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Abundance of Three Sap Sucking Pests on Three Eggplant Cultivars With Utilization of *Phytoseiulus persimilis* Athias–Henriot against *Tetranychus urticae* Koch

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ABSTRACT

Abundance and fluctuation of *Tetranychus urticae* Koch, *Aphis gossypii* Glover and *Bemisia tabaci* (Gann.) were studied on three eggplant cultivars (i.e. Baladi-White, Florida Market and Baladi-Black) during 2009 and 2010 successive seasons. *T. urticae* occurrence continued almost all the season and reached its maximum at the end of June or the beginning of July. *A. gossypii* reaching the highest abundance in the middle of September while *B. tabaci* reached its maximum abundance at the end of July and first half of August. Variance in susceptibility among tested cultivars was recorded based on the abundance averages overall the two seasons. Florida Market, Baladi-White and Baladi-Black recorded the lowest abundance of *T. urticae*, *A. gossypii* and *B. tabaci*, respectively. *Phytoseiulus persimilis* proved to be a good biocontrol agent against *T. urticae* at release ratios of 1:5 and 1:10 predator : prey. A reduction appeared one week after release, generally it revealed 68.60 and 88.20 % mean reduction for both release ratios, respectively.

Key Words: Eggplant, *Tetranychus urticae, Bemisia tabaci, Aphis gossypii, Phytoseiulus persimilis,* Abundance and Biological control.

INTRODUCTION

Eggplant, *Solanum melongen* L, is one of the important solanaceous plants. Its production is highly concentrated. Ninty percent of production comes from five countries, China produes 24.5 melion tons followed by India 10.6 and Egypt come the third by 1.2 melion tons per year. About 1.7 million hectares are devoted to cultivate eggplant in the world (FAOSTAT 2010, http://faostat.fao.org/site/567/DesktopDefault.aspx). Eggplant grow in temperate climates, so it is subjected to many pests as the two spotted spider mite, *Tetranychus urticae* Koch, the whitefly *Bemisia tabaci* (Gann.) and *Aphis gosspii* Glover. These pests cause great damage to the plant. *T. urticae* feeds on the plant sap causing serious damage varying according to the degree of infestations (Iskander *et al.*, 2002). The primary damage caused by aphids and whiteflies is the production of sticky honeydew and subsequent growth of black sooty mold on the honeydew, lowering the photosynthetic capacity of the plant and making the fruit unattractive. They can also stunt plants by feeding early in the season before blooming.

Studying pests fluctuation along the season should help to define the proper control timing which result in reduce the use of pesticides and avoid any misplacement of predator. Screening of susceptibility of different cultivars against pests may help in I.P.M. strategies. It also may help in the breeding of resistant varieties.

Using predaceous mites is considered the safest methods in controlling mite pest attacking the field crops especially the two–spotted spider mite on eggplant cultivars.

The present work was conducted throughout two successive summer seasons 2009 and 2010, to study the fluctuation of *T. urticae*, *A. gossypii* and *B. tabaci* along the planting season, in Egypt, to shade some light on the relative susceptibility of the three eggplant cultivars to infestation with the same pests under field conditions. The efficiency of the predatory mite, *Phytoseiulus persimilis* Athias–Henriot in two different releasing ratios of predator: pest (1:5 & 1:10) against *T. urticae* throughout twelve weeks after release was considered.

MATERIALS AND METHODS

Abundance of sap sucking pests on different eggplant cultivars:

The abundance of *T. urticae*, *B. tabaci* and *A. gossypii* on the eggplant cultivars (i.e. Baladi-white, Florida Market and Baladi-Black) was studied. An area of 525 m^2 was cultivated at Kaha Agricultural Research Station, Qalyubiya Governorate, Egypt during two successive seasons 2009 and 2010. The nurseries of the cultivars were transported to hills in the permanent area on 21st of March during the two seasons. The experimental area was divided into 9 plots. Each tested cultivar was represented by three replicates (58 m^2) which were arranged in a randomized complete block design.

All the recommended agricultural practices were carried out as needed. The experimental area was kept free from any pesticide treatments, as the plants were left to the natural infestation.

Three weeks after transplantation from the nurseries and for 29 weeks later, samples of ten leaves representing all plant levels were weekly picked from each replicate (30 leaves for each cultivar). The collected leaves were placed directly into paper bags and taken to the laboratory. All stages of *T. urticae*, *A. gossypii* and the imature stages of *B. tabaci* were counted using stereomicroscope.

Biological control:

The predatory mite *P. persimilis* was utilized as a biological control agent against *T. urticae* on eggplant. The predatory mite was reared on kidney been plants, *Phaseolus vulgaris* (L.) which previously infested with *T. urticae*. Kidney been plants were planted in plastic pots and placed in isolated greenhouse covered with a fine mesh plastic net (500 holes/inch^2). The predator culture was monitored daily and provided with prey when needed, until the populations of the predator became suitable for harvest.

Releasing the predatory mite was carried out in separate area on Florida Market cultivar as the population of *T. urticae* built up on 16th May 2009. The predator was released with two ratios 1:5 and 1:10 predator: prey, respectively. The experimental area was divided into 9 plots which was arranged in a randomized complete block design. Each rate was represented by 3 replicate, besides three plots as control. Bean leaves with the predatory mite were transferred in an ice-box to eggplant field and then distributed on infested eggplant plants in order to achieve required release ratio. A sample of thirty eggplant leaves were picked up to the laboratory in order to count the motile stages of *T. urticae* once before release, and then weekly for the thirteen subsequent weeks.

Statistical analysis:

Data were subjected to analysis of variance (ANOVA) using SAS program (SAS Institute, 1988) and means were separated by LSD. For biological control experiment, percentages of reduction in the number of motile stages of *T. urticae* were calculated using the equation of Henderson and Tilton (1955).

RESULTS AND DISCUSSION

Abundance of *Tetranychus urticae*:

The abundance (number of mites/inch^2) of *T. urticae* on three eggplant cultivars (i.e. Baladi-White, Florida and Baladi-Black) was examined during the growing season that extended between April 11, to October 24, in the two successive years, 2009 and 2010 (Figs. 1 & 2). The mite infestation started from the first week of the observation until the end of the season on all the tested cultivars. The population fluctuated all over the examining period. The first peak was moderate and reached its maximum after the mid of April then decreased. The abundance started to raise up once again in the middle of May and reached the highest peak in the end of June or the beginning of July as it reached almost 80 mites/ inch^2 in Baladi-White cultivar. Another smaller peak was recorded before or at the mid of August. Then the population of the mite decreased in the subsequent month September. After that one moderate peak was observed, at the first third of October. Relative susceptibility of three eggplant cultivars to the *T. urticae* was calculated on bases of the abundance averages on the three cultivars along the two seasons and tabulated in Table (1). Baladi-white cultivar hosted the highest population followed by Baladi-Black and Florida Market. Averages of abundance in 2009 season were 32.96, 32.59 and 25.81 mite/inch^2, respectively. Averages of abundance showed the same trend in 2010 season with averages of 28.96, 18.14 and 14.28 mite/inch^2, respectively. According to calculated LSD, Florida Market cultivar significantly hosted the least mite population in the two seasons.

Abundance of *Aphis gossypii*:

Considering the population fluctuation of *A. gossypi* on the three eggplant cultivars, Figures (3 & 4) illustrate the abundance of the aphid infestation during 2009 and 2010 seasons. A little or moderate abundance was recorded at the end of April and the beginning of May. Then the aphid abundance decreased to reach its minimum in June. Then aphid population started to increase gradually in the beginning of July until it reached the highest abundance in the middle of September then decreased again. As shown in Table (1), according to abundance averages, Baladi-White cultivar hosted the least aphid population among the tested cultivars in the two seasons. Whereas aphid density on this cultivar was significantly lower in 2009 season only.

Abundance of *Bemisia tabaci*:

The population curve of *B. tabaci* on the three tested cultivars (Figures 5 & 6) showed almost the same trend during the two studied seasons. The population started very low and increased gradually at the beginning of May to form a peak at the middle of June then it breaked down at the end of this month. *B. tabaci* started to increase once again in the first half of July as it reached the maximum abundance during the end of July and first half of August. Then the abundance decreased gradually through the last two months, September and

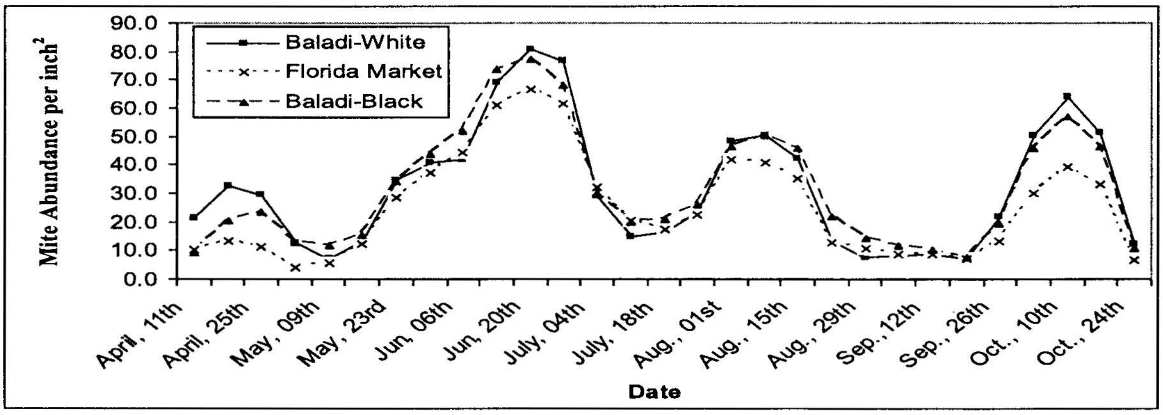

Fig. (1): Fluctuation of *T. urticae* population density on three eggplant cultivars in 2009.

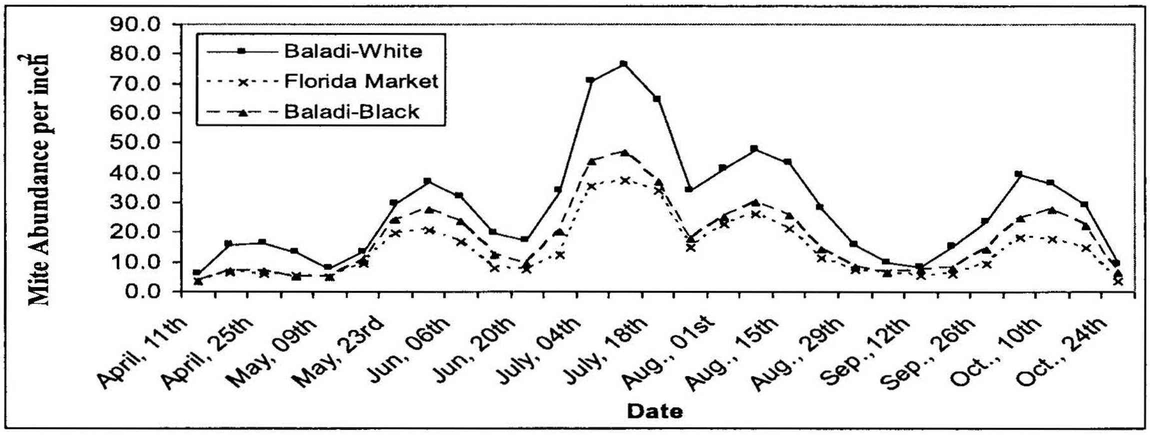

Fig. (2): Fluctuation of *T. urticae* population density on three eggplant cultivars in 2010.

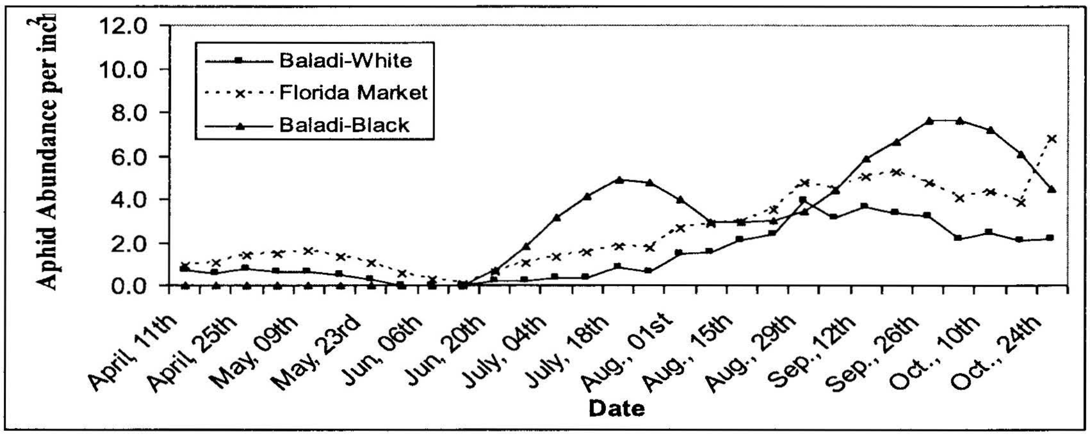

Fig. (3): Fluctuation of *A. gossypi* population density on three eggplant cultivars in 2009.

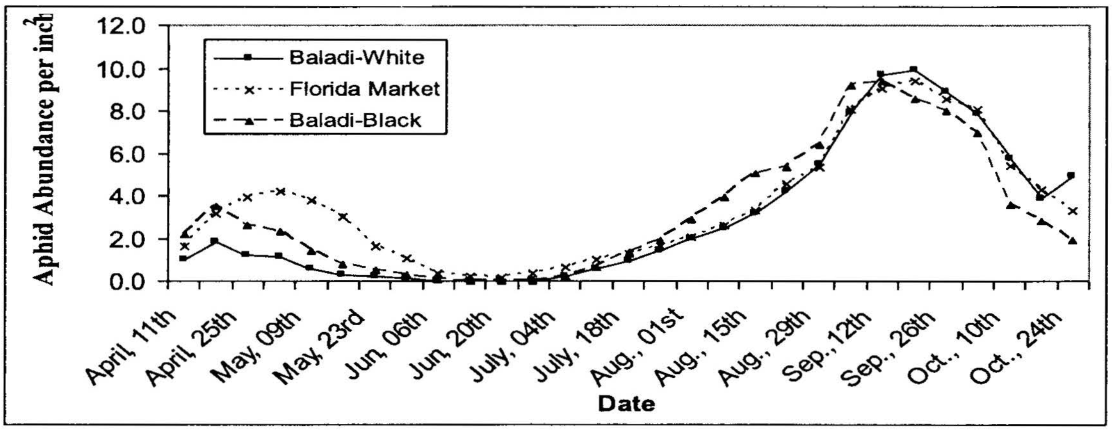

Fig. (4): Fluctuation of *A. gossypi* population density on three eggplant cultivars in 2010.

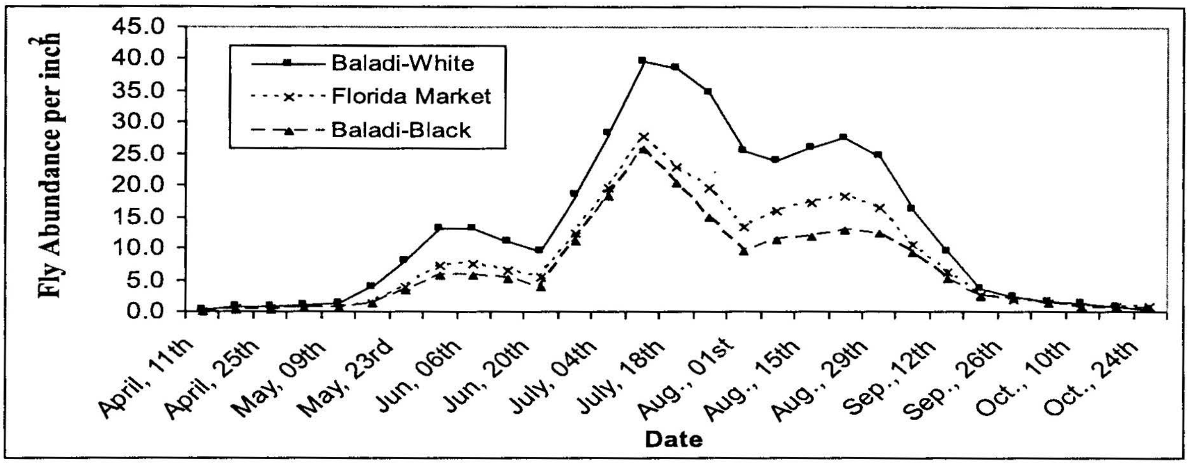

Fig. (5): Fluctuation of *B. tabaci* population density on three eggplant cultivars in 2009.

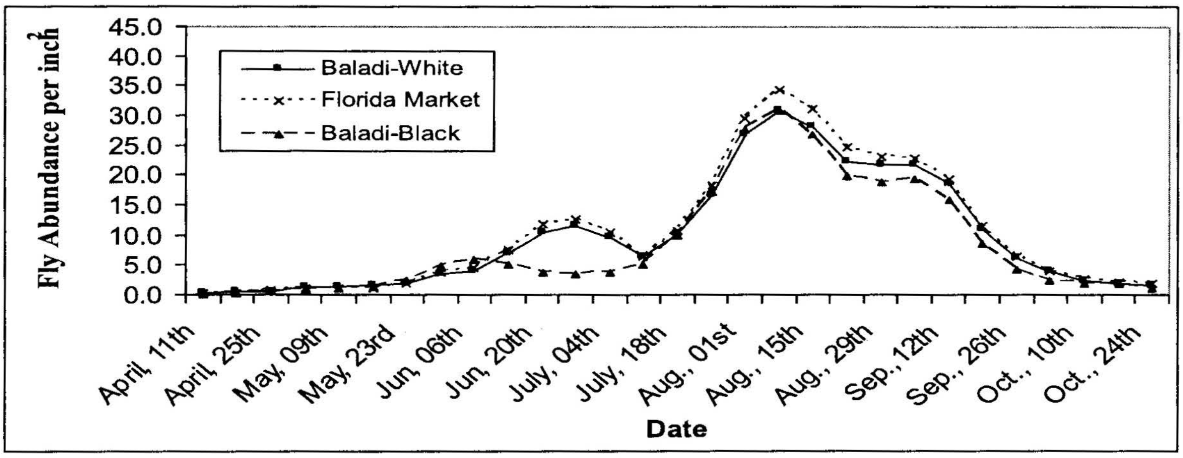

Fig. (6): Fluctuation of *B. tabaci* population density on three eggplant cultivars in 2010.

October. Data in Table (1) revealed that, Baladi-Black was the lowest preferable cultivar for *B. tabaci* as it demonstrated the lowest abundance compared with the other two cultivars.

Differences in population increase and degree of infestations of the pests on different eggplant varieties or cultivars were demonstrated in various studies among them Parvane *et al.*, (2002) on nine commercial egg-plant varieties and Islam *et al.*, (2010) on 3 eggplant varieties. Iskandar (2003) mentioned that Florida Market was one of the least infested varieties with *T. urticae.*

Table (1): Abundance averages of three sucking pests on three eggplant cultivars

year	Cultivar	*T. urticae*	*A. gossypii*	*B. tabaci*
2009	Baladi-White	32.96a	1.40b	13.28a
	Florida Market	25.81b	2.50a	8.34b
	Baladi-Black	32.59a	3.01a	6.78b
	LSD	4.19	0.94	1.92
2010	Baladi-White	28.96a	2.93a	9.77a
	Florida Market	14.28c	3.58a	10.55a
	Baladi-Black	18.14b	3.19a	8.41b
	LSD	3.47	0.67	1.07

Biological control of *T. urticae* on eggplant with the predatory mite, *Phytoseiulus persimilis*:

As it is tabulated in Table 2, both released ratios (1:5, 1:10) revealed a reduction of 42.11 and 38.56% , respectively, one week after release. Then, the reduction percent of the pest increased gradually by time until reaching the maximum at 6^{th}-9^{th} week after release. Then the percent reduction fluctuated until the end of the season during the thirteen weeks of evaluation.

Regarding the mean reduction for the two levels of treatments, it was observed that the mean percentages were 68.60 and 88.20 for the levels 1:5, and 1:10 predator: prey, respectively. These data proved that *P. persimilis* release at level 1:10 gave better results for biocontroling *T. urticae* on eggplant. So it could be recommended to use *P. persimilis* to control *T. urticae* on eggplant.

Biocontrol of *P. persimilis* against *T. urticae* was proved on many hosts by several authors but on eggplant by El-Saiedy *et al.*, (2008); Shibao and Tanaka (2006)).

Table (2): The mean density of *T. urticae* mobile stages before and after releasing *P. persimilis* on eggplant plant with the corresponding reduction percentage

Releasing level	1:5 predator : prey		1:10 predator : prey		Control
Sampling date	Mean	R.%	Mean	R.%	
Pre count	9.00		10.50		8.90
After 1st week	9.60	42.11	11.90	38.50	16.40
2nd week	11.80	65.78	13.10	67.44	34.10
3rd week	14.20	72.03	16.10	72.82	50.20
4th week	13.60	75.94	5.70	91.36	55.90
5th week	3.20	95.52	2.10	97.48	70.70
6th week	0.00	100.00	0.50	99.58	100.30
7th week	0.00	100.00	0.00	100.00	105.40
8th week	0.05	99.94	0.00	100.00	76.40
9th week	11.10	87.15	0.00	100.00	85.40
10th week	30.60	70.25	0.00	100.00	101.70
11th week	57.50	51.32	0.10	99.93	116.80
12th week	30.70	22.16	2.70	94.13	39.00
13th week	17.00	9.62	3.20	85.42	18.60
Mean R. %		68.60 B		88.20 A	
L.S.D.			6.58		

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