RELATIVE ABUNDANCE AND SPATIAL DISTRIBUTION OF *Liriomyza trifolii* (Burgees), *Thrips tabaci* (Lind.) and *Tetranychus urticae* (Koch.) POPULATIONS ATTACKING CUCUMBER AND TOMATO GROWN UNDER GREEN-HOUSES AT KAFR EL-SHEIKH

Abou-Attia, F.A.; F.A. Sharshir, M.S. Tadros and Ghada, M.A. El-Shafei
Dept. of Economic Entomology, Fac. of Agric. Kafr El-Sheikh, Tanta Univ., Egypt.

ABSTRACT

Relative abundance and spatial distribution of the serpentine leafminer (SLM) *Liriomyza trifolii* Burgees, *Thrips tabaci* Lind. and *Tetranychus urticae* Koch. were studied throughout two consective seasons on cucumber, *Cucumis sativus* L. var. Delta star and throughout one long season on tomato *Lycopersicon esculentum* var. Strain B-VF145B, under plastic tunnel at Kafr El-Sheikh.

Results revealed that leaf miner recorded from cucumber 1999/2000 showed two conspicuous peaks for SLM larvae on November 28th and December 12th. While, only one peak on May 2nd was recorded for SLM larvae during season 2000. Lower plant level held the majority of SLM infestation followed by middle, while the upper level was found to held nil. Relative abundance and spatial distribution of *L. trifolii* on tomato 99/2000 was similar to those on cucumber.

T. tabaci was recorded from cucumber 2000 only. Results revealed that three conspicuous peaks were recorded for nymphs through April 11th, May 2nd and May 16th. As for tomato season 1999/2000, only one peak was recorded through April 3rd. Middle level held the majority of thrips nymphs, followed by upper level, while lower level the least.

The red spider mite *T. urticae* recorded during season of cucumber 99/2000, two peaks on cucumber during the first season through Nov. 7th and Dec. 19th. Also, in the second season 2000, two peaks were recorded through April 4th and May 9th. Only one peak was recorded through April 14th for tomato 99/2000. Lower level held the majority of the pest followed by middle, while the upper level the least.

During the present study there were a significant correlation between weather factors (temperature and relative humidity) and all tested pests, *L. trifolii, T. tabaci* and *T. urticae* were recorded.

Key words : Leaf miner, thrips, the red spider mite, cucumber and tomato plants, green-house.

INTRODUCTION

The development in the use of plastics in greenhouses have recently taken place in Egypt, mainly over the past 25 years as research on protected cultivation started in 1968. Cucumber and tomato are among the most important grown vegetable crops under walk in tunnels **El-Aidy (1996)** sited from (**MOAR, 1996**). Preserved areas were found to carry a lot of pests either mites or insects which causing a serious damage in both quantity and quality of fruits, among the most important recorded pests are leaf miners, thrips, and mites (**Hussey and Scope, 1985; Syversen and Fuglestad, 1988; Heinz and Parrella 1990 and Milevoj and Osvald, 1996**).

The serpentine leafminer (SLM) *Liriomyza trifolii* Burg. is a serious major pest on vegetable greenhouses (**Ulubiliar and Yabas, 1996; Godinho and Mexia, 2000 and Ghabeish and Allawi, 2001**). It recorded as a pest of economic importance on greenhouse cucumber and tomato (**Szwejda, 1999**).

Thysanoptera are important pests of protected crops causing great damage either directly by feeding and indirectly, by the transmission of viruses (**Colombo and Biondo, 1996**). *Thrips tabaci* Lind. was one of the surveyed pests under plastic houses (**Ibrahim, 1995**). **Yasarakinici and Hincal (1999)**, added that this pest has become an important pest attacking cucumber.

The tetranychid mite, *Tetranychus urticae* Koch. was recorded on cucurbit and solanaceous and some other crops in greenhouses (**Trottin-Caudal *et al.* 1989, Stenseth, 1991 and Ibrahim, 1995**).

Therefore the present work was carried out under plastic tunnel to study the following: (1) Relative abundance of *L. trifolii*, *T. tabaci* and *T. urticae* occurring at 3 plant levels on cucumber and tomato plants. (2) the effect of temperature and relative humidity on the pest fluctuations under plastic tunnels.

MATERIALS AND METHODS

The current study was carried out in the experimental farm of the Faculty of Agriculture, Kafr El-Sheikh, Tanta University. One plastic tunnel ($270m^2$) divided into two equal parts, each one ($135m^2$). A part was cultivated with cucumber, *Cucumis sativus* L. Var. Delta Star., while the other was grown up with tomato, *Lycopersicon esculentum* Var. Strain B-VF145B.

without pesticide application and was covered with an anti-insect nets.

Cultivation of soil under tunnels :

Seeds of cucumber were sown into seedling trays (84 cells) under seedling tunnels on September 10th (1999) and were planted to the investigated plastic tunnel in October, 2nd (1999). However for tomato seeds were sown in seedling trays (209 cells) in September 3rd, 1999 and were transferred to the permanent plastic tunnel in October 4th, 1999 for long season that lasted from October 17th, 1999 till April 17th, 2000. Mineral fertilization was added to the soil during the growth season of the plants.

Sampling procedure :

Samples were taken on weekly basis, from all considered cultivations, through the 2 seasons all time experiment, as for cucumber, the first season began on October 17th, 1999 till January 16th, 2000 while the second one began on February 29th till May, 30th, 2000, while for tomato it was all time experiment that began on October 17th, 1999 and ended by April 17th, 2000. At every sampling date, from each of the 2 tested locations, ten plants were chosen at random, from 3 plots for each and the sample was represented by 3 levels, the upper, the middle, and lower level of the grown plants [30 leaves (cucumber) and / or 30 leaflets (tomato)]. Samples were taken in the early morning at (8.00 a.m.) as recommended by (**Butler *et al.*, 1989; Naranjo and Fint, 1994**). Direct examination took place on the spot by the aid of a hand lens. The number of nymphs of the *Thrips tabaci*, however, for the leafminer *Liriomyza*, it was larvae and tunnels that was encountered. On the other hand, as for the mite, larvae, nymphs and adults were recorded. The obtained data were statistically analyzed according to **Duncan's (1955)**.

RESULTS

1. The SLM, *Liriomyza trifolii* :

1.1. On cucumber plants :

1.1.1. Relative abundance of *L. trifolii* larvae occurring at 3 plant levels, through the season 1999/2000:

Results in Table (1) indicated that *L. trifolii* larvae started to attack cucumber plants at the end of October (1999) and their relative abundance increased gradually to reach the highest abundance at 12th of December (26.0 larvae) then the larval population decreased gradually to reach (1.0 larvae) at 16th of

January. In respect to the second season 2000, (Table 2) *L. trifolii* larvae started to attack cucumber plants at 21st of March 2000 and its population increased gradually to reach the highest peak at 2nd of May (32.0 larvae), then decreased gradually to reach (10.0 larvae) at 30th of May.

Table (1): Relative abundance of the SLM, *L. trifolii* larvae and tunnels occurring at 3 plant levels (lower, middle and upper) on cucumber plants, during the season 1999-2000.

Sampling date	Low.		Mid.		Up.		Tot.		°C	R.H.
	Larvae	No. of Tunnels	Larvae	No. of Tunnels	Larvae	No. of Tunnels	Larvae	No. of Tunnels		
17/10/1999	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.2	67.2
24/10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.0	67.0
31/10	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	25.5	77.2
7/11	1.00	5.00	0.00	0.00	0.00	0.00	1.00	5.00	23.0	65.0
14/11	1.00	6.00	0.00	1.00	0.00	0.00	1.00	7.00	23.5	80.2
21/11	2.00	9.00	1.00	2.00	0.00	0.00	3.00	11.00	25.5	81.5
28/11	4.00	12.00	2.00	3.00	0.00	0.00	6.00	15.00	23.5	79.2
5/12	2.00	17.00	1.00	12.00	0.00	0.00	3.00	29.00	22.2	64.5
12/12	16.00	74.00	10.00	37.00	0.00	0.00	26.00	111.00	21.0	63.0
19/12	11.00	66.00	6.00	39.00	0.00	0.00	17.00	105.00	21.7	71.0
26/-12	9.00	35.00	3.00	15.00	0.00	0.00	12.00	50.00	19.2	69.0
2/1/2000	3.00	20.00	1.00	7.00	0.00	0.00	4.00	27.00	17.5	60.0
9/1	2.00	16.00	1.00	4.00	0.00	0.00	3.00	20.00	16.1	58.0
16/1	0.00	2.00	1.00	2.00	0.00	0.00	1.00	4.00	16.0	60.2
Total	52.00	263.00	26.00	122.00	0.00	0.00	78.00	385.00		
Mean	3.38 a	17.25 a	1.88 b	7.98 b	0.00 c	0.00 c	5.06	25.08		
%	66.70	68.30	33.30	31.70	0.000	0.00				

L.S.D. = 0.156 (for larvae) L.S.D. = 3.221 (for tunnels)

1.1.2. Spatial distribution of SLM, *L. trifolii* :

Results in (Table 1) revealed that the lower level held the highest number of SLM larvae. However, the average number was (3.38 larvae) during the season, comprising (66.70%) of the three levels. While, the middle level held (1.88) comprising (33.30%). On the other hand, the lower level held the majority of tunnels (17.25) comprising (68.30%) of the 3 plant levels, while the middle level held (7.98) comprising (31.70%) of the total plant levels. In the second season 2000, results in table (2) showed that the lower level also held the majority with SLM larvae (4.49) comprising (58.87%) of the three levels. While, the middle level held (3.09 larvae) comprising (41.13%). In addition to the total tunnels, the lower level held mean of 37.74 comprising (56.98%) of the 3 levels, while the middle level held mean of 27.94 comprising (42.02%) of the three levels. The upper level was found to held nil of the larvae and tunnels. The statistical analysis showed significant differences between the 3

plant levels, while in the second season no significant differences between the lower and middle levels for larvae.

Table (2): Relative abundance of the SLM, *L. trifolii* larvae and tunnels occurring at 3 plant levels (lower, middle and upper) on cucumber plants during the season 2000.

Sampling date	Low.		Mid.		Up.		Tot.		°C	R.H. %
	Larvae	No. of tunnels	Larvae	No. of tunnels	Larvae	No. of tunnels	Larvae	No. of tunnels		
29/2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.0	55.2
7/3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00	55.00
14/3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.50	59.00
21/3	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	19.30	60.00
28/3	1.00	3.00	1.00	1.00	0.00	0.00	2.00	4.00	20.50	62.10
4/4	2.00	7.00	1.00	2.00	0.00	0.00	3.00	9.00	20.00	62.00
11/4	8.00	32.00	2.00	10.00	0.00	0.00	10.00	42.00	22.50	65.00
18/4	7.00	39.00	5.00	23.00	0.00	0.00	12.00	62.00	25.00	67.00
25/4	8.00	65.00	6.00	31.00	0.00	0.00	14.00	96.00	27.30	70.00
2/5	18.00	151.00	14.00	113.00	0.00	0.00	32.00	264.00	29.00	71.50
9/5	9.00	127.00	11.00	90.00	0.00	0.00	20.00	217.00	29.00	69.20
16/5	14.00	125.00	7.00	94.00	0.00	0.00	21.00	219.00	31.00	67.50
23/5	9.00	85.00	7.00	90.00	0.00	0.00	16.00	175.00	29.00	69.00
30/5	6.00	83.00	4.00	88.00	0.00	0.00	10.00	171.00	27.00	68.00
Total	83.00	718.00	58.00	542.00	0.00	0.00	141.00	1260.00		
Mean	4.49 a	37.74 a	3.09 a	27.94 b	0.00 b	0.00 c	7.58	65.68		
%	58.87	56.98	41.13	43.02	0.00	0.00				

L.S.D. = 1.532 (For larvae) L.S.D. = 6.100 (for tunnels)

1.1.3. The effect of temperature and relative humidity on *L. trifolii* population.

A slight correlation were recorded between both temperature & R.H. and the leaf miner larvae as r = 0.311 and r = 0.264, respectively, in the first season. While, in the second season there were highly significant correlation between the populations of leafminer larvae and temperature r=0.930. Also, a positive correlation with R.H. % were found. That reflect a significant correlation as r = 0.360.

1.2. On tomato plants :

1.2.1. Relative abundance of SLM larvae occurring at 3 plant levels, through the season 1999/2000.

The evaluation of the number of *L. trifolii* on the tomato plants (Table 3) showed that SLM larvae started to attack tomato plants at October (1999) and their relative abundance increased to reach the highest peak (10.5 larvae) at December (1999), then larval population decreased through January and February 2000. The second peak was recorded at March (7.0 larvae) then population decreased through April (end of season).

Table (3): Monthly Relative abundance of the SLM, *L trifolii* larvae and tunnels occurring at 3 plant levels (lower, middle and upper) on tomato plants, during the season 1999-2000.

Sampling date	Low.		Mid.		Up.		Total		°C	R.H. %
	Larvae	No. of Tunnels	Larvae	No. of Tunnels	Larvae	No. of Tunnels	Larvae	No. of Tunnels		
Oct. 1999	0.33	0.33	0.00	0.00	0.00	0.00	0.33	0.33	25.57	70.47
Nov.	3.00	6.00	1.50	2.50	0.00	0.00	4.50	8.50	23.88	76.48
Dec.	6.75	19.25	3.75	7.75	0.00	0.00	10.50	27.00	21.03	66.88
Jan. 2000	0.80	2.20	0.60	0.80	0.00	0.00	1.40	3.00	15.88	63.56
Feb.	0.75	0.75	0.25	0.25	0.00	0.00	1.00	1.00	15.73	71.78
Mar.	4.00	9.50	3.00	5.25	0.00	0.00	7.00	14.75	18.58	67.75
Apr.	3.00	9.67	2.33	6.33	0.00	0.00	5.33	16.00	22.50	64.67
Total	72.00	183.00	44.00	86.00	0.00	0.00	116.00	269.00		
Mean	2.67 a	6.81 a	1.63 b	3.27 b	0.00c	0.00 c				
%	62.07	68.03	37.93	31.97	0.00	0.00				

L.S.D. = 0.423 (for larvae) L.S.D. = 1.562 (for tunnels)

1.2.2. Spatial distribution of SLM, *L. trifolii* :

Results in (Table 3), indicated that the lower level held the majority of the larvae and tunnels (2.67 and 6.81), resp. that comprised (62.07 and 68.03%), resp. of the totals 3 plant levels. However, the middle level held (1.63 and 3.27), resp. comprising (37.93% and 31.97%), resp. of larvae and tunnels. On the other hand, the upper level was found to held nil of the larvae and tunnels. The statistical analysis showed significant differences were found between the three plant levels.

1.2.3. The effect of temperature and relative humidity on *L. trifolii* population :

Statistical analysis showed a significant correlation between larvae population and temperature as r = 0.545. While for R.H. the correlation was insignificant as r = 0.009.

2. Thrips, *T. tabaci* :

2.1. On cucumber plants :

2.1.1. Relative abundance of *T. tabaci* occurring at 3 plant levels, through the season 2000:

Results in Table (4) showed that *T. tabaci* nymphs started to attack cucumber plants at 14th of March 2000 and their relative abundance increased to reach the highest abundance at 3 peaks, the first peak (504.0 nymphs) at 11th of April, the second peak (756.0 nymphs) at 2nd of May and the third peak (733.0 nymphs) at 16th of May. Then population decrease till the end of the season.

Table (4): Relative abundance of *T. tabaci* nymphs, occurring at 3 plant levels (lower, middle and upper) on cucumber plants, during the season 2000.

Sampling date	Levels			Total	°C	R.H. %
	Low.	Mid.	Up.			
29/2/2000	0.00	0.00	0.00	0.00	16.00	55.20
7/3	0.00	0.00	0.00	0.00	17.00	55.00
14/3	1.00	4.00	7.00	12.00	17.50	59.00
21/3	15.00	59.00	52.00	126.00	19.30	60.00
28/3	63.00	111.00	112.00	286.00	20.50	62.10
4/4	129.00	173.00	177.00	479.00	20.00	62.00
11/4	112.00	204.00	188.00	504.00	22.50	65.00
18/4	118.00	181.00	177.00	476.00	25.00	67.00
25/4	132.00	165.00	163.00	460.00	27.30	70.00
2/5	206.00	275.00	275.00	756.00	29.00	71.50
9/5	171.00	271.00	240.00	682.00	29.00	68.20
16/5	188.00	269.00	276.00	733.00	31.00	67.50
23/5	184.00	267.00	268.00	719.00	29.00	69.00
30/5	138.00	194.00	237.00	569.00	27.00	68.00
Total	1457.00	2173.00	2172.00	5802.00		
Mean	364.25 b	543.25 a	543.00 a	1450.50		
%	25.11	37.45	37.44			

L.S.D. = 20.48 (for nymphs)

2.1.2. Spatial distribution of *T. tabaci* :

The records of the nymphs (Table 4) indicated that the middle level held the majority of the nymphs with mean number of 543.25 that comprised (37.45%) of the total levels. However, the upper level held 543.00 that comprised (37.44%), while the lower level the least and was found to held 364.25 comprised (25.11%). The statistical analysis showed that there were no significant between the two levels middle and upper, while they were different from the lower level.

2.1.3. The effect of temperature and relative humidity on *T. tabaci* population :

Statistical analysis that showed a significant correlation between thrips nymphs and both temperature and R.H. as r=0.728 and r=0.280, respectively.

2.2. On tomato plants :

2.1.1. Relative abundance of *T. tabaci* occurring at 3 plant levels, through the season 1999/2000:

Results in Table (5) indicated that population of *T. tabaci* nymphs were not detected during the first period of the season from October through December 1999 till January 2000. Then it

build up gradually and continued to raising up till March 20th then continued its building up till April 3rd giving the highest peak (460.0 nymphs) then population declined till the end of season.

Table (5): Relative abundance of *T. tabaci* nymphs, occurring at 3 plant levels (lower, middle and upper) on tomato plants, during the season 1999-2000.

Sampling date	Levels			Total	°C	R.H. %
	Low.	Mid.	Up.			
6/2/2000	0.00	0.00	0.00	0.00	15.00	69.00
13/2	0.00	0.00	0.00	0.00	15.30	70.10
20/2	1.00	5.00	2.00	8.00	16.10	73.00
27/2	1.00	7.00	4.000	12.00	16.50	75.00
6/3	2.00	13.00	9.00	24.00	17.00	69.30
13/3	18.00	36.00	36.00	90.00	17.50	68.20
20/3	69.00	86.00	59.00	214.00	19.30	70.40
27/3	89.00	146.00	114.00	349.00	20.50	63.10
3/4	130.00	157.00	173.00	460.00	20.00	62.00
10/4	106.00	177.00	165.00	448.00	22.50	65.00
17/4	87.00	156.00	148.00	391.00	25.00	67.00
Total	503.00	783.00	710.00	1996.00		
Mean	21.81 b	33.80 a	31.14 a			
%	25.20	39.23	35.57			

* No recorded was obtained through the months Oct./Dec. 1999 and Jan. 2000.
* Samples were taken 3 times, 4 times per month for Oct./Dec. 1999 and 5 times per month for Jan. 2000.
L.S.D. = 5.980 (for nymphs)

2.2.2. Spatial distribution of *T. tabaci* :

Results in (Table 5) indicated that the middle level held the majority of the nymphs (33.80) that comprised (39.23%) of the 3 plant levels. However the upper level held (31.14), comprising (35.57%), while the lower level the least and was found to held (21.81), comprising (25.20%). The statistical analysis showed significant differences between the levels, while there were no differences between both middle and upper levels.

2.2.3. The effect of temperature and relative humidity on *T. tabaci* population :

Results showed that, a slight positive correlation could be detected between the total of the thrips nymphs and temperature especially at the early season and that it reversed in late season. The statistical analysis showed a slight significance between nymphs and temperature as $r = 0.483$, while also with R.H. as the correlation was insignificant as $r = 0.120$.

3. The red spider mite, *T. urticae* :

3.1. On cucumber plants :

3.1.1. Relative abundance of the red spider mite, *T. urticae*:

Results in Table (6) showed that relative abundance began to build its numbers, from the beginning of experiment on Oct. 17th 1999 and that build ran gradually till Nov. 7th, then population multiplied fast to build up a clear peak on Dec. 19th. (470.0 ind.) then declined rapidly and steeply till Jan 2nd. it declined gradually till Jan 16th 2000 the end of experiment. While in the second season Table (7) the population of *T. urticae* ran up gradually from the second sample date on 7th of March then they raised up till 4th of April recording a first peak (929.0 ind.) then they ran up rapidly till 9th of May recording the second peak (2463.0 ind.) then declined till the end of season.

Table (6): Relative abundance of *T. urticae*, (larvae, nymphs and adults) occurring at 3 plant levels (lower, middle and upper) on cucumber plants, during the season 1999-2000.

Sampling date	Levels			Total	Temp. °C	R.H. %
	Low.	Mid.	Up.			
17-10-99	1.00	0.00	0.00	1.00	26.20	67.20
24-10	21.00	9.00	4.00	34.00	25.00	67.00
31-10	26.00	14.00	7.00	47.00	25.50	77.20
7-11	33.00	15.00	9.00	57.00	23.00	65.00
14-11	17.00	11.00	1.00	29.00	23.50	80.20
21-11	22.00	19.00	10.00	61.00	25.50	81.50
28-11	90.00	44.00	23.00	157.00	23.50	79.20
5-12	115.00	82.00	42.00	239.00	22.20	64.50
12-12	154.00	123.00	96.00	373.00	21.00	63.00
19-12	210.00	145.00	115.00	470.00	21.70	71.00
26-12	168.00	129.00	105.00	402.00	19.20	69.00
2-1-2000	67.00	49.00	99.00	215.00	17.50	60.00
9-1	35.00	30.00	48.00	113.00	16.10	58.00
16-1	22.00	18.00	45.00	85.00	16.00	60.20
Total	991.00	688.00	604.00	2283.00		
Mean	64.90 a	45.50 b	41.98 c	153.00		
%	43.40	30.14	26.46	-		

L.S.D. = 1.784

3.1.2. Spatial distribution of the red spider mite, *T. urticae* population.

The record of the different stages of the *T. urticae* during season 99/2000 (Table 6), indicated that the lower level held the majority of the pest (64.90) that comprising (43.40%) of the total three plant levels. However the middle level held (45.50) comprising (30.14%), while the upper level the least and was found to held (41.98) comprising (26.46%). The statistical

analysis showed significant differences between the three plant levels. While in the second season 2000. Results in Table (7) showed that the lower level held the majority of the pest 325.34 comprising (35.81%) of the three plant levels. However, the middle level held 308.15 comprising (34.14%), while the upper level the least and was found to held 262.61 comprising (30.05%).

Table (7): Relative abundance of *T. urticae*, (larvae, nymphs and adults) occurring at 3 plant levels (lower, middle and upper) on cucumber plants, during the season 2000.

Sampling date	Levels			Total	Temp. °C	R.H. %
	Low.	Mid.	Up.			
29/2/2000	17.00	14.00	1.00	32.00	16.00	55.20
7/3	46.00	43.00	17.00	106.00	17.00	55.00
14/3	48.00	45.00	19.00	112.00	17.50	59.00
21/3	97.00	75.00	38.00	210.00	19.30	60.00
28/3	214.00	184.00	105.00	503.00	20.50	62.10
4/4	369.00	314.00	246.00	929.00	20.0	62.00
11/4	388.00	328.00	195.00	911.00	22.5	65.00
18/4	481.00	440.00	281.00	1102.00	25.00	67.00
25/4	676.00	559.00	416.00	1651.00	27.30	70.00
2/5	757.00	707.00	589.00	2053.00	29.00	71.50
9/5	903.00	795.00	765.00	2463.00	29.00	69.20
16/5	776.00	774.00	760.00	2310.00	31.00	67.50
23/5	619.00	683.00	747.00	2049.00	29.00	69.00
30/5	593.00	649.00	740.00	1982.00	27.00	68.00
Total	5884.00	5610.00	4937.00	16431.00		
Mean	325.34a	308.15 ab	262.61b	896.10		
%	35.81	34.14	30.05			

L.S.D. = 62.518

3.1.3. The effect of temperature and relative humidity on *T. urticae* population :

In the first season 99/2000, statistical analysis showed a positive correlation between the temperature and the red spider mite population as r = 0.310. As for R.H. the correlation was significant too as r = 0.155. While in the second season 2000, significant correlation were recorded between population of *T. urticae* and both temperature and R.H. as r = 0.678 and 0.228, respectively.

3.2. On tomato plants :

3.2.1. Relative abundance of the red spider mite, *T. urticae* :

Results in Table (8) indicated that the red spider mite was totally absent through the first part of the season or rather from a

October 1999 till January 2000. The first appearance was on February 13th 2000 and the pest build up gradually till April 3rd recording a small peak then continued raising up till it reached its maximum number (1800.0 ind.) at 17th of April, the end of the season.

3.2.2. Spatial distribution of the red spider mite, *T. urticae* population :

The records of the different stages of the *T. urticae* Table (8) indicated that the lower level held the majority of the pest (87.28) that comprised (41.56%) of the total three plant levels. However, the middle level held (69.63), comprising (32.88%), while the upper level the least and was found to held (54.05), comprising (25.56%) the statistical analysis showed a significant differences between the 3 levels.

Table (8): Relative abundance of *T. urticae* (larvae, nymphs and adults) occurring at 3 plant levels (lower, middle and upper) on tomato plants during the season 1999-2000.

Sampling date	Level			Total	°C	R.H. %
	Lower	Middle	Upper			
6/2/2000	0.00	0.00	0.00	0.00	15.00	69.00
13/2	9.00	6.00	4.00	19.00	15.30	70.10
20/2	17.00	14.00	10.00	41.00	16.10	73.00
27/2	48.00	39.00	24.000	111.00	16.50	75.00
6/3	111.00	86.00	53.00	250.00	17.00	69.30
13/3	146.00	98.00	94.00	338.00	17.50	68.20
20/3	179.00	141.00	106.00	426.00	19.30	70.40
27/3	222.00	147.00	129.00	498.00	20.50	63.10
3/4	231.00	197.00	176.00	604.00	20.00	62.00
10/4	318.00	251.00	195.00	764.00	22.50	65.00
17/4	735.00	616.00	449.00	1800.00	25.00	67.00
Total	2016.00	1595.00	1240.00	4851.00		
Mean	87.28a	69.63b	54.05c	210.96		
%	41.56	32.88	25.56			

* No recorded was obtained through the months Oct./Dec. 1999 and Jan. 2000.
* Samples were taken 3 times, 4 times per month for Oct./Dec. 1999 and 5 times per month for Jan. 2000.
L.S.D. = 10.221

3.2.3. The effect of temperature and relative humidity on *T. urticae* population :

Statistical analysis showed a positive significant correlation between the red spider mite populations and temperature as r = 0.874. While the statistical analysis showed a slight significant correlation between R.H. and the red spider mite population as r = 0.470.

DISCUSSION

Relative abundance of the leafminer *L. trifolii* larvae, and tunnels on cucumber 99/2000 indicated that two peaks were recorded on November 28th and December 12th 1999, that matched with the results of Gharbiev *et al.* **(1993)** and **Yabas and Ulubilir (1995)** showed leafminer populations seriously infected cucumber plantation through winter time and the peak was recorded on November, our results confirms the present records. Leafminer tunnels happened on the lower level and at lower percentages on the middle levels, however, on the upper no record and a slight correlation was recorded between temperature and leaf miner larvae population r = 0.311 for temperature and for R.H., it was r = 0.264. During season cucumber 2000 obtained result indicated that only one peak on May 2nd was recorded. Our results in agreement with those obtained by **Yabas and Ulubilir (1995)**. Temperature and R.H. were found to affect the larvae populations since a highly significant correlation between larvae and temperature since r = 0.930 while for R.H. r = 0.360. As for tomato plants the leaf miner *L. trifolii* relative abundance during the 1999/2000 tomato season was similar to cucumber season.

Thrips were found to fluctuate through all time experiment. Three peaks were recorded through April 11th, May 2nd and May 16th on cucumber 2000, our results in agreement with those obtained by **Morishita and Azuma (1988)**, they observed the population fluctuations of *Thrips palmi* Karny as a pest on sweet pepper in vinyl-house cultivation in Japan. They stated that the seasonal changes were similar in most of the houses, densities being low in winter, increasing in spring and peaking in April or May. **Grill (1988)** in France, he reported that the activity of the thrips on cucumber in the field and under glass begins after overwintering usually in May. The middle level was found to held the majority of thrips nymphs followed by the upper, while the lower the least. The statistical analysis showed no significance between levels. A significant correlation was recorded between thrips populations and temperature since r = 0.728 and for R.H. it was r = 0.280. Only one peak was recorded through April 3rd of *T. tabaci* during the 1999/2000 tomato season, middle level held the majority, while the lower the minority **Legutowska (1997)** showed that adults and nymphs of *Thrips tabaci* were most numerous on the middle Leaves of leek.

Relative abundance of the red spider mite *T. urticae* populations were maximum recorded on November 7th and December 19th 1999 on cucumber plants. **Szwejda and Nawrocha (1996)** indicated that the highest population density

of the mite was recorded on Autumn and that result matches with present findings. Our records showed a positive correlation between mite populations and temperature since r = 0.310 while R.H. showed significant correlation since r = 0.155. While in the second season 2000, two peaks were recorded through April 4th and May 9th. The lower level held the maximum record of mite populations, while the upper level the lowest, Temperature and R.H. were found to affect mite populations r = 0.678 for temperature and r = 0.228 for R.H. Only one peak was recorded through Arpil 14th for tomato season 99/2000. The statistical analysis showed .a positive correlation between red spider mite and temperature since r=0.824. As for R.H. significant correlation since r=0.470.

REFERENCES

Al-Ghabeish, I. and T.F. Allawi (2001). Agromyzia leafminers and their parasitoids in Jordan. Dirasat. Agric. Sci., 28 (13), 172-177.

Butler, G.D.; D.I. Coudriet and T. J. Henneberry (1989). Sweet potato whitefly. Host plant preference and repellent, effect of plant derived oils on cotton, squash, lettuce and cantaloupe-South westen Ent. 14: 9-16.

Colombo, M. and L. Biondo (1996). Monitoring of Thysanoptera Q in crops of cyclamen with azure blue sticky traps. Inform Agr., 52 (3): 7-72.

Duncan, D.B. (1955). Multiple range and Multiple F. tests. Biometrics, 11: 1-24.

El-Aidy, F. (1996). Recent development in Egyptian plasticulture. "Plsticulture",No. 110, 29-34.

Ganiev, I.G.; A.T. Ushchekov; I.S. Muzafarov; G.Yu and Y. L. Emel (1993). The potato leaf miner and its parasites in greenhouses of Tatarstan. Zashchita Rastenii Moskva (USSR), 7 : 12-13.

Godinho, Y. and A. Mexia (2000). Leafminers (*Liriomyza sp.*) importance in greenhouses in the Oeste region of Portugal and its natural parasitoids as control agent in IPM programs. Bull. OILB/SROP, 23 (1): 157-161.

Grill, D. (1988). The tobacco thrips threatens leeks. Phytoma, No. 402, 51p.

Heinz, K.M. and M.P. Parrella (1990). Biological control of insect pests on greenhouse marigolds. Environ. Ent. 19 (4): 825-835.

Hussey, N.W. and N. Scope (1985). Biological pest control. The Greenhouse Experience. 240 p.

Ibrahim, M.A. (1995). Survey of insect pests of plants grown in greenhouses with the biology of Certain Species. M. Sc. Thesis, Fac. Agric., Alex. Univ. 130 P.

Legutowska, H. (1997). The occurrence of onion thrips; *Thrips tabaci* (Lindeman), on leek plants. Prog. Pl. Prot., 37 (2): 57-60.

Milevoj, L. and J. Osvald (1996). Methods for integrated cultivation and control of horticultural crops. in "New Challenge in Field Crop Production" Zbornik Simpozija Nov. izziviv Poljedelstvu Ljubljana (Slovenia) pp. 313-317.

Morishita, M. and K. Azuma (1988). Population fluctuation and economic injury level of *Thrips palmi* Karny (Thysanoptera : Thripidae) on sweet pepper in vinyl-house cultivation. Proc. Kansai Pl. Prot. Soc., 30: 57-62.

Naranjo, S.E. and H.M. Fint (1994). Spatial distributin of peimaginal *Bemisia tabaci* (Genn.) (Homoptera : Aleyrodidae) in cotton and development of fixed-precision, sequential sampling plans, Environ. Ent., 23: 254-266.

Stenseth, C. (1991). Mite-predatory mite (*Phytoseiulus persimilis*). Gartneryrket, 81 (14): 20-21.

Syversen, O. and K. Fuglestad (1988). All causes of damage cleaned in the glasshouse. Gartneryrket. 78 (19): 575-577.

Szwejda, J. (1999). Status of Entomology Research in Protection of Vegetable Crops in Poland. Prog. Pl. Prot., 39 (1): 43-51.

Szwejda, J. and B. Nawrocka (1996). Influence of soil-less cultivation on development and control of spider mites on vegetable crops in glasshouses. Brighton Cr. Prot. Conf. Pests & Diseases;vol. 3 in Proc. Inter. Conf., Brighton, PP. 855-860.

Trottin-Caudal, Y.; D. Grasselly; M. Trapateau and M. Villevielle (1989). The principal mite found on Solanaceae and cucurbitaceae grown under glass in France. Infos. (Paris), 57: 9-13.

Ulubiliar, A. and C. Yabas (1996). Pest and beneficial fauna of under cover vegetables and their distribution in the Mediterranean region of Turkey, Turkey Entomologi Dergisi, 20 (3): 217-228.

Yabas, C. and A. Ulubilir (1995). Investigations on the popualtion fluctuations and parasitization of the leafminer (*Liriomyza trifolii* Burgess). Bitki koruma Bulteni, 35(1-2): 35-44.

Yasarakinici, N. and P. Hincal (1999). The population growth of pests and their beneficial in cucumber plastic tunnels in the Izmir region of Turkey. Acta Horticul. PP. 491, 461-468.

الملخص العربى

الوفرة النسبية والتوزيع الفراغى لصانعة الأنفاق *Liriomyza trifolii* والتربس *Thrips tabaci* وأكاروس العنكبوت الأحمر *Tetranychus urticae* والتى تهاجم الخيار والطماطم تحت الصوب فى كفرالشيخ

فايز على أبوعطية ، فرج عبداللطيف شرشير،
محسن شكرى تادرس، غادة محى على الشافعى
قسم الحشرات الإقتصادية بكلية الزراعة بكفرالشيخ –جامعة طنطا – مصر

بدأ الأهتمام باستخدام الصوب البلاستيكية فى مصر منذ عام ١٩٦٨م فى الأغراض البحثية ثم زاد الإهتمام بها فى أغراض الإنتاج. ويعتبر محصول الطماطم من المحاصيل الرئيسية التى تزرع تحت الصوب البلاستيكية يليها محصول الخيار وكنتيجة لهذا التوسع فى الزراعة تحت الصوب البلاستيكية انتشرت الأفات الكثيرة والتى لم تكن لها أهمية اقتصادية كبيرة ولكن مع هذا الإنتشار والزراعة المكثفة فقد سببت أفات معينة أضرار للمجموع الخضرى والثمرى فى الكمية والجودة، وهذه تعد من أهم المشاكل التى تواجه هذا النوع من الزراعة بعد النمو.

وكان الغرض من تناول الدراسة الحالية الأهداف الأتية :

دراسة الوفرة النسبية والتوزيع الفراغى لصانعة الأنفاق والتربس وأكاروس العنكبوت الأحمر والتى تهاجم محصول الخيار *Cucumis sativus* Var. Delta Star. صنف Delta star، وكذلك محصول الطماطم *Lycopersicon esculentum* Var. Strain B- VF 145B صنف سترين B وقد تمت التجربة فى مزرعة كلية الزراعة بكفرالشيخ فى موسمين للخيار وموسم واحد طويل للطماطم من خلال ٣ مستويات للنبات خلال مدة التجربة ودراسة تأثير درجة الحرارة والرطوبة النسبية على تذبذب الأفات تحت ظروف الصوب البلاستيكية.

وقد تم الحصول على النتائج الأتية :

١- **بالنسبة لصانعة الأنفاق *L. trifolii*** : فقد أوضحت الوفرة النسبية لها خلال موسم ٩٩/٢٠٠٠م على الخيار وجود قمتين لليرقات خلال ٢٨ نوفمبر ، ١٢ ديسمبر. أما موسم الخيار ٢٠٠٠

أظهرت النتائج وجود قمة واحدة فى ٢ مايو لليرقات. كما أظهرت النتائج أن المستوى السفلى للنبات هو المفضل للحشرة حيث أحتوى على أعلى تعداد للحشرة وجاء بعدة المستوى الأوسط بينما لم تشاهد اليرقات والأنفاق على المستوى العلوى وبالنسبة لموسم الطماطم ٩٩/٢٠٠٠ أظهرت النتائج تشابه الوفرة النسبية والتوزيع الفراغى لتعداد الحشرة مع موسمى الخيار.

٢- **التربس *T. tabaci*** : أوضحت النتائج عدم وجود التربس على الخيار خلال موسم ٩٩/٢٠٠٠م بينما بدأت أعداده فى الظهور والتذبذب خلال موسم ٢٠٠٠. وأظهرت النتائج وجود ثلاث قمم خلال ١١ أبريل، ٢ مايو، ١٦ مايو ٢٠٠٠م. أما بالنسبة لزراعة الطماطم موسم ٩٩/٢٠٠٠م أظهرت النتائج وجود قمة واحدة فى ٣ أبريل ٢٠٠٠م لتعداد الحوريات. وسجل أعلى تعداد للحوريات على المستوى الأوسط تلاه العلوى واقلهم هو المستوى السفلى.

٣- **أما بالنسبة لأكاروس العنكبوت الأحمر *T. urticae*** : أظهرت الوفرة النسبية خلال الموسم الأول للخيار ٩٩/٢٠٠٠م وجود قمتين لتعداد الآفة. الأولى خلال ٧ نوفمبر والثانية خلال ١٩ ديسمبر ١٩٩٩م بينما فى الموسم الثانى للخيار ٢٠٠٠ شوهد أيضا قمتين للآفة الأولى خلال ٤ أبريل والثانية خلال ٩ مايو ٢٠٠٠ وبالنسبة لموسم الطماطم ٩٩/٢٠٠٠ لوحظ قمة واحدة فقط خلال ١٤ أبريل. وكان المستوى السفلى هو المفضل للآفة تلاه المستوى الأوسط بينما المستوى العلوى أقلهم تعداداً.

لوحظ خلال الدراسة الحالية ارتباط معنوى بين عوامل الطقس (الحرارة والرطوبة النسبية) وكل الحشرات المختبرة: صانعة أنفاق الأوراق – التربس – أكاروس العنكبوت الأحمر.