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EFFECT OF CERTAIN ABIOTIC AND BIOTIC FACTORS ON POPULATION DYNAMICS OF *Retithrips syriacus* Mayet (THRIPIDAE:THYSANOPTERA) AND *Panonychus ulmi* KOCH (TETRANYCHIDAE:PROSTIGMATA) INFESTING GRAPEVINE

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ABSTRACT

The black vine thrips, *Retithrips syriacus* Mayet (Thripidae: Thysanoptera) and the European red mite, *Panonychus ulmi* Koch (Tetranychidae: Prostigmata) cause serious damage to grapevine. Biotic and abiotic factors can be either helpful or harmful to pest's population, and understanding of such factors may contribute to better pest control. This study aimed at investigating the effect of the two predators (*Scolothrips longicornis* and *Amblyseius hutu*), temperature and relative humidity (RH) on the population fluctuations of these two pests on Muscat, Thompson seedling and Azmerly grapevine cultivars during the 2007/2008 and 2008/2009 growing seasons. The results indicated that *R. syriacus* fluctuated throughout the two seasons. The peak was recorded during June (2007/2008) and September (2008/2009) on the three grapevine cultivars. Although, the population fluctuation of *P. ulmi* differed during the two studied seasons, but the peak was recorded during May or June in both seasons according to the grapevine cultivars. In both growing seasons, it seems that both pests have one generation a year, and high temperature and moderate RH seem to be favorable for both pests. During both growing seasons, the population of both predators reached a peak in May and June on the three cultivars. Minimum temperature and RH played an important role in regulating the population changes of *R. syriacus* and *P. ulmi*, respectively. Mean numbers of the two associated predators, *Scolothrips longicornis* and *Amblyseius hutu* were significantly higher in 2007/2008 than 2008/2009 on Muscat and Thompson seedling. There was a negative significant correlation between the populations of both predators and *R. syriacus* and *P. ulmi*. In conclusion, the selected abiotic and biotic factors played the most important role in regulating the population density of these two pests.

Keywords: *abiotic factors, grapevine, Panonychus ulmi, population dynamics, predator,Retithrips syriacus*

1. INTRODUCTION

Grapevine, *Vitis vinifera* L. is one of the most widely planted fruit crops in the world, and vineyards covering an approximate area of 10 million hectares (Pearson and Goheen, 1996). In Egypt, grapevine is an economic crop for both local consumption and exportation, and its cultivated area estimated to be 59 thousands ha (Mohamed, 1996). However, grapevine is attacked by several arthropod pests including insects and mites worldwide (Al-Zyoud and Elmosa, 2007; Khanjani and Ueckermann, 2003; Rosi *et al.*, 2006; Miranda *et al.*, 2007; Vasquez *et al.*, 2007). In Egypt, many pest species are infesting vineyards (Saeed and Muhammad, 2005; Abdel Maksoud, 2006).

The black vine thrips, *Retithrips syriacus* Mayet (Thripidae: Thysanoptera) is distributed in many countries of the world including Egypt (Fattouh, 1999; Medina-Guad and Franqui, 2001; Al-Zyoud and Elmosa, 2007). *R. syriacus* causes a serious damage to grapevine leaves (Lopes *et al.*, 2002; Tsitsipis *et al.*, 2003; Al-Zyoud and Elmosa, 2007). The pest inhabits under the surface of the leaves causing discoloration and silvering spots, gradually the leaves dropdown and the high infestation could harm the newly formed fruits (Khalil *et al.*, 2010). The European red mite, *Panonychus ulmi* Koch (Tetranychidae: Prostigmata) is the most common pest of grapes.

This mite species is an important foliar pest of grapevine, and its adults and nymphs feed on the lower surfaces of the leaves, and cause fruits dropdown. In heavy mite infestation, the leaves turn into a bronze color, and fruit ripening is negatively affected as a result of feeding (Khalil *et al.*, 2010).

Predators as biotic factors of the agro-ecosystem are playing an important role in suppressing many pest populations. However, the predaceous thrips, *Scolothrips longicornis* Priesner (Thripidae: Thysanoptera) is always associated and considered as a common predator of tetranychid mites (Mari and Gonzales-Zamora, 1999; Gotoh, 2004). Ozsemerci *et al.* (2006) stated that *S. longicornis* is the most abundant phytophagous species belong to Thysanoptera order on grapes. Also, Kheradpir *et al.* (2008) showed that *S. longicornis* is a persistent predator able to function at lower prey population densities. In Egypt, Abdel-Maksoud (2006) showed that the phytoseiid mite, *Amblyseius hutu* (Pichard and Baker) (Phytoseiidae: Mesostigmata) is the main predator on tetranychid mites on grapevine trees.

Nevertheless, it was pointed out that abiotic and biotic factors affect the development and activity of insects and mite pests under which the grapevine is growing. Accordingly, changes in weather conditions can be either helpful or harmful to pests' population (Al-Zyoud and Elmosa, 2007), and understanding of such factors may contribute in designing successful integrated pest management (IPM) programs (Frisbie, 1984). However, up to date and to the best of our knowledge, no research has been undertaken on the effect of abiotic and biotic factors on *R. syriacus* and *P. ulmi* pests on grapevines in Egypt. Therefore, the present study aimed to investigate the effect of predators, temperature and relative humidity (RH) on the population dynamics of *R. syriacus* and *P. ulmi* on three different cultivars of grapevine throughout the 2007/2008 and 2008/2009 growing seasons. It is hoped that this work could help positively in laying the foundation for sustainable and environmentally friendly pest control strategy through IPM for grapevine production in the future.

2. MATERIALS AND METHODS

2.1. Experimental site and condition

The current study was carried out in the Experimental Research Station at Faculty of Agriculture, Assiut University. The population dynamics of *R. syriacus* and *P. ulmi* pests during the 2007/2008 and 2008/2009 growing seasons were investigated on three grapevine cultivars; Muscat, Thompson seedling and Azmerly. The planting distance was 2.5 x 2 m (length and width) for Muscat and Thompson Seedling, while it was Arbors for Azmerly cultivar. The training systems of grapevine trees were Y-shape for Muscat, head for Thompson seedling and Arbors for Azmerly. The leaf surface was semi-hairy, smooth and hairy for Muscat, Thompson seedling and Azmerly, respectively. Age of the grapevine trees for the three cultivars averaged 15±5 years. Pesticides were not used throughout the entire period of the study. The trees were irrigated at 15-day intervals, pruned during January and hoed after spring as well as chemical (super phosphate) and organic fertilizers were added during March in both seasons. Minimum and maximum daily temperatures as well as RH were obtained from the nearest Meteorology Station of Assiut University.

2.2. Population dynamics of the pests and the predators

For studying the population fluctuations of the pests, *R. syriacus* and *P. ulmi* as well as the associated predators, *S. longicornis* and *A. hutu*, weekly samples each of 25 leaves were randomly collected from different sites of each cultivar starting from the first of March in both growing seasons. Sampling took place in the early morning before sunrise, and the collected leaves from each cultivar were separately kept in polyethylene bags and transferred to the laboratory. All of the moving stages (nymphs and adults) of *R. syriacus* and *P. ulmi* as well as *S. longicornis* and *A. hutu* found on both sides of each leaf were carefully examined by a dissecting microscope and the numbers of individuals were recorded. The relationships between the population density of both pests from one hand and the biotic factors (predators) and abiotic factors (minimum and maximum temperatures as well as RH) on the other hand were reported over the period of the two growing seasons.

2.3. Statistical analysis

In order to affirm the basic assumptions of the data to be analyzed, they were firstly tested for the normal distribution and the homogeneity of variance using the Barlett-test (Kohler *et al.*, 2002). Thereafter, the analysis of variance was conducted to detect any differences among the means. In case of detecting differences among means, the second step was to determine the significant differences between them at a probability level of 0.05 using the Least Significant Differences test (LSD) (Clewer and

Scarisbrick, 2001). The statistical analysis was performed using the proc GLM of the Statistical Package SigmaStat version 16.0 (SPSS, 1997) to compute the effect of weather factors and predators on the population dynamics of *R. syriacus* and *P. ulmi*. To determine the direct effect of each weather factor and predator on each of the two studied pests, the population counts were plotted against the corresponding weather data and predators. Also, the correlation between the population of each pest and both weather factors and predators was calculated by Spearman's correlation method. The multiple stepwise regressions were then reapplied to determine the separate effect of each weather factor and predator on each pest activity in the presence of the other tested factors (R-values). Squared partial regression coefficients (R^2) were multiplied by 100 to obtain the percentages of explained variance (efficiency) which reflect the amount of effect expressed by a particular weather factor and predators on the activity of each pest in the presence of the other considering weather factors and predators.

3. RESULTS

The population dynamics of the black vine thrips, *R. syriacus* and the European red mite, *P. ulmi*, both predators (*S. longicornis* and *A. hutu*) on three different cultivars of grapevine in the 2007/2008 growing season are shown in (Fig. 1). The population of *R. syriacus* was low during April with means of 0.46, 2.24 and 1.72 individuals/leaf on Muscat, Thompson seedling and Azmerly cultivars, respectively. The insect numbers increased to moderate levels during May, and progressed to reach a peak through June (32.6, 37.7 and 33.2) and July (30.4, 36.8 and 31.5) on the three grapevine cultivars, respectively. Thereafter, the numbers of *R. syriacus* declined sharply until September, and fluctuated until January. On the other hand, the numbers of *P. ulmi* (Fig.1) showed a low level of initial infestation during April with means of 3.1, 1.6 and 0.6 individuals/leaf on Muscat, Thompson seedling and Azmerly cultivars, respectively. The mean population of the mite increased rapidly hereafter and peaked during May on Muscat (35.5) and Thompson seedling (31.8), and during June on Azmerly (18.5). After that, a sharp decrease was recorded until June, then the numbers were very low through the following months until no mites appeared after January. During the 2007/2008 growing season, the mean individuals of both predators started to appear in March, then the numbers increased gradually reaching a peak in May (on Muscat) and June (on Thompson seedling and Azmerly). Their number decreased sharply until July. Then a second peak was reached in September on the three cultivars. Thereafter, the numbers decreased sharply and then gradually until no individuals were found after January. High mean temperature (30.2°C) and moderate RH (45.3%) dominated from May to August, seem to be favorable for *R. syriacus* since most of nymphs and adults occurred during this period. Also, in regards to *P. ulmi*, high mean temperature (29.0°C) and moderate RH (41.6%) recorded from May to June seem to be favorable for the mite.

During the 2008/2009 growing season, *R. syriacus* individuals started to appear in April with very low numbers (Fig. 2). They increased gradually until August with means of 6.57, 15.13 and 9.38 individuals/leaf on Muscat, Thompson seedling and Azmerly cultivars, respectively. A sharp increase peaked in September with means of 19.3, 42.3 and 40.5 on the three cultivars, respectively. Throughout the three successive months, the numbers were gradually decreased, then the pest was completely disappeared after January on all the cultivars investigated. On the other hand, population of *P. ulmi* (Fig. 2) appeared in March. After that, its level of abundance rapidly increased and reached a peak in May on Thompson seedling (55.1) and in June on Muscat (48.5) and Azmerly (31.6). Then, the population dropped sharply during July and August, and disappeared in September. During the 2008/2009 growing season, the mean individuals of both predators appeared also in March, and started to increase and then decreased on Muscat, while they increased gradually on Thompson seedling and Azmerly. After that the numbers increased gradually until they reached a peak in June on the three cultivars. Hereafter, the numbers decreased sharply and then gradually until no individuals were recorded in December. It seems that thrips is influenced by temperature and RH, where high temperature (28.3?C) and moderate RH (48.8%) occurred from June to November were the most favorable to the insect. Also, high mean temperature (29.8°C) and moderate RH (48.6%), which occurred during May and June seem to be favorable for the mite since most of *P. ulmi* occurred during this period. It seems that both pests have one generation a year in both growing seasons.

The results of multi-regression analysis between the population of *R. syriacus* and certain biotic

Fig. (1): Population dynamics of the black vine thrips, *Retithrips syriacus* **and the European red mite,** *Panonychus ulmi* **and the two predators,** *Scolothrips longicornis* **and** *Amblyseius hutu* **(together) on three different cultivars of grapevine in the 2007/2008 growing season.**

Fig.(2): Population dynamics of the black vine thrips, *Retithrips syriacus* **and the European red mite,** *Panonychus ulmi* **and the two predators,** *Scolothrips longicornis* **and** *Amblyseius hutu* **(together) on three different cultivars of grapevine in the 2008/2009 growing season.**

and abiotic factors during the two growing seasons are shown in Table 1. The results revealed a significant positive effect of temperature (maximum and minimum), and insignificant negative effect of RH on the thrips numbers. The predators showed insignificant effect on the population changes of this insect species on Muscat, Thompson seedling and Azmerly cultivars. It is also obvious from the coefficients of determination that the maximum temperature, minimum temperature, RH and predators were responsible together for 41.11%, 42.57% and 34.46% of the *R. syriacus* population changes through both studied seasons on Muscat, Thompson seedling and Azmerly cultivars, respectively. It is also evident that by dropping one of each variable, step by step from the input analyzed data, to explain the gradual representative efficacy of each variable on the population changes of *R. syriacus* (coefficient of determination in percentages), it was generally found that most of the pest population changes; 27.21%, 29.97% and 1.08% out of 41.11%, 42.57% and 34.46% were related to minimum temperature variable on Muscat, Thompson seedling and Azmerly, respectively. In general, the minimum temperature ranked the first important factor, while maximum temperature generally ranked the lowest considerable variable. Concerning *P. ulmi*, the results declared that the simple correlation coefficients of RH were highly significant (Table 2), while the rest investigated variables were insignificant for the three studied cultivars. The coefficient of determination revealed that the maximum temperature, minimum temperature, RH and predators were responsible for 76.49%, 66.12% and 75.23% of the mite population changes. When the coefficient of determination was calculated for each variable to study their effect on the population size of *P. ulmi*, the results indicated that the RH had the highest effect, negatively one, with 56.59%, 51.30% and 52.06% for Muscat, Thompson seedling and Azmerly, respectively. The rest investigated variable had positive effect on the mite population. Generally, the minimum temperature and RH played important role in regulating the population changes of the *R. syriacus* and *P. ulmi*, respectively.

During the 2007/2008 growing season, the population of *R. syriacus* with monthly grand mean of 8.0 individuals/leaf was significantly more abundant than in 2008/2009 with only 4.7 (F=5.27; 1, 22 df; P=0.032) on Muscat cultivar, while there were no significant differences on Thompson seedling and Azmerly between the two growing seasons (Fig.3). No significant differences were detected in the numbers of *P. ulmi* between the two growing seasons (F=1.17-2.89; 1, 22 df; P=0.10-0.20) on the three cultivars. Mean monthly number of both predators was significantly higher in 2007/2008 than 2008/2009 with means of 0.15 and 0.04 on Muscat (F=9.82; 1, 22 df; P=0.004) and 0.19 and 0.04 on Thompson seedling (F=10.47; 1, 22 df; P=0.005), respectively. There were no significant differences

Table (1): Multi-regression analysis between the number of *Retithrips syriacus* and certain biotic and abiotic factors during the two growing seasons at the experimental location.

Variety	Variable removed	r	R	$R^2 \times 100$	Decrease in $R^2 \times 100$	Efficiency
Muscat	**None**	**-----**	**0.641**	**41.11**	**-----**	**-----**
	Sum of predator no.	**0.116**	**0.629**	**39.52**	**1.59**	**5.753**
	Mean RH	**-0.304**	**0.628**	**39.43**	**1.68**	**6.100**
	Min. temp.	**0.600****	**0.580**	**33.60**	**7.51**	**27.21**
	Max. temp.	**0.499***	**0.638**	**40.69**	**0.42**	**1.544**
Thompson seedless	**None**	**-----**	**0.652**	**42.57**	**-----**	**-----**
	Sum of predator no.	**0.222**	**0.651**	**42.33**	**0.24**	**2.343**
	Mean RH	**-0.372**	**0.649**	**42.10**	**0.47**	**4.543**
	Min. temp.	**0.624****	**0.629**	**39.51**	**3.06**	**29.97**
	Max. temp.	**0.531****	**0.652**	**42.55**	**0.02**	**0.133**
Azmerly	**None**	**-----**	**0.587**	**34.46**	**-----**	**-----**
	Sum of predator no.	**-0.075**	**0.538**	**28.99**	**5.47**	**15.53**
	Mean RH	**-0.180**	**0.585**	**34.16**	**0.30**	**0.845**
	Min. temp.	**0.412***	**0.584**	**34.08**	**0.38**	**1.076**
	Max. temp.	**0.316**	**0.578**	**33.35**	**1.11**	**3.155**

Abbreviations: r: simple correlation coefficient, R: multiple regression coefficient, R^2: coefficient of determination, **: significant at 1% level of probability, *: significant at 5% level of probability.

Table (2): Multi-regression analysis between the number of *Panonychus ulmi* and certain biotic and abiotic factors during the 2007-2009 growing seasons at the experimental location.

Variety	Variable removed	r	R	R^2×100	Decrease in R^2×100	Efficiency
Muscat	None	-----	0.875	76.49	-----	-----
	Sum of predator no.	0.223	0.875	76.49	0.00	0.003
	Mean RH	-0.693**	0.481	23.10	53.39	56.59
	Min. temp.	0.237	0.834	69.57	6.92	7.344
	Max. temp.	0.380	0.874	76.33	0.16	0.174
Thompson seedless	None	-----	0.813	66.12	-----	-----
	Sum of predator no.	0.267	0.813	66.02	0.10	0.118
	Mean RH	-0.636**	0.470	22.05	44.1	51.30
	Min. temp.	0.218	0.774	59.94	6.18	7.191
	Max. temp.	0.349	0.812	65.97	0.15	0.173
Azmerly	None	-----	0.867	75.23	-----	-----
	Sum of predator no.	0.423*	0.812	65.87	9.36	10.55
	Mean RH	-0.679**	0.540	29.11	46.12	52.05
	Min. temp.	0.363	0.849	72.02	3.210	3.622
	Max. temp.	0.440*	0.867	75.15	0.08	0.084

Abbreviations: r: simple correlation coefficient, R: multiple regression coefficient, R^2: coefficient of determination, **: significant at 1% level of probability, *: significant at 5% level of probability.

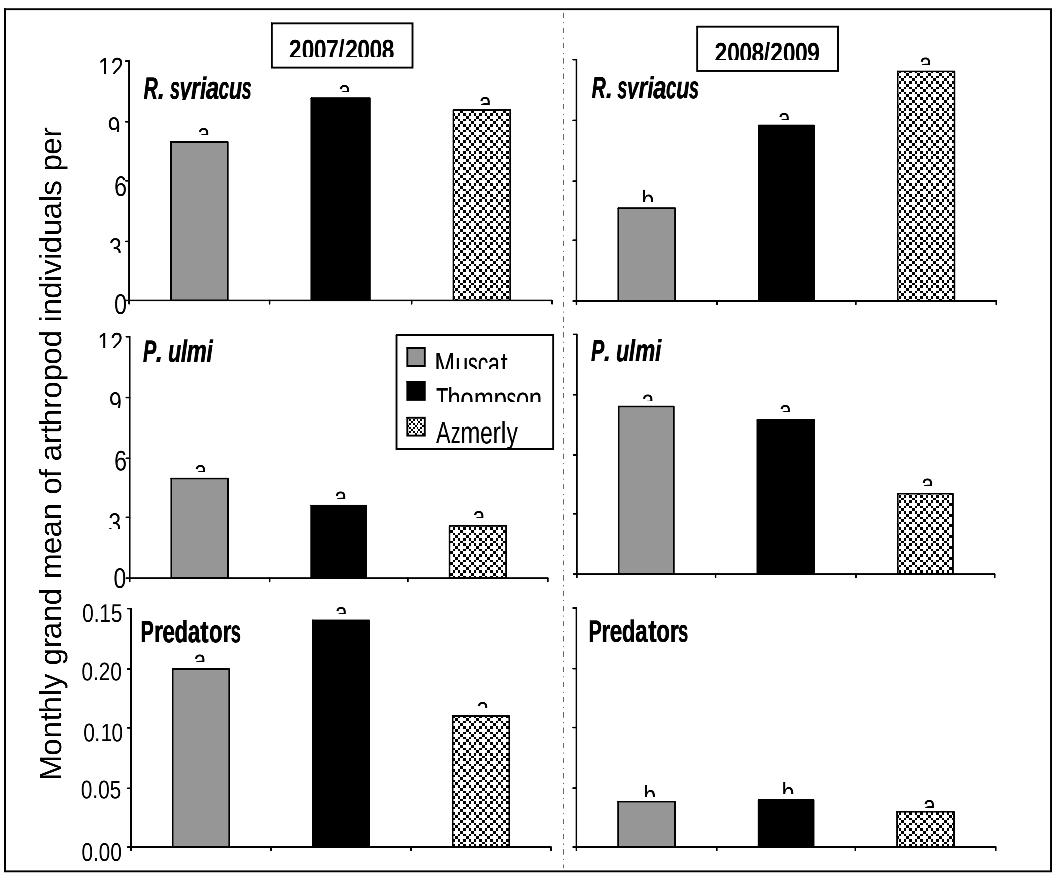

Fig. (3): Monthly grand mean of arthropod individuals on three different cultivars of grapevine in the 2007/2008 and 2008/2009 growing seasons (Different small letters indicated significant differences between the two different growing seasons within the same arthropod and cultivar at $p<0.05$ (one-factor analysis of variance).

in the numbers of predators between the two growing seasons on Azmerly (F=2.38; 1, 22 df; P=0.137). A negative significant correlation was reported between the populations of both predators and *R. syriacus* (-0.602) and *P. ulmi* (-0.327) in the 2007/2008 as well as *R. syriacus* (-0.568) and *P. ulmi* (-0.296) in the 2008/2009 growing season.

Thompson seedling (F=10.47; 1, 22 df; P=0.005), respectively. There were no significant differences in the numbers of predators between the two growing seasons on Azmerly (F=2.38; 1, 22 df; P=0.137). A negative significant correlation was reported between the populations of both predators and *R. syriacus* (-0.602) and *P. ulmi* (-0.327) in the 2007/2008 as well as *R. syriacus* (-0.568) and *P. ulmi* (-0.296) in the 2008/2009 growing season.

4. DISCUSSION

Biotic *(i.e.* predators) and abiotic (*i.e.* temperature and RH) factors can play a great role in regulating the population abundance of agricultural pests (Al-Zyoud and Elmosa, 2007). However, the results of the current study indicated that *R. syriacus* was found to be fluctuated throughout the two studied seasons. The insect peak was recorded during June (2007/2008) and September (2008/2009) on the three grapevine cultivars. These results agreed with those of Rosi *et al.* (2006) who showed that population peak of the thrips was reported in June, and with those obtained by Lal (1982) in India, who found low population level of *R. syriacus* on grapevine between June and July, and showed a marked increase after July. While the results of this study are in partially agreement with Fattouh (1999) in Egypt who reported that this thrips species attacked grapevine leaves from spring until autumn and attacked flowers during spring and summer, and with De Villiers and Pringle (2007), who observed that *R. syriacus* numbers started to increase from September or October. Al-Zyoud and Elmosa (2007) in Jordan stated that *R. syriacus* appeared late on mid July, then the numbers fluctuated until diminished on late September. It seems that *R. syriacus* has one generation a year in this study, while Bastos *et al.* (1981) recorded four population peaks of *R. syriacus* in Brazil which may represent four generations of the insect. Nevertheless, the variation among the present results and the previous ones might be due to the differences in the grapevine cultivars, temperatures and relative humilities, and thrips strains presented in the different studies. In addition, even the abundance of the natural enemies at the different experimental locations might explain such a variation in the population of *R. syriacus* in the different studies.

Although, the population fluctuation of *P. ulmi* differed during the two studied seasons, but the peak of the population was recorded during May or June according to the grapevine cultivars. In this regards, Jubb *et al.* (1985) showed that *P. ulmi* reached its peak in September in commercial Concord grape vineyards in the USA. It might be that the differences in the peak time of the mite between the two different studies were due to the fact that different temperatures, RH and grapevine cultivars are included in the different studies. It seems that *P. ulmi* has one generation a year. The number of generations per year varies among the geographical regions, for example, Bessin (2005) stated that *P. ulmi* can have 6 generations per year in the USA, depending on the temperature.

Both predators (*S. longicornis* and *A. hutu*) appeared in March in both growing seasons, and reached the first peak in May and June and the second one in September in the 2007/2008 growing season, and in June in the 2008/2009 on the three cultivars. However, the population dynamics of spider mites and thrips are affected by various biotic factors, which play an important role in regulating their populations (Takafuji, 1996; Kitashima and Gotoh, 2003; Al-Zyoud and Elmosa, 2007). The phytoseiid predatory mite, *A. hutu* is associated with spider mites on grapevine (Rizk *et al.*, 2005; Abdel-Maksoud, 2006). Also, the predaceous thrips, *S. longicornis* is always associated with spider mite colonies on grapevine (Mari and Gonzales-Zamora, 1999; Hidenari and Ishizue, 2006). Ozsemerci *et al.* (2006) in Turkey stated that *S. longicornis* was the most abundant phytophagous species belong to the Thysanoptera on the Round seedling grape cultivar. In addition, Kheradpir *et al.* (2008) in Tehran showed that *S. longicornis* was a persistent predator able to function at lower prey population densities. Also in Tehran, Pakyari *et al.* (2009) found that *S. longicornis* exhibited type II functional response to different densities of tetranychid mites. From our study and the previous ones, it can be concluded that the two predators investigated in this study could play an important role in regulating and suppressing both populations of *R. syriacus* and *P. ulmi*.

The current results revealed significant positive effect of temperature (maximum and minimum), and insignificant negative effect of RH on the thrips population. It was generally found that most of *R. syriacus* population changes were related to minimum temperature variable. Our results are in accordance with Ripa *et al*. (1992) in Chile, who found that the maximum temperature greatly affected the number of *R. syriacus* on grapevine. Also, in this regards, Lal (1982) in India observed negative significant relation of *R. syriacus* population size and humidity, but insignificant relation was reported to each of maximum temperature, minimum temperature or rainfall. Fergusson and Dennehy (1993) in Brazil observed an increase of *R. syriacus* individuals on grapevine when the temperature increases and RH decreases. While, Varvara *et al.* (1995) in Romania found that minimum and maximum temperatures and RH have a positive effect on *R. syriacus* population in vineyards. Therefore, it can be concluded that in spite of that all of maximum temperature, minimum temperature, rainfall and RH could affect the population size of the thrips; still the minimum temperature played the most important role on the *R. syriacus* population changes through the two successive seasons in the current study. These may be ascribed to the behavior of this thrips species, which is active early in the morning (daily minimum temperature). Our results indicated that high mean temperature (28.3-30.2?C) and moderate RH (45.3- 48.8%) which occurred from May to August (2007/2008), and June to November (2008/2009) seem to be favorable for *R. syriacus* since most of nymphs and adults occurred during this period. It is to be mentioned that *R. syriacus* develop most rapidly at 28-30°C, and the nymphal mortality increases when the temperature rises above 33°C. Also, the results of this study indicated that moderate RH is the most favorable for *R. syriacus*.

There was a negative significant correlation between the populations of both predators and both of *R. syriacus* and *P. ulmi* in both growing seasons. This means that biotic factors play a great role in regulating populations of these two pest species. Moreover, both of temperature and predators had a positive effect, while the RH had a negative one on the population changes of these pests. Therefore, it can be summarized that the recorded biotic factors (*A. hutu* and *S. longicornis*) and the selected abiotic ones (temperature and relative humidity) played the most important role in regulating the population density of these pests. These results are in accordance with those obtained by Koleva *et al.* (1996) who noted that *Typhlodromus pyri* is an effective biological control agent for *P. ulmi* in European vineyards and they added that the high densities of *P. ulmi* occurred in vineyard without association of *T. pyri*. Whereas, *S. longicornis* may be effective for biological control of the two-spotted spider mite in warmer conditions (Pakyari *et al.*, 2009). Domiciano *et al.* (1993) recorded that thrips population was negatively correlated with RH and positively with temperature.

The results indicated *R. syriacus* population recorded through the first season was higher than that recorded through the second one for only the two grapevine cultivars of Muscat and Thompson seedling. In addition, comparing the population of *P. ulmi*, it is clear that the population was lower during the first season than in the second one for the three grapevine cultivars. Mean number of both predators was significantly higher in 2007/2008 than 2008/2009 on Muscat and Thompson seedling. These variations between the two growing seasons may be attributed to the weather conditions prevailing through the investigated seasons. On the other hand the previous results also indicated that the yearly grand totals of both phytophagous pests recorded on the grapevine cultivars were different. This variation in infestation among the different cultivars may be ascribed to certain morphological characteristics of plant leaves as previously mentioned. The present results agreed with those obtained by Duso and Vettorazzo (1999) who stated that the difference in mite populations in two vineyards is due to the different leaf hair density of the cultivars. Also, the current data cleared that the predacious mite, *A. hutu* appeared early during March than the predacious thrips, *S. longicornis* on the three grapevine cultivars during the two successive seasons, in harmony with the results obtained by McMurtry and Croft (1997) who showed that the acarine family Phytoseiidae includes a large number of generalist predators develop and reproduce using various food sources as alternatives to their primary prey, tetranychid mites.

It can be concluded that *R. syriacus* and *P. ulmi* exhibited high dominance and abundance degrees on the three grapevine cultivars during the two seasons, indicating that these two species are considered key pests, these matched with Medina-Guad and Franqui (2001) and Jessica (2001) who showed that *R. syriacus* and *P. ulmi* have been a significant problems in grapevine in Puerto Rico, United State and Canada. Therefore, it is recommended that much attention should be directed to these two pests.

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Retithrips syriacus [illegible]
(Tetranychidae: Prostigmata) *Panonychus ulmi* **Koch** [illegible] **(Thysanoptera : Thripidae) Mayet**
[illegible]

[illegible]

[illegible]
[illegible]

[illegible]

[illegible] (Thripidae: Thysanoptera) *Retithrips syriacus* Mayet [illegible] (Tetranychidae: Prostigmata) *Panonychus ulmi* Kock الأحمر [illegible] *R.* [illegible] *syriacus* [illegible] *ulmi* *P.* [illegible]

Monthly grand mean of arthropod individuals per leaf

Thompson Muscat
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