlation (r) value was significantly positive between its population and both temperature and wind velocity, while it was insignificant for RH% but in the second season (r) value was insignificantly positive except with temperature that proved to be insignificantly negative. Berseem leaf weevil, *Phytonomus bruneipennis* had three peaks on 14th and 28th of February and 14th of March. Simple correlation values (r) between the insect population and the three weather factors were insignificant during both years. *Liriomyza spp.* showing three peaks on 24th of January, 28th of February and 28th of March and positively correlated with both temperature and wind velocity during two seasons. In the first season both, *Aphis craccivora* and *Myzus persicae* showed two peaks on (31st January, 7th March) and (14th February, 14th March), respectively but *A. pisum* showed four peaks on mid and late February, mid March and late April. *A. craccivora*, *A. pisum* and *M. persicae* recorded three peaks for each during the second season. The effects of the three weather factors on aphid populations had insignificant influence during the two seasons except in the relation between *A. pisum* and temperature degree, it was highly significant and significant in the first and second seasons, respectively. Two natural enemies were associated to pests infesting fenugreek plants. *Coccinella spp.* which began to appear in the first week of February and second half of January during the first and second seasons, respectively. Simple correlation values were not significantly positive for both temperature and wind velocity, while they were negative for RH% during two seasons. *Oruis spp.* appeared from last half of February during the two growing seasons. Temperature had insignificant and positive effect during the two seasons, but RH% and wind velocity had insignificant and negative during the two seasons except wind velocity was insignificant and positive in the first season.

INTRODUCTION

Fenugreek, *Trigonella foenum graecum* L. is an annual herb native to countries bordering on the eastern shores of the Mediterranean and largely cultivated in

India, Egypt and Morocco. Seeds has a faint characteristic odour when entire but strong when powdered and mucilaginous slightly better taste.

Fenugreek used as a spice in carry powdered. The dry ground employed in domestic medicine, when boiled with water, the decorations used as a hot demulcent drink. Recently, fixed oil of fenugreek considered as a good locatagauge. It contains 28 percent of mucilage occurs in the endosperm, about 22 percent of protein, 16 percent of fixed oil, saponin and two alkaloids, tregoniline and choline (Ahmed and Zayed 1994).

Fenugreek plants as the leguminous plants are attacking with several insect pests that affect the quantity and quality of crops (Hamid *et al.*, 1974, Harakly and Assem, 1978, Zaka-ur-Rab, 1981 and Kalra *et al.*, 2002).

The aim of this work is to study the effect of three environmental conditions (temperatures, RH% and wind velocity) on population of some insect pests and their associated natural enemies on fenugreek plants.

MATERIALS AND METHODS

Field experiments were carried out at Plant Protection Research Station at Qaha, Qalyubiya Governorate during two successive seasons 2006/2007 and 2007/2008 in order to study, the population fluctuation of the major insect pests and their associated predators on fenugreek plants.

An area of 525 m² was divided into three replications, each replicate was about 175 m². Fenugreek was sown on 15th and 10th of November in first and second seasons, respectively. The normal agricultural practices (irrigation and fertilization) were followed but no pesticidal treatments were applied. Weekly samples of terminal buds and leaves (20 of each replicate) were separately collected at random. Each sample was placed in polyethylene bags to examine in laboratory using stereomicroscope at the same day. Aphid species (nymphs and adults), thrips (larvae and adults) and berseem weevil (larvae) were harboured terminal buds, but the leafminer (larvae) was occurred on leaves. Natural enemies were recorded as adults on stems and leaves of fenugreek (20 stems/replicate), all data were calculated as mean number of individual/sample.

Daily means of temperatures, relative humidity and wind velocity, which obtained from Central Laboratory for Agriculture Climate during the week preceding the sample date were used in calculating the simple correlation coefficient (r) and partial regression values (b) between the pest population and three factors (Fisher, 1950).

RESULTS AND DISCUSSION

Population activity of fenugreek insects namely, leguminous aphid, *Aphis craccivora* Koch, pea aphid, *Acyrtosiphon pisum* (Harris), green peach aphid, *Myzus persicae* Sulz., cotton thrips, *Thrips tabaci* Lind., berseem leaf weevil, *Phytonomus brunneipennis* Boh, leafminer, *Liriomyza* spp. and certain natural enemies was studied during the two successive seasons of 2006/2007 and 2007/2008.

1. Seasonal abundance of insect pests:

Data in Fig. (1) revealed that the individuals of *Thrips tabaci* during the first season of 2006/2007 began to attack the terminal buds of plants with low numbers of 0.02 individuals/bud on the second week of January. The population of this pest began to increase gradually recording 6.0 individuals/bud on the first week of March. The number of this pest sharply increased during the following week to record the first peak of 14.93 individuals/bud at 17.5° C and 85% RH and wind velocity of 10.29 meter/h. Respecting the average number of *T. tabaci* on fenugreek during the cultivation season of 2007/2008 (Fig., 1), it is clear that the insect, which considered the main destructive pest for these plants, recorded comparatively highly average numbers on each terminal bud. It began to appear by the end of December and the population trend was nearly similar to the previous season. As it ranged from 0.65 to 4.5 individuals/bud giving two peaks, the first peak of 2.1 thrips/bud, occurred on the 20th January at 10.64°C, 53.57% RH and 7.14 meter/h. Nevertheless, the second one of 4.5 moving stages/bud was recorded on the 17th February at 14.0°C, 60.86% RH and wind velocity of 6.57 m/h. Data in Tables (1&2) show the simple correlation (r) and partial regression (b) values for the effect of three considered weather factors (mean of temperatures RH% and wind velocity) on the population of *T. tabaci* during two seasons (2006/2007) & (2007/2008). Data revealed that during the first season (r) value was significantly positive for both temperature and wind velocity, while it was insignificant for RH% but in the second season (r) value was insignificantly positive except with temperature that proved to be insignificantly negative.

The present results are in partial agreement with those obtained by Hanafy (2007) who found that the degree of infestation by *T. tabaci* increased by delaying planting date, as sweetpea plants cultivated in the earliest planting date were attacked by the fewest number, while the plants of the latest planting.

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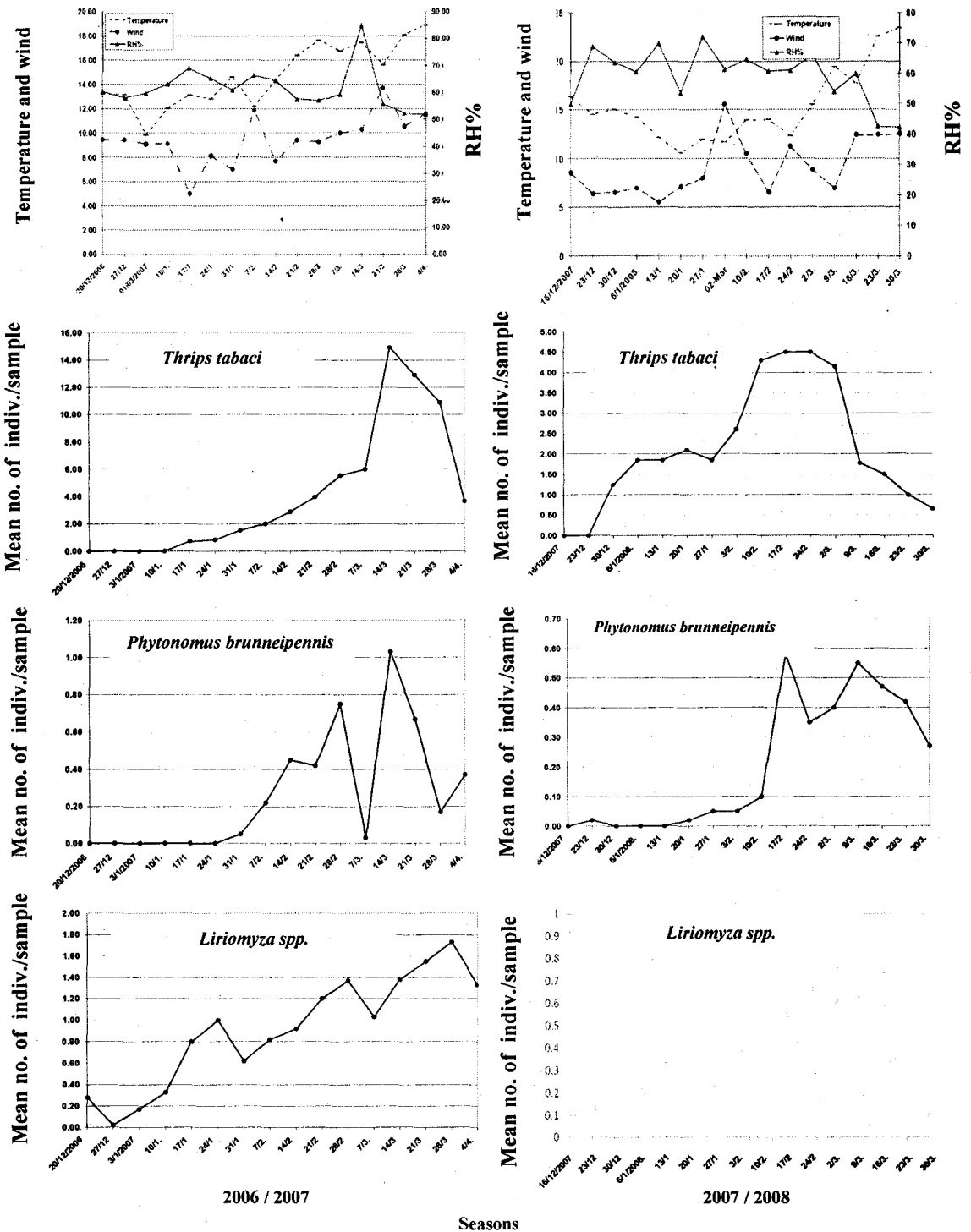


Fig. 1. Population fluctuation of different insect species infesting fenugreek crop at Plant Protection Research Station at Qaha region, Qalubia Governorate during 2006 /2007 and 2007/2008 seasons.

Table 1. Effect of three environmental conditions on population of some insects on fenugreek plants at Plant Protection Research Station at Qaha region, Qalyubiya Governorate during 2006/2007 season.

Weather factors	<i>Thrips tabaci</i>			<i>Phytonomus brunneipennis</i>			<i>Liriomyza spp.</i>		
	r	b	CD%	r	b	CD%	r	b	CD%
Temp.	*0.573	-403.60	15.86	0.397	6.33	22.86	**0.809	15.786	60.28
RH%	0.361	1224.47	6.93	0.418	15.15	35.18	-0.072	-1.186	1.55
Wind velocity	*0.569	-414.37	7.62	0.320	3.35	9.26	0.393	0.568	2.9
Temperature × RH%			16.93			15.91			3.7
Temperature × Wind			18.49			6.85			8.78
RH% × Wind			10.81			6.57			1.19
Total			76.64			96.63			78.40

No singe = non-significant

* = Significant

** = Highly significant

Table 2. Effect of three environmental conditions on population of some insects on fenugreek plants at Plant Protection Research Station at Qaha region, Qalyubiya Governorate during 2007/2008 season.

Weather factors	<i>Thrips tabaci</i>			<i>Phytonomus bruneipennis</i>			<i>Liriomyza spp.</i>		
	r	b	CD%	r	b	CD%	r	b	CD%
Temp.	-0.424	3.86	26.18	0.496	-1.05	33.36	0.189	-0.43	4.32
RH%	0.261	63.07	0.07	-0.311	-10.73	2.26	-0.120	-2.25	3.14
Wind velocity	0.068	30.54	4.73	0.213	-1.92	0.91	0.353	-1.81	12.93
Temperature × RH%			1.98			12.8			5.40
Temperature × Wind			6.99			3.41			4.62
RH% × Wind			0.49			1.16			5.13
Total			40.44			53.92			35.54

No singe = non-significant

* = Significant

** = Highly significant

date were more liable to insect infestation. Thrips populations were negatively correlated with minimum temperature and negatively or positively with maximum temperature and mean relative humidity depending on the planting date.

The average number of *P. bruneipennis* ranged from 0.03 to 1.03 larvae/bud during the first season. This pest had three peaks of 0.45, 0.75 and 1.03 individuals/bud on 14th, 28th of February and 14th of March at temperatures of 14.36, 17.64, 17.5°C, RH of 64.64, 57.14, 85.0% and wind velocities of 7.71, 9.29, 10.29 meter/hour, respectively. In the 2nd season, the insect infestation began by 23rd of December giving average number of 0.02 individuals/terminal bud, then disappeared during the flowing three weeks and began to increase sharply giving two peaks 0.58 and 0.55 individual on 17th of February and 9th of March (Fig., 1).

The obtained results are in agreement with those obtained by Kalra *et al.* (2002) who recorded that alfalfa weevil associated with fenugreek plants from the first week of February until mid of March.

Tables (1&2) show the simple correlation values between the three weather factors and the population of *P. bruneipennis* both seasons of infestations where the temperature, RH% and wind velocity had insignificantly effects on the population of the pest.

Data illustrated graphically in Fig. (1) revealed that the infestation with leaf-miner *Liriomyza spp.* appeared from the beginning of growing season in both years with weekly average numbers of 0.28 and 0.10 larvae/leaf during 2006/2007 and 2007/2008 seasons, respectively. In the first season the population activity of *Liriomyza spp.* showed three peaks of 1.0, 1.37 and 1.73 larvae/leaf on 24th of January, 28th of February and 28th of March, respectively. The corresponding atmospheric conditions were 12.86, 17.64, 18.14°C, 65.43, 57.14, 52.21% RH and 8.14, 9.29, 10.57 meter/h, respectively. In the second season, the leafminer population increased after the first occurrence to attain its first peak (0.18 larvae/leaf) on 30th December at 15.07°C, 68.67% RH and 6.57 meter/h. after that, the population fluctuation exhibited 4 peaks of 0.27, 0.52, 0.45 and 0.63 larvae/leaf on 20th of January, 10th of February, 24th of February and 23rd of March at 10.64°C, 55.57% RH, 7.14 meter/h, 13.93°C, 64.64% RH, 10.50 meter/h, 12.36°C, 61.07%RH, 11.29 meter/h. and 22.57°C, 42.57% RH, 12.43 meter/h, respectively.

The obtained results disagreed with those obtained by Kalra *et al.* (2002&2004) while, agree with those obtained by El-Serwy (2007).

The obtained results in Tables (1&2) clearly indicated that the weekly average numbers of individuals of the leafminer positively correlated with both temperature and wind velocity but it was negatively correlated with relative humidity in the first

and second season. Regarding, the significance of three weather factors, proved that the impact temperature was highly significant in the first season, but in the second season, the impact temperature was insignificant.

The obtained results in Fig. (2) clearly revealed that the initial infestation on fenugreek plants of three aphid species took place after about 8-11 and 8 weeks from sowing date in the first and second growing seasons, respectively, the rate of infestation in the first season was similar to that in the second one for all aphid species. After the first appearance of pests, their population fluctuation and several different peaks, in first season, *A. craccivora* and *M. persicae* showed two peaks of 2.48, 0.32 and 0.62, 0.03 individuals/terminal bud on the 31st of January, 7th of March and 14th of February, 14th of March with 14.64, 16.79 and 14.36, 17.5°C, 60.93, 59.36 and 64.64, 85.0% RH, 7.0, 10.0 and 7.71, 10.29 meter/h, respectively. However *A. pisum* showed four peaks of 0.55, 1.17, 1.1 and 1.17 on 14th, 28th of February, 14th of March and 4th of April at 14.36°C, 64.64% RH, 7.71 meter/h, 17.64°C, 57.14% RH, 9.24 meter/h, 17.5°C, 85% RH, 10.29 meter/h and 18.93°C, 51.93% RH, 11.57 meter/h, respectively.

craccivora, *A. pisum* and *M. persicae* recorded three peaks in the second season for each of 0.92, 0.72, 0.32, 0.75, 0.72, 0.23, 0.2, 0.08, 0.08 individuals/bud on 13th of January, 3rd, 24th of February, 20th of January, 17th of February, 16th of March and 20th of January, 2nd, 16th of March at 12.21°C, 69.93% RH, 5.57 meter/h, 11.71°C, 61.29% RH, 15.57 meter/h, 12.36°C, 61.07% RH, 11.29 meter/h, 10.64°C, 53.57% RH, 7.14 metre/h, 14.0°C, 60.86% RH, 6.57 meter/h, 17.79°C, 59.93% RH, 12.43 meter/h and 10.64°C, 53.57% RH, 7.14 meter/h, 15.57°C, 65.86% RH, 8.86 meter/h, 17.79°C, 59.93% RH, 12.43 meter/h.

Data in Tables (3&4) showed that the effects of the three weather factors on the population activity of *A. craccivora*, *A. pisum* and *M. persica* were insignificant during the two seasons except in case of *A. pisum* in which correlation between temperature degree and its population was highly significant and significant in the first and second seasons, respectively.

The obtained results agreed with those obtained by Hamid *et al.* (1974) who recorded that *A. pisum* population was on pea and sweetpea from November till February and it gradually increased in February and April. Also, Kalra *et al.* (2004) recorded that pea aphid *A. craccivora* population was observed from the third week of February to the first week of March.

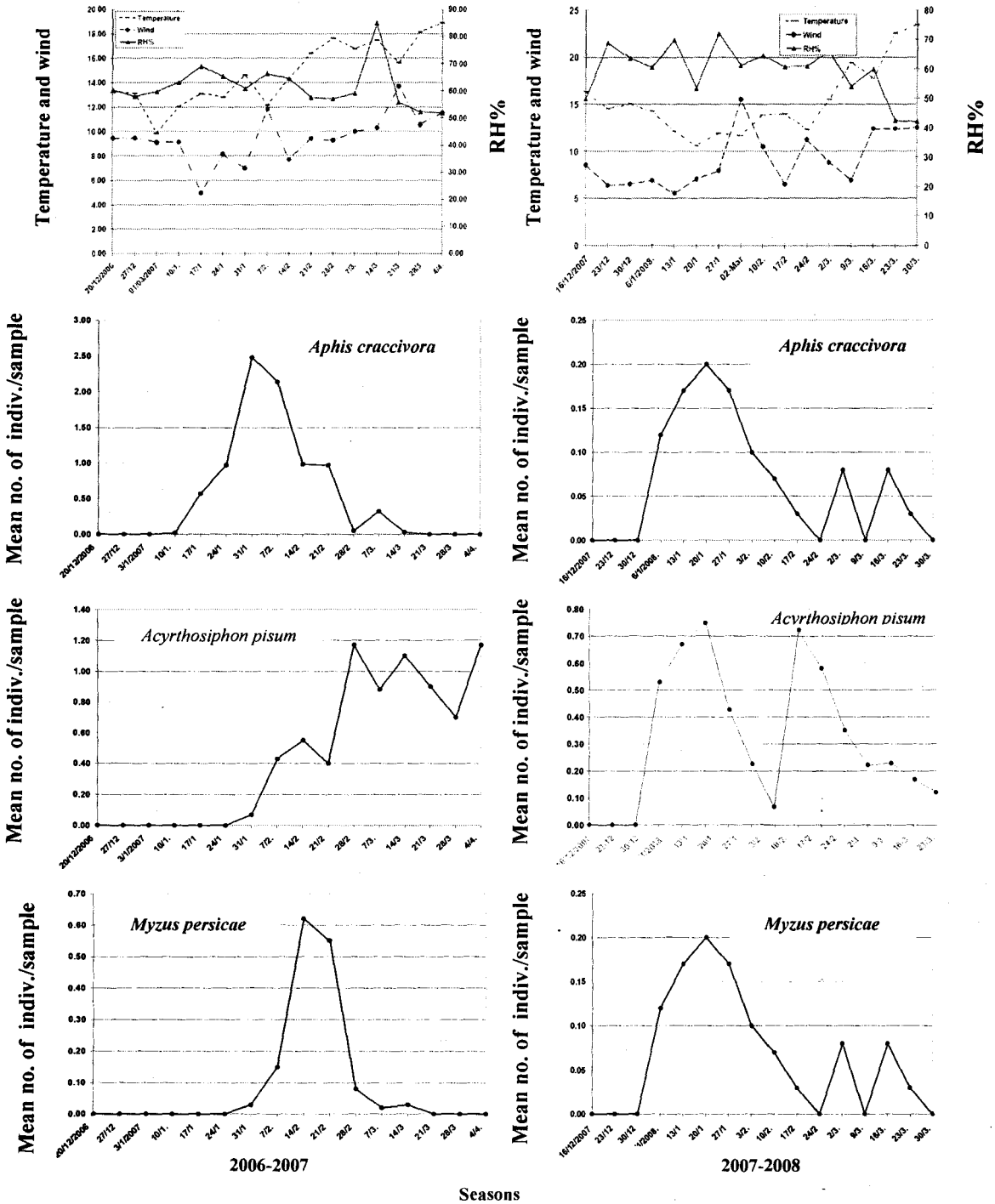


Fig. 2. Population fluctuation of different aphid species infesting fenugreek crop at Plant Protection Research Station at Qaha region, Qalubiya Governorate during 2006 / 2007 and 2007 / 2008 seasons.

Table 3. Effect of three environmental conditions on population of aphid species on fenugreek plants at Plant Protection Research Station at Qaha region, Qalyubiya Governorate during 2006/2007 season.

Weather factors	<i>Aphis craccivora</i>			<i>Acyrtosiphon pisum</i>			<i>Myzus persicae</i>		
	r	b	CD%	r	b	CD%	r	b	CD%
Temp.	-0.160	-2.56	1.34	**0.767	6.46	49.51	-0.058	-0.06	0.10
RH%	-0.033	-2.94	0.31	-0.044	0.68	5.16	-0.131	-2.33	2.08
Wind velocity	-0.208	-4.26	3.68	0.544	3.06	15.61	-0.287	-1.28	8.48
Temperature × RH%			0.09			8.97			0.02
Temperature × Wind			0.94			13.09			0.14
RH% × Wind			0.33			3.27			0.41
Total			6.69			95.60			11.23

No singe = non-significant

* = Significant

** = Highly significant

Table 4. Effect of three environmental conditions on population of aphid species on fenugreek plants at Plant Protection Research Station at Qaha region, Qalyubiya Governorate during 2007/2008 season.

Weather factors	<i>Aphis craccivora</i>			<i>Acyrtosiphon pisum</i>			<i>Myzus persicae</i>		
	r	b	CD%	r	b	CD%	r	b	CD%
Temp.	-0.686	-4.46	40.70	* 0.648	-0.70	29.76	-0.620	0.98	45.18
RH%	0.317	4.55	1.79	0.377	10.31	6.23	0.442	4.58	1.16
Wind velocity	0.143	1.48	1.23	-0.406	0.29	3.53	-0.262	0.78	0.91
Temperature × RH%			5.15			20.75			11.05
Temperature × Wind			0.95			6.38			3.99
RH% × Wind			0.23			3.71			0.81
Total			50.05			70.36			63.10

No singe = non-significant

* = Significant

** = Highly significant

2. Seasonal abundance of natural enemies:

Data in Fig. (3) revealed that during the two cultivating seasons of 2006/2007 and 2007/2008 two natural enemies species were associated to pests infesting fenugreek plants. *Coccinella* spp. began to appear in the first week of February and second half of January giving average numbers of 0.05 and 0.07 and it ranged from 0.02-0.27 and 0.02-0.13 individuals/plant during the first and second seasons, respectively.

The obtained results agreed with those obtained by Meena and Bhargava (2001a&b) who found that *Coccinella septempunctata* found on the first week of February on fenugreek plants. Data in Table (5) give that the simple correlation and partial regression values for the effect of three considered weather factors (temperature, RH% and wind velocity) on the population of *Coccinella* spp. during the two seasons (2006/2007) and (2007/2008). Data revealed that during the two seasons (r) values were not significantly positive for both temperature and wind velocity, while they were negative for RH%.

On the other hand, *Oruis* spp. had comparatively low average numbers ranged from 0.02 to 0.20 and 0.02 to 0.12 during the first and second seasons, respectively (Fig.,3).

It is obvious that *Oruis* spp. appeared from last half of February during the two growing seasons with average numbers of 0.05 and 0.03 individuals in the first season and second one, respectively.

Regarding the data in Table (6) it is clear that temperature and wind velocity had insignificant and positive effect during the two seasons except wind that proved to be velocity negative in the second season, but RH% had insignificantly effect negative during the two seasons.

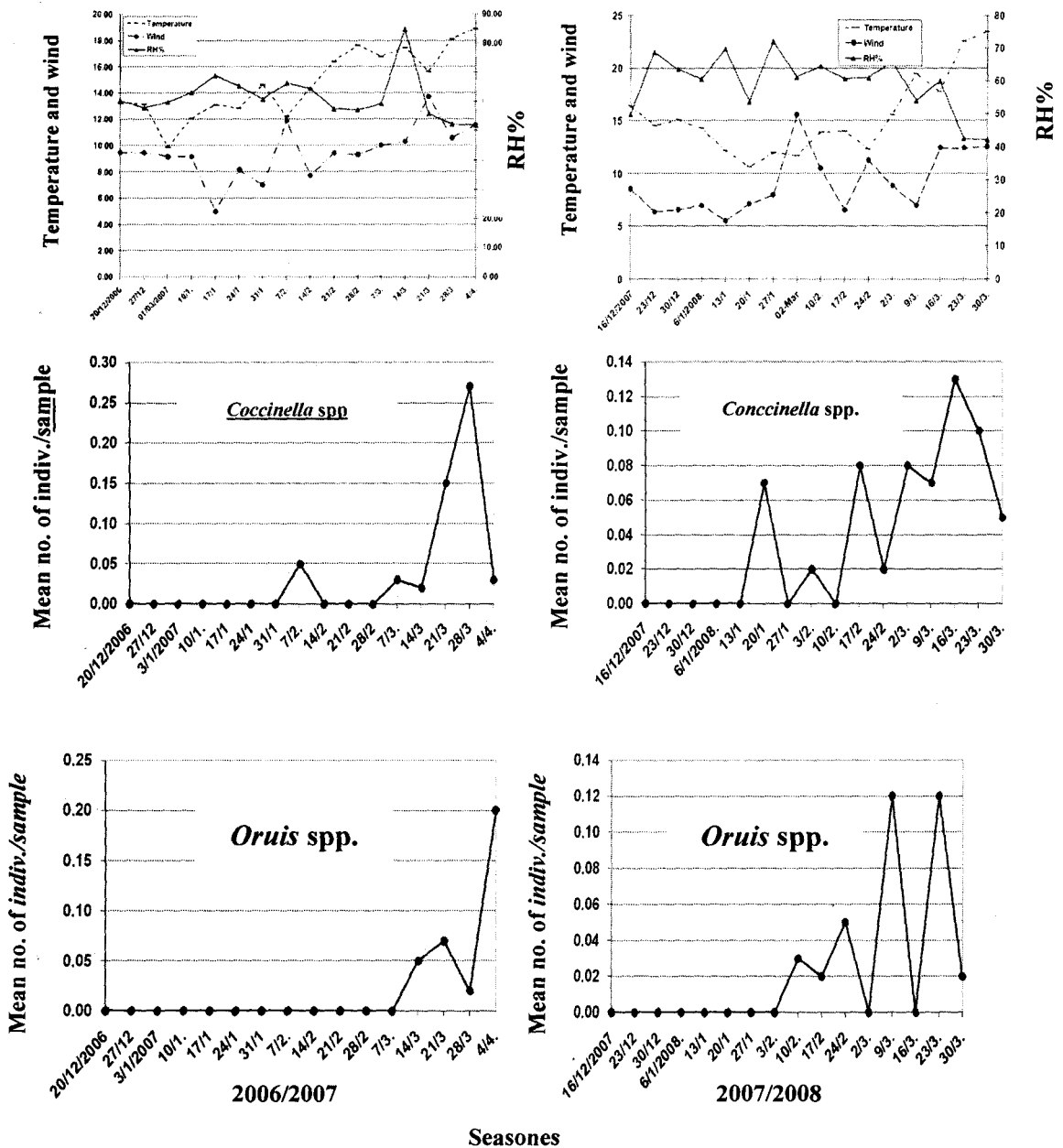


Fig. 3. Population fluctuation of two natural enemies (*Coccinella* spp. and *Oruis* spp.) associated with different insect species infesting fenugreek crop at Plant Protection Research Station, at Qaha region, Qalubia Governorate during 2006/2007 and 2007/2008 seasons.

Table 5. Effect of three environmental conditions on population of *Coccinell* spp. associated with main insect species infesting fenugreek crop at Plant Protection Research Station, at Qaha region, Qalubiya Governorate during 2006/2007 and 2007/2008 seasons.

Weather factors	2006/2007			2007/2008		
	r	b	CD	r	b	CD
Temp.	0.217	-0.38	1.01	0.527	-1.57	11.39
RH%	-0.364	-2.81	7.50	-0.509	-3.80	8.46
Wind velocity	0.498	0.41	19.92	0.106	-0.79	1.16
Temp. × RH%			1.35			15.04
Temp. × Wind			0.01			2.25
RH% × Wind			3.59			2.36
Total			33.38			40.66

No singe = non-significant

* = Significant

** = Highly significant

Table 6. Effect of three environmental conditions on population of *Oruis* spp. associated with main insect species infesting fenugreek crop at Plant Protection Research Station, at Qaha region, Qalubiya Governorate during 2006 /2007 and in the second season 2007/2008 seasons.

Weather Factors	2006/2007.			2007/2008		
	r	b	CD	r	b	CD
Temp.	0.511	-0.09	32.86	0.478	-5.28	4.4
RH%	-0.255	-1.23	1.35	-0.540	-6.91	27.18
Wind velocity	0.384	-0.31	29.54	-0.263	-1.81	6.36
Temp. × RH%			1.49			19.28
Temp. × Wind			0.30			0.13
RH% × Wind			4.65			6.00
Total			70.19			63.35

No singe = non-significant

* = Significant

** = Highly significant

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الوفرة الموسمية لبعض الآفات الحشرية والأعداء الطبيعية المصاحبة لها علي نباتات الحلبة

عبد الجابر فتوح السيد عقصه

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقي - جيزة

تم دراسة تأثير بعض الظروف البيئية علي تعداد بعض الآفات الحشرية وكذلك تعداد بعض الأعداء الطبيعية علي نباتات الحلبة في محافظة القليوبية خلال موسمي ٢٠٠٦/٢٠٠٧، ٢٠٠٧/٢٠٠٨. سجل للتربس قمة واحدة في الأسبوع الثاني من مارس وسجل أعلي تعداد له علي البراعم الطرفية. خلال الموسم الأول كان معامل الارتباط معنوي موجب لكل من درجة الحرارة وسرعة الرياح، بينما كان غير معنوي مع النسبة المئوية للرطوبة النسبية وفي خلال الموسم الثاني معامل الارتباط غير معنوي موجب ماعدا مع درجة الحرارة حيث كانت غير معنوية سالبة. ووجد لسوسة أوراق البرسيم ثلاث قمم في ١٤، ٢٨ فبراير، ١٤ مارس. كما وجد أن معامل الارتباط بين تعداد الحشرة وكل من الحرارة والرطوبة النسبية وسرعة الرياح في كل من الموسمين غير معنوي. ووجد أن صناعات الأنفاق لها ثلاث قمم خلال في ٢٤ يناير، ٢٨ فبراير و ٢٨ مارس ووجد لمعامل الارتباط تأثير موجب لكل من الحرارة والرياح خلال موسمي الدراسة. في الموسم الأول وجد لمنّ البقوليات ولمنّ الخوخ الأخضر قمتين في ٣١ يناير، ٧ مارس و ١٤ فبراير و ١٤ مارس علي التوالي بينما لمنّ البسلة أربعة قمم في منتصف وآخر فبراير و منتصف مارس وآخر أبريل. بينما في الموسم الثاني وجد لمنّ الخوخ الأخضر ومنّ البقوليات ومنّ البسلة ثلاث قمم. ووجد أن ليس للعوامل الجوية الثلاثة تأثير معنوي علي أنواع المنّ علي نباتات الحلبة ماعدا منّ البسلة وجد أن للحرارة تأثير عالي المعنوية في الموسم الأول ومعنوي بالموسم الثاني. سجل نوعين من المفترسات مرتبطة بأفات الحلبة حيث ظهر أبو العيد في بداية الأسبوع الأول من فبراير والنصف الثاني من يناير خلال الموسمين علي التوالي. كان الارتباط بين العوامل الجوية وتعداد أبو العيد موجب غير معنوي لكل من الحرارة والرياح بينما كان هناك تأثير سالب للرطوبة النسبية خلال الموسمين. كما ظهرت بقعة الأوريس كمفترس في نهاية النصف الثاني من فبراير للموسمين كما كان للحرارة تأثير غير معنوي موجب في الموسمين ماعدا الرطوبة النسبية وسرعة الرياح كان تأثيرهما غير معنوي سالب خلال الموسمين باستثناء سرعه الرياح كانت غير معنويه وموجبه في الموسم الأول.