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The diversity of useful mite species found in two grape cultivars

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***Abstract*— The study was conducted in two years (2014-2015), in two grape cultivars Muscat Hamburg and Merlot. The samples are taken once a month for five months in a row. The main objectives of the study were: to identify and to find the dominant species that are present in both cultivars during two years of the study; to find the most populated period; to find the most populated cultivar; to find the dominant mites and to see, if is there a correlation between the growths of the population of phytoseiid mites from the increase of the populations of tetranychid mites. During this study we have identified two species of *Phytoseiidae* family: *Amblyseius stipulatus* (Athias–Henriot) and *Phytoseius finitimus* (Ribaga). *Phytoseius finitimus* was the dominant species, we have found this species in both cultivars and in both years of the study. The most populated period with phytoseiids was the 4th period of sampling 2014 in Muscat Hamburg cultivar, in this period we have found also the highest number of *Ph. finitimus* /leaf (29.73±5.05). The most populated period with phytoseiids in Merlot cultivar were, the 4th period of the sampling 2014. In the 3rd period of the sampling 2014 we have found the highest number of Ph. finitimus per leaf. *Amblyseius stipulatus* were present in both cultivars only in 2014. We have found this species only in the 4th periods of sampling. The most populated grape cultivar with *Amblyseius stipulatus* was Merlot. Muscat Hamburg was the most populated cultivar with phytoseiid mites. The first year was the most populated with phytoseiid mites than the second year. In total, phytoseiid mites are present in higher numbers than tetranychid mites; and are present in most of the sampling periods whereas tetranychid mites are less present. We have not a significant influence of the presence of tetranychid mites in population of phytoseiid mites.**

***Keywords*— Amblyseius stipulatus; Phytoseius finitimus; Muscat Hamburg; mites; Merlot; sampling period; cultivar; phytoseiids.**

I. INTRODUCTION

Mites of the family *Phytoseiidae* are predators, and some species are used for controlling pest mites and small insects, in various crops all over the world [6; 12; 21]. Phytoseiids are mostly generalist predators that occur both in natural habitats and in crops [12]. In nature, phytophagous mite populations are kept under the economic damage levels by a considerable number of natural enemies such as predatory mites and insects [3]. In European vineyards, these natural enemies play a key role in plant protection as their presence usually makes the use of acaricides unnecessary [17]. The family *Phytoseiidae* is the most important family of acarine predators of plant pest mites in agriculture [6; 9] The presence of phytoseiid mites on the grapevine shows a 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 [11; 19]. Certain phytoseiids consume large numbers of prey and maintain plant-feeding mites at low densities [4].

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. [15], and is quite common in Mediterranean vineyards [1; 15; 20]. *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* [12], which feed primarily on pollen, but will also feed on mites, thrips, leaf sap and other small insects [11].

Amblyseius stipulatus (Euseius stipulatus) is reported in vineyard together with other species in California [7] also is reported in European vineyards [10; 18]. This species, except vineyards, is reported also in other plants, for example, in Citrus [13].

The objectives of the study were: to identify species that are present in both cultivars during two years of study; to find the dominant species, to find the most populated period; to find the most populated cultivar; to find the dominant mites and to see if there is a correlation between the growth of the population of phytoseiid mites from the increase of the populations of tetranychid mites

II. MATERIAL AND METHODS

The study was carried during two years 2014, 2015 in two grape cultivars Merlot and Muscat Hamburg. The vineyard is set on the hill in a surface 0.2 ha, is located in Maminas, Durrës, Albania (41°22'49.0" N, 19°36'25.7" E). The form of cultivation was double Guyot and the age of grapes was 14-17 years old. In this vineyard were carried out all the necessary agro-technical services (paring, fertilization, protection from pests and diseases, etc.). In order to be protected from pests and diseases, the farmer has used fungicides

and insecticides during the period of vegetation (from April to the middle of July) and also winter treatments.

For this study, we have taken leaves during the vegetative period, once a month, from May to September 2014-2015. We have taken 15 leaves [8] per cultivar, per period. Leaves were taken inside the rows and in the middle of the sprig [2] (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 slide 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 [5; 14; 18; 22]. 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. [16; 22]. In this case we have worked with keys for identification *Phytoseius* genus for Ph. finitimus specie [18], and Amblyseius genus [14; 18] for *Amblyseius. stipulatus* (*Euseius. stipulatus*).

III. Results and Discussion

During the study that was carried out in two grape cultivars (2014-2015) we have recorded useful mites of *Phytoseiidae* family and phytophagous mites of Tetranychidae family. Phytoseiid mites were found in higher numbers compared to tetranychid mites. We have identified two species of *Phytoseiidae* family: *Amblyseius stipulatus* or *Euseius stipulatus* (Athias–Henriot) and *Phytoseius finitimus* (Ribaga).

From the 1st-year results, in both cultivars Merlot and Muscat Hamburg, we have identified and recorded two species of Phytoseiidae family: *Amblyseius stipulatus* (Athias–Henriot) and *Phytoseius finitimus* (Ribaga). In Merlot cultivar, *Amblyseius stipulatus* was found only in the 4th period of sampling (0.47±0.1 phytoseiids/leaf). *Phytoseius finitimus* were found in higher number than *Amblyseius stipulatus*, and it is present in all periods of the sampling. From the 3rd period of sampling to the 5th period of sampling, *Phytoseius finitimus* were found in higher number, over 5 phytoseiids/leaf. The most populated period was the 3rd period of the sampling, in this period we have found 5.47±1 phytoseiids/leaf, "Fig.1, Fig.2". In this cultivar during the 1st year of the study *Phytoseius finitimus* was the dominant species with, 97.5% of the total. Tetranychid mites were found in the 3rd period of sampling (0.2±0.07mites per leaf) and in the 5th period of sampling (0.2±0.33mites per leaf). Phytoseiid mites were found in higher number than tetranychids mites and were dominant with 97.2% of the total of mites present in this cultivar. We have not a significant influence of tetranychid mites in a population of phytoseiid mites (R^2=0.0921), with equation y=-4.8518+4.2763 (Significance F=0.62).

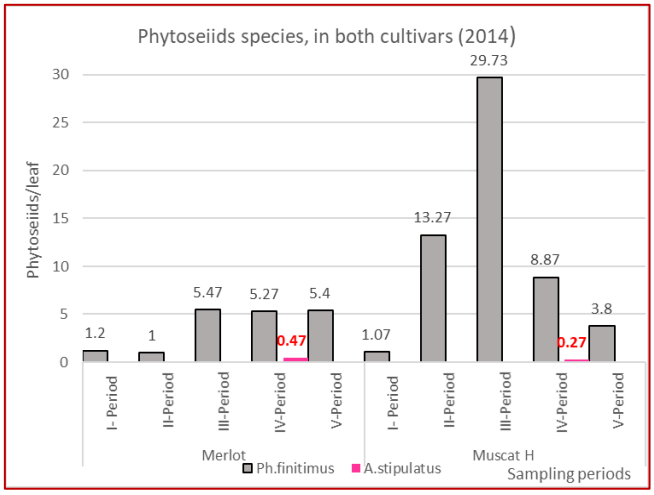

Fig. 1. *Phytoseiid species present in both cultivars during 2014.*

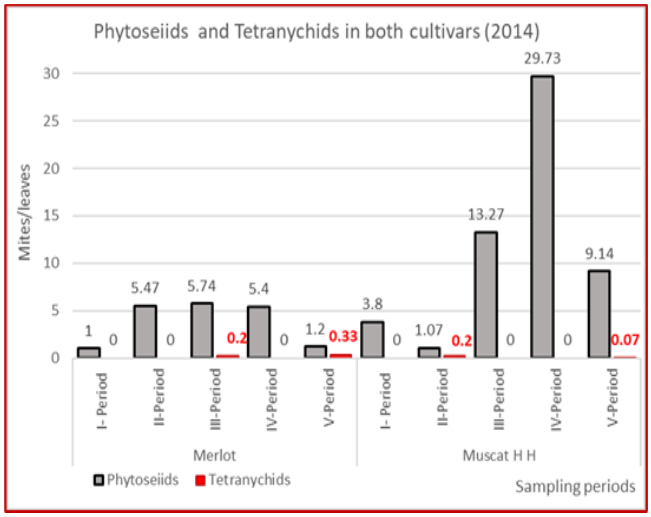

Fig. 2. *Mites present in both cultivars during 2014.*

In Muscat Hamburg cultivar as in the Merlot cultivar, *Amblyseius stipulatus* was present only in the 4th period of sampling (0.27±0.05 phytoseiids/leaf.). *Phytoseius finitimus* was found in higher number than *Amblyseius stipulatus*, and it is present in all periods of sampling. The most populated period with *Phytoseius finitimus* was the 4th period of sampling, in this period we have found 29.73±5.05 phytoseiids/leaf. The less populated period with *Ph. finitimus* was the 1st period of sampling. In this period, we have found 1.07±5.05 phytoseiids/leaf, "Fig.1, Fig.2". In Muscat Hamburg cultivar during the 1st year of the study, *Phytoseius finitimus* was the dominant species, with 99.5% of the total. Tetranychid mites were found in the 2nd and in the 5th period of sampling. The most populated period with tetranychid mites was the 2nd period of sampling, in this period we have found 0.2±0.04mites/leaf.

Phytoseiids mites were found in higher number than tetranychid mites and were dominant with 99.5% of the total of mites present in this cultivar. We have not a significant influence of tetranychid mites in a population of phytoseiid mites (R^2=0.32), with equation y=-73.375x+15.364 (Significance F=0.32).

During the first year of the study, in Muscat Hamburg cultivar we have found more phytoseiid mites than in Merlot cultivar. In this cultivar we have found around 75.6% of the total of phytoseiids, and in Merlot cultivar we have found 24.4% of the total. Tetranychid mites are found in a relatively low number in both cultivars. In Merlot cultivar (67%) we have found more tetranychid mites than in Muscat Hamburg cultivar (33%) *"Fig.3".*

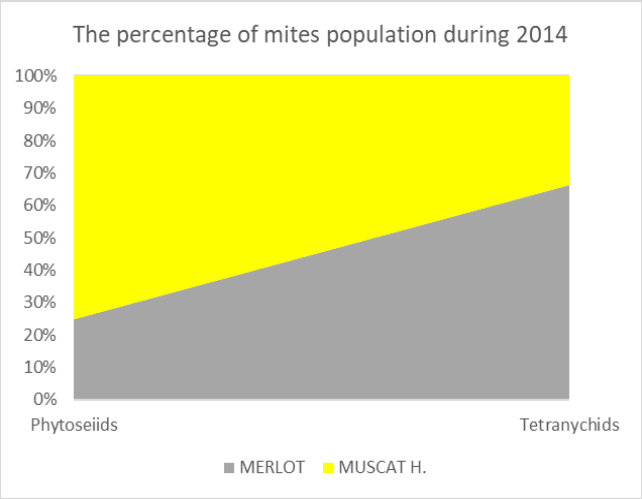

Fig. 3. *Phytoseiid mites and tetranychid mites percentage according cultivars during 2014.*

During the second year, in both cultivars Merlot and Muscat Hamburg, we have identified and recorded only *Phytoseius finitimus*. *Phytoseius finitimus* was present during all periods of sampling. The most populated period with *Phytoseius finitimus* was the 4th period of the sampling. In this period, we have found 1.2±0.1 phytoseiids/leaf. The least populated period was the 3rd period of sampling. In this period, we have found 0.13±0.1 phytoseiids/leaf. Tetranychid mites were found from the 3rd to the 5th period of sampling. The most populated period with tetranychid mites was the 5th period of sampling, in this period we have found 7.6±0.8mites per leaf, "*Fig.4*". In the 5fth period of sampling, we have found a lot of tetranychid wintering stages (egg and adult). In total tetranychid mites were more dominant than phytoseiids. About 69% of the total number belongs to tetranychid mites, although phytoseiids are present in all periods. We have not a significant influence of tetranychid mites in the population of phytoseiid mites (R^2=0.0022), with equation y=0.0056+0.7486 (Significance F=0.9).

In Muscat Hamburg cultivar, *Phytoseius finitimus* were found in: the 1st, the 4th and the 5th period of sampling. The most populated period with *Phytoseius finitimus* was the 5th period of sampling. In this period, we have found 1.47±0.31 phytoseiids/leaf. In the 2nd and in the 3rd period of sampling we haven't found phytoseiid mites. Tetranychid mites were found in the 4th and the 5th period of sampling. The most populated period was the 5th period of sampling, in this period we have found 3.93±0.76mites/leaf. In the 5th period of sampling, we have found a lot of tetranychid wintering stages (egg and adult) *"Fig.4"*. In total, tetranychid mites occupy 57.6% of mites that are found in this cultivar, and phytoseiid mites occupy about 42.4%. We have not a significant influence of tetranychid mites in a population of phytoseiid mites (R^2=0.5544), with equation y=0.3002x+0.396 (Significance F=0.15).

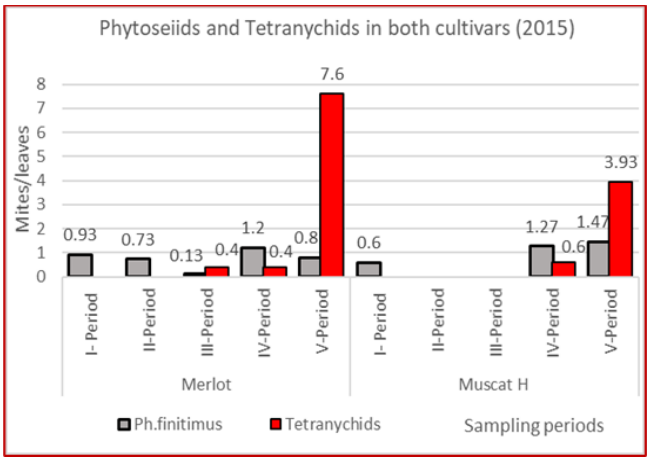

Fig. 4. *Mites present in both cultivars during 2015.*

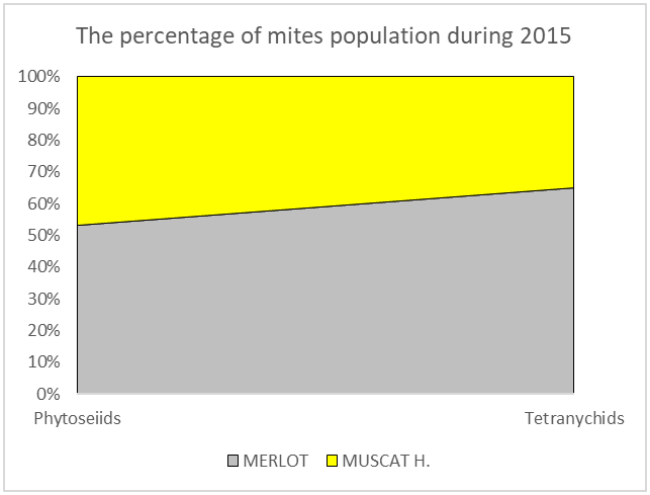

Fig. 5. *Phytoseiids mites and tetranychid mites percentage according cultivars during 2015*

In figure 5 are shown the spread of mites during 2015 in both cultivars. During the second year of the study, distribution of phytoseiids according to cultivars is almost at the same levels with very little difference. In Merlot cultivar, we have found about 53% of the total of phytoseiids found during 2015, whereas in Muscat Hamburg were found about 47% of the total "Fig.5". Tetranychid mites are found in a higher number in merlot grape cultivar. In this cultivar we have found about 65% of the total and 35% of the total in Muscat Hamburg.

During two years of study, the first year was the most populated with phytoseiid mites than the second year. Tetranychid mites in both cultivars are found in higher number in the second year of the study. During this study in Muscat Hamburg we have found more

phytoseiid mites and tetranychid mites than in Merlot cultivar. In total, phytoseiid mites are present in higher numbers than tetranychid mites, and are present in most of the sampling period, whereas tetranychid mites are less present.

IV. CONCLUSIONS

Based on this study, two species belonging to the Phytoseiidae family were identified:

Amblyseius stipulatus (Euseius stipulatus)

Phytoseius finitimus

Both species are important generalist that can control phytophagous mites in grapevine, especially Phytoseius finitimus, which was the dominant species, we have found this species in both cultivars and in both years of the study. The most populated period with phytoseiids was the 4th period of sampling in 2014 in Muscat Hamburg cultivar. In this period, we have found also the highest number of Ph. finitimus /leaf (29.73±5.05). The most populated period with phytoseiids in Merlot cultivar was, the 4th period of the sampling in 2014 and the 5th period of the sampling 2015. In the 3rd period of the sampling in2014 in Merlot, we have found the highest number of Ph. finitimus per leaf. *Amblyseius stipulatus* were present in both cultivars only in 2014. We have found this species only in the 4th periods of sampling. The most populated grape cultivar with *Amblyseius stipulatus* was Merlot. The first year was more populated with phytoseiid mites than the second year. In total, phytoseiid mites are present in higher numbers than tetranychid mites, and are present in most of the sampling period, whereas tetranychid mites are less present. The most populated period with tetranychids was the 5th period of sampling in 2015 (Merlot cultivar). We have not a significant influence of the presence of the tetranychid mites in the population of phytoseiid mites.

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