MITES SPECIES OF THE PHYTOSEIIDAE FAMILY PRESENT IN MUSCAT HAMBURG GRAPE CULTIVAR IN TWO VINEYARDS

Aris Huqi
Agricultural University of Tirana
ALBANIA

ABSTRACT

The study was carried out in two vineyards in Muscat Hamburg grape cultivar during 2016-2017. The main objectives of the study were: to identify species that are present in Muscat Hamburg grape cultivar in both vineyards during 2016-2017; to see if we have any difference between phytoseiid mites that are found in both vineyards and to see the difference between the years; to find the dominant species and the most populated period. During this study we have identified four species of Phytoseiidae family *Amblyseius andersoni*; *Amblyseius(Euseius) stipulatus; Phytoseius finitimus*; *Typhlodromus pyri*. We have also recorded tydeid mites and tetranychid mites that are found in low populations compared with phytoseiid mites. In the vineyard I, were present four species of Phytoseiidae family: *A. andersoni; A. stipulatus*; *Ph. finitimus* and *T. pyri. Ph. finitimus* was the dominant species and was present in both years of the study, in 9 from 10 sampling periods. In September 2016 we found the highest number of phytoseiid mites and *Ph. finitimus* per leaf (8.87±1.64). *A. andersoni* was present in both years of the study only in September. *A. stipulatus* was present in September 2016 whereas *T. pyri* was present in July 2017. In vineyard II were present two species, *Ph. finitimus* and *T. pyri. Ph. finitimus* was the dominant species and was present in both years of the study, in 9 from 10 sampling periods. In September 2016 we found the highest number of phytoseiid mites and *Ph. finitimus* per leaf (5.13±0.85). *T. pyri* was present only in September 2017. We don't have a significant difference between phytoseiid populations found in 2016 -2017 and phytoseiid mites found in vineyard I - vineyard II.

Keywords: *Phytoseiidae*, Muscat Hamburg, vineyard, *Ph. finitimus*, *A. andersoni*.

INTRODUCTION

Phytoseiidae is an important family of predatory mites as several species in this family are important natural enemies controlling phytophagous mites and small insects in natural areas, open fields and protected crops all around the world [12; 14; 15]. Mites of the family Phytoseiidae are the most common predators of phytophagous mites on most plant species. Some species are widely studied and used for biological control of mite pests [8, 18]. In European vineyards, these natural enemies play a key role in plant protection as their presence usually makes the use of acaricides unnecessary [21; 23]. The presence of phytoseiid mites on the grapevine shows better management from pests and diseases. Most species of this family are generalist predators; they can feed on their prey (especially the families Tetranychidae and Eriophyidae) but can also develop feeding on pollen, plant exudates, fungi and small insects [14; 24]. Each species has its specific biological features [23] The predatory mites, *Amblyseius andersoni, are* naturally found in apple, grapevine, hazelnut and peach orchards, etc. [20]. This predator is classified as a type III generalist predator that feeds on a variety of prey and non-prey foods [13;15]. *Amblyseius andersoni* was observed to be abundant and more effective as a predator of spider mites on grape varieties with more glabrous leaves [3; 5]. *Phytoseius finitimus* is a generalist phytoseiid mite

mainly recorded in the Mediterranean region on a variety of both cultivated and non-cultivated plants, such as grapevine, hazelnut, citrus, elm, etc. [17] and is quite common in Mediterranean vineyards [1; 17; 25]. *Amblyseius stipulatus (Euseius stipulatus)* (Athias-Henriot) is the generalist predator type IV, there are more than 200 known species of *Euseius,* few of *Iphiseiodes* and only one *Iphiseius* [15], which feed primarily on pollen, but feed on mites, thrips, leaf sap and other small insects too[14]. *Amblyseius stipulatus* (*Euseius stipulatus*) is reported in vineyards together with other species in California [9]. It is also reported in European vineyards [11; 23]. *Typhlodromus pyri* are generalist phytoseiids that prey on grapevine pests, including the European red mite *Panonychus ulmi* and the grape rust mite *Calepitrimerus vitis* (Nalepa) [6], but also feed on pollen and fungal spores [2].

The objectives of the study were: to identify species that are present in Muscat Hamburg grape cultivar in both vineyards during 2016-2017; to see if we have any difference between phytoseiid mites that are found in both vineyards and to see the difference between years; to find the dominant species and the most populated period; to see if there is any significant impact of temperature in population of phytoseiid mites.

METHODOLOGY

The study was carried out during two years 2016, 2017, in Muscat Hamburg grape cultivar in two different vineyards. Vineyards are located in different places, Vineyard I is located in Rada, Durrës and vineyard II is located in Maminas, Durrës, Albania. Both vineyards are set on the hill. The form of cultivation was double Guyot. In both vineyards were carried out all the necessary agro-technical services (paring, fertilization, protection from pests and diseases, seasonal and winter treatments, etc.). For this study, we have taken leaves during the vegetative period, once a month, from May to September 2016-2017. We have taken 15 leaves [10] per each vineyard, per period. Leaves were taken inside the rows and in the middle of the sprig [4] (to avoid the first row and the first three plants in the second row) and were brought to the laboratory in plastic bags. Phytoseiid mites and all other mites that are present on the leaves were counted under the stereo microscope. We have mounted in Hoyer's medium on microscope slides only with mites of Phytoseiidae family, and we have identified species. To determine the species of phytoseiid mites, we have worked with many identification keys for Phytoseiidae family [7; 16; 22; 23; 26]. Nomenclatures of the crests were based on the systems of Lindquist and Evans and adopted for the Phytoseiidae family from Rowell H. J., Chant D.A. & Hansell R.I.C. [19; 26]. In this case we have worked with keys for identification *Amblyseius* genus [16; 22; 23]. *Phytoseius* genus [22, 23], and Typhlodromus genus [22]. Daily average temperatures were obtained from the 'Institute of Geoscience, Energy, Water and Environment', Albania. T-test was used to determine the difference of Phytoseiid mites population between vineyards, years, etc. Regression analysis was used to see the impact of temperature in the population of phytoseiid mites.

RESULTS AND DISCUSSION

From the two years of the study that was carried out in Muscat Hamburg grape cultivar in two different vineyards, were recorded mites of *Phytoseiidae* family, Tydeid mites and Tetranychid mites. Phytoseiid mites were found in higher numbers compared to tetranychid mites and tydeid mites. From this study were identified four species of *Phytoseiidae* family:

1-*Amblyseius andersoni* (Chant)
2-*Amblyseius(Euseius) stipulatus* (Athias–Henriot)
3- *Phytoseius finitimus* (Ribaga).

4- *Typhlodromus pyri* (Scheuten)

The presence of mites in Vineyard I.

From the results in the first year of study in Vineyard I we have observed and recorded Phytoseiid mites, Tydeid mites and Tetranychid mites. Phytoseiid mites were present in four from five sampling periods. The most populated period with phytoseiid mites was August. In this period, we have found 8.87±1.61 phytoseiid mites per leaf (Figure 2). During the first year of the study in vineyard I, we have identified three species of Phytoseiidae family: *Amblyseius andersoni*, *Amblyseius (Euseius) stipulatus* and *Phytoseius finitimus. Ph. finitimus* was present in four from five sampling periods. The most populated period with *Ph. finitimus* was August. In this period, we have found 8.87±1.64 phytoseiid mites per leaf. *A. andersoni* and *A. stipulatus* were present only in September. In this sampling period we have found 0.4± 0.08 *A. andersoni* per leaf and 0.2± 0.08 *A. stipulatus* per leaf. In June we haven't found phytoseiid mites whereas In September we have found all three species (Figure 1). In populations structure of phytoseiid mites *Ph. finitimus* was the dominant species. This species occupies about 95% of total, *A. andersoni* occupies 3.2%of total and *A. stipulatus* occupies about 1.8% of total.

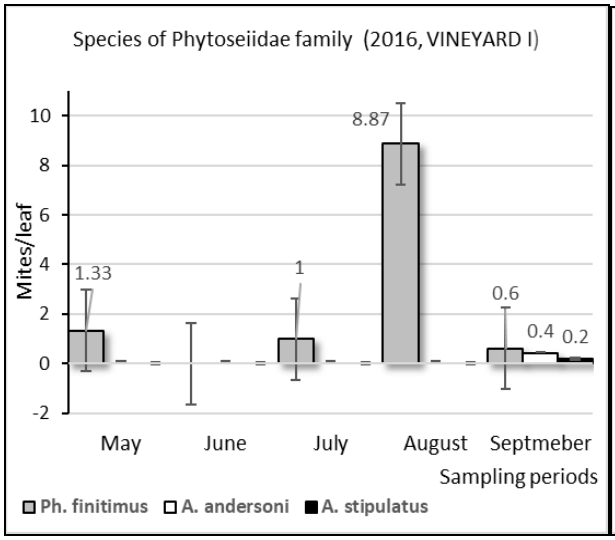

Figure 1 Phytoseiidae family species present in Vineyard I during 2016.

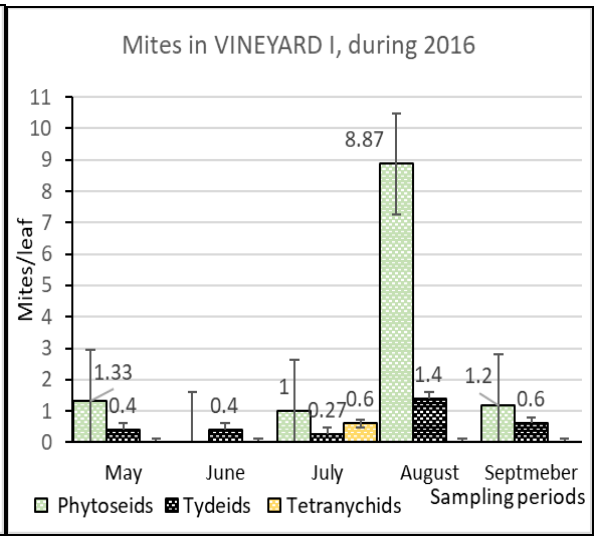

Figure 2 Mites present in Vineyard I during 2016.

During the first year of the study in Vineyard I, Tetranychid mites were present only in July (0.6±0.12 tetranychid mites/per leaf). Tydeid mites were present in all sampling periods, the most populated period with Tydeid mites was August (1.4±0.2 tydeid mites/per leaf) (Figure II). In populations structure of mites present in this vineyard during the first year of the study Phytoseiid mites were dominant mites and occupy about 77% of total, tydeid mites occupy about 19% of total and tetranychid mites occupy about 4% of total. Statistically, we do not have a significant influence of seasonal temperature on populations of phytoseiid mites (R^2=0.1184, with equation y=0.368x-6.3234, significance F=0.57).

From the results in the second year of the study in Vineyard I we have observed and recorded Phytoseiid mites and Tydeid mites. Phytoseiid mites were present in all sampling periods. The most populated period with phytoseiid mites was September. In this period, we have found 2.87±0.38 phytoseiid mites per leaf. Tydeid mites were present in all sampling periods; the most populated period with Tydeid mites was August (0.4±0.07 tydeid mites/per leaf) (Figure 4) Phytoseiid mites were dominant mites and occupy about 90% of the total; tydeid

mites occupies about 10% of the total. Statistically, we do not have a significant influence of seasonal temperature on populations of phytoseiid mites (R^2=0.017, with equation y=-0.0299x-2.3173, significance F=0.84).

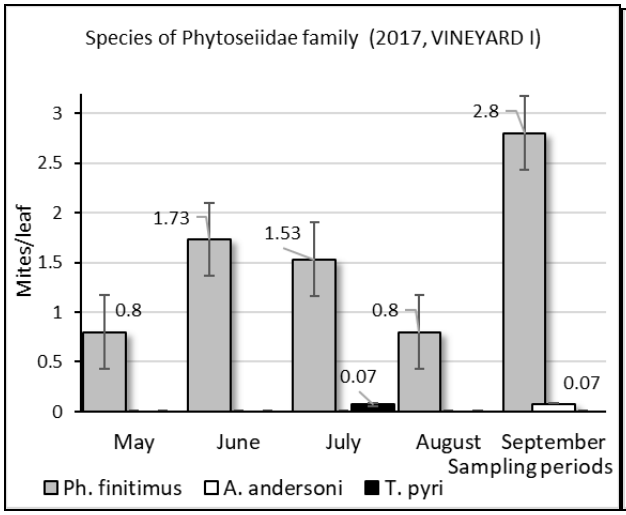

Figure 3 Phytoseiidae family species present in Vineyard I during 2017.

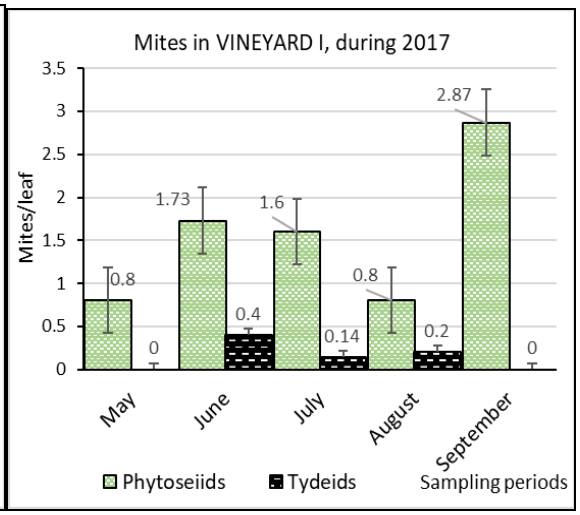

Figure 4 Mites present in Vineyard I during 201

During the second year of the study in vineyard I, we have identified three species of Phytoseiidae family: *Amblyseius andersoni*, *Phytoseius finitimus* and*. Typhlodromus pyri.*
Ph. finitimus was present in all sampling periods. The most populated period with *Ph. finitimus* was September. In this period, we have found 2.8±0.37 phytoseiid mites per leaf. *A. andersoni* and *T. pyri* were present in low densities (0.07±0.01 phytoseiid mites per leaf). *A. andersoni* was present in September and *T. pyri* was present in July (Figure 3). In populations structure of phytoseiid mites *Ph. finitimus* was the dominant species; this species occupies about 98% of total. *A. andersoni* occupies 1% of total and *T. pyri* occupies about 1% of total.

From the two years results in vineyard I, we have identified 4 species of Phytoseiidae family: *Amblyseius andersoni, Amblyseius (Euseius) stipulatus, Phytoseius finitimus* and *Typhlodromus pyri. A. andersoni* and *Ph. finitimus* were present in both years of the study. In September 2016 we found the highest number of phytoseiid mites per leaf (8.87±1.64); this period was also the most populated period with *Ph. finitimus. Ph. finitimus* was present in 9 from 10 sampling periods of this study. *A. andersoni* in both years of the study was present only in September. In September 2016 *A. andersoni* was in higher density compared with 2017. *A. stipulatus* was present in the first year of the study whereas *T. pyri* in the second year of the study. In populations structure of phytoseiid mites *Ph. finitimus* was the dominant species; this species occupies about 96.34% of total. *A. andersoni* was the second dominant species; this species occupies about 2.35%. *A. stipulatus* occupies about 1% and *T. pyri* occupies about 0.31% of the total. We don't have a significant difference between phytoseiid mites found in 2016 and 2017 (p=0.6).

The presence of mites in Vineyard II.

From the results in the first year of the study in Vineyard II we have observed and recorded Phytoseiid mites, Tydeid mites and Tetranychid mites. In vineyard II during the first year of the study we have identified only one species of Phytoseiidae family, *Phytoseius finitimus.*
Phytoseiid mites (*Ph. finitimus*) were present in all sampling periods. The most populated period with phytoseiid mites (*Ph. finitimus*) was September; in this period we have found 5.13±0.85 phytoseiid mites per leaf (Figure 5). Tydeid mites and tetranychid mites were present only in May.

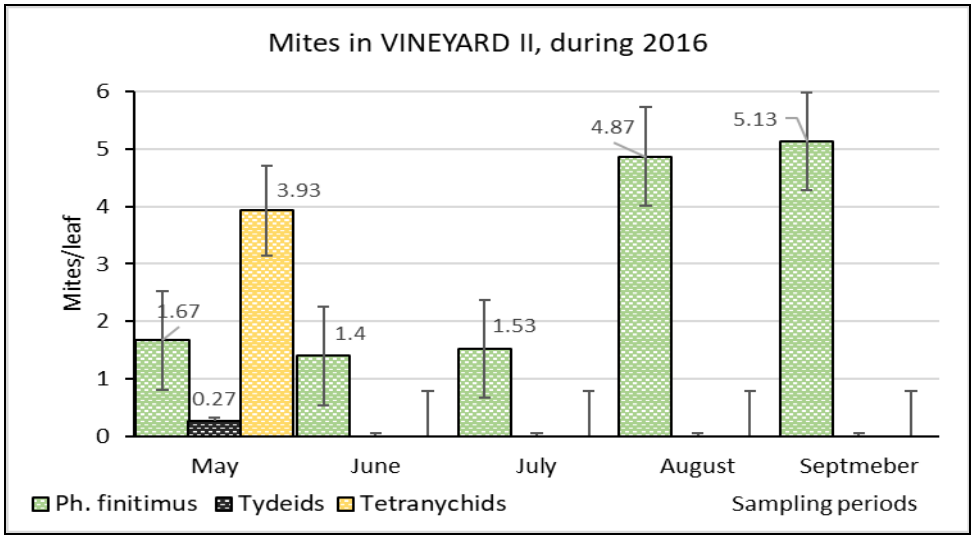

Figure 5 Mites present in Vineyard II during 2016

In populations structure of mites present in this vineyard during the first year of the study, Phytoseiid mites were dominant mites and occupy about 77.7% of the total, tydeid mites occupy about 1.4% of the total and tetranychid mites occupy about 20.9% of the total. Statistically, we do not have a significant influence of seasonal temperature on populations of phytoseiid mites (R^2=0.0215, with equation y=0.0826x+0.9445, significance F=0.81).

From the results in the second year of the study in vineyard II we have observed and recorded Phytoseiid mites and Tydeid mites. Phytoseiid mites were present in all sampling periods. The most populated period with phytoseiid mites was May; in this period we have found 2.53±0.41 phytoseiid mites per leaf. Tydeid mites were present in May, June and July. The most populated period with Tydeid mites was May (0.47±0.1 tydeid mites/per leaf) (Figure 7). Phytoseiid mites were dominant mites and occupied about 89% of the total, tydeid mites occupied about 11% of the total. Statistically, we do not have a significant influence of seasonal temperature on populations of phytoseiid mites (R^2=0.7418, with equation y=-0.2113x+6.2844, significance F=0.06), (α=0.05).

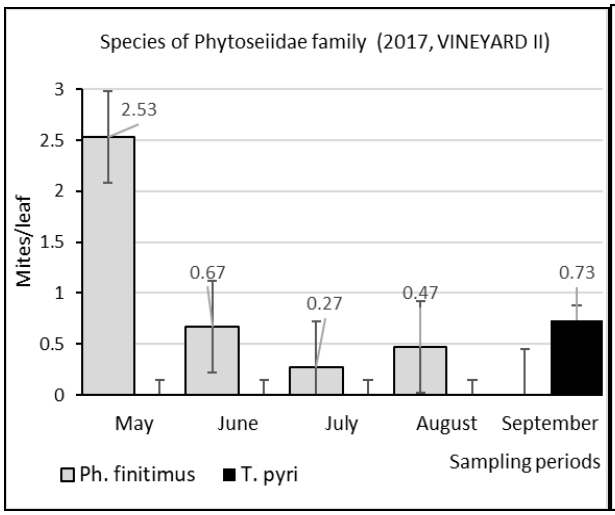

Figure 6 Phytoseiidae family species present in Vineyard II during 2017.

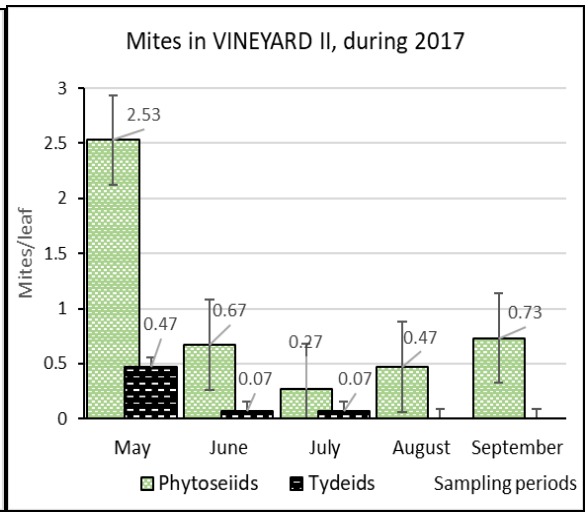

Figure 7 Mites present in Vineyard II during 2017

During the second year of the study in vineyard II, we have identified two species of Phytoseiidae family: *Phytoseius finitimus* and *Typhlodromus pyri.*

Ph. finitimus was present in four from five sampling periods. The most populated period with *Ph. finitimus* was May; in this period we have found 2.53±0.45 phytoseiid mites per leaf. *T. pyri* was present only in September in low densities (0.73±0.15 phytoseiid mites per leaf) (Figure 6). In populations structure of phytoseiid mites *Ph. finitimus* was the dominant species; this species occupies about 84% of total and *T. pyri* occupies about 16% of total.

From the two years results in vineyard II, we have identified 2 species of Phytoseiidae family: *Phytoseius finitimus* and *Typhlodromus pyri. Ph. finitimus* was present in both years of the study. In September 2016 we found the highest number of phytoseiid mites per leaf (5.13±0.85). This period was also the most populated period with *Ph. finitimus. Ph. finitimus* was present in 9 from 10 sampling periods of this study. *T. pyri* was present in the second year of the study. In populations structure of phytoseiid mites *Ph. finitimus* was the dominant species; this species occupies about 97% and *T. pyri* occupies about 3% of total. We don't have a significant difference between phytoseiid mites found in 2016 and 2017 (p=0.08)

From the results of the study, we do not have a significant difference between phytoseiid mites found in Vineyard I and Vineyard II, during 2016 (p=0.8). There is not a significant difference between phytoseiid mites found in Vineyard I and Vineyard II, during 2017 (p=0.8).

We don't have a significant difference between phytoseiids population found in total in 2016–2017 (p=0.2) and between phytoseiids population found in total in Vineyard I-Vineyard II (p=0.9)

CONCLUSIONS

During two years of study in two different vineyards we have identified four species of Phytoseiidae family: *Amblyseius andersoni*; *Amblyseius(Euseius) stipulatus*; *Phytoseius finitimus*; *Typhlodromus pyri*. Also we have recorded tydeid mites and tetranychid mites. During two years of study in vineyard I, were present four species of Phytoseiidae family: *A. andersoni; A. stipulatus*; *Ph. finitimus* and *T. pyri. Ph. finitimus* was present in both years of the study and in 9 from 10 sampling periods. In September 2016 we found the highest number of phytoseiid mites per leaf (8.87±1.64). This period was also the most populated period with *Ph. finitimus*. *A. andersoni* was present in both years of the study only in September. *A. stipulatus* was present in September 2016 whereas *T. pyri* was present in July 2017. In populations structure of phytoseiid mites in Vineyard I, *Ph. finitimus* was the dominant species, and *A. andersoni* was the second dominant species. During two years of study in vineyard II were present two species of Phytoseiidae family: *Ph. finitimus* and *T. pyri. Ph. finitimus* was present in both years of the study and in 9 from 10 sampling periods. In September 2016 we found the highest number of phytoseiid mites per leaf (5.13±0.85). This period was also the most populated period with *Ph. finitimus*. *T. pyri* was present only in September 2017. In populations structure of phytoseiid mites in Vineyard II, *Ph. finitimus* was the dominant species. We don't have a significant difference between phytoseiid mites populations found in 2016 -2017 and between phytoseiid mites found in vineyard I- Vineyard II. Temperature has not a significant impact on phytoseiid mites populations. During this study in both vineyards and during years Phytoseiid mites were found in higher densities compared with tydeid mites or tetranychid mites. The most populated period with tetranychid

mites was May 2016 in vineyard II, whereas the most populated period with tydeid mites was the period of August 2016 in vineyard I.

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