

SEASONAL POPULATION DYNAMICS OF *PH. FINITIMUS* IN TWO DIFFERENT GRAPE CULTIVARS

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ABSTRACT

From the data collected during this study were recorded mites of Phytoseiidae family (*Phytoseius finitimus*), tetranychid mites and tydeid mites. The main objectives of the study were to follow seasonal population dynamics of *Phytoseius finitimus* in two grape cultivars Sheshi i bardhë and Sheshi i zi; to see if there is any significant impact of temperature or tetranychid mites in the population of *Ph. finitimus*; to see if cultivars impact the population of *Phytoseius finitimus*. The study was carried out during 2015. The samples were taken from May to September every ten days, three times a month. During this study a considerable number of *Ph. finitimus* per leaves was recorded in both cultivars. We don't have a significant difference between populations and life stages of *Ph. finitimus* found in both cultivars. August was the most abundant month with *Ph. finitimus*, and the first period of August (29.08.2015) was the most abundant sampling period with *Ph. finitimus*. The least populated month with *Ph. finitimus* for both cultivars was May. The highest number of *Ph. finitimus* per leaf was found in the third period of August (29.08.2015), in Sheshi i bardhë grape cultivar (10 ± 06). In Sheshi i bardhë cultivar, we have found more adults than eggs and more larvae than eggs. These differences are statistically validated, whereas between adults and larvae we don't have a significant difference. In Sheshi i zi grape cultivar larvae was the dominant stage. We have found more larvae than eggs, more larvae than adults and more adults than eggs. These differences are statistically validated. In both cultivars, we don't have a significant influence of tetranychid mites and temperature in the population of *Ph. finitimus*. Tetranychid mites and tydeid mites are found in fewer numbers compared with *Ph. finitimus*.

Keywords: Grape cultivar, phytoseiid mites, *Ph. finitimus*, tetranychids.

INTRODUCTION

The family Phytoseiidae is the most important family of acarine predators of plant pest mites in agriculture [7;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 [13; 18]. Certain phytoseiids consume large numbers of prey and maintain plant-feeding mites at low densities [5]. In European vineyards, these natural enemies play a key role in plant protection as their presence usually makes the use of acaricides unnecessary [16]. Several species in the family Phytoseiidae are important natural enemies used to control mite pest outbreaks in many crops [12]. *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. [14], and is quite common in Mediterranean vineyards [1; 14; 19]. Unfavorable climate conditions and the application of pesticides lead to the decrease of predatory mite because they are generally more susceptible to pesticides than their prey [2], causing population outbreaks of tetranychid mites species [10;12]. The mites

are poikilotherms; temperature is the main abiotic factor influencing their biology, ecology, and population dynamics [11; 6].

In this paper we want to show the seasonal progress of the *Ph. finitimus* population in two grape vine cultivars and some factors that may have influenced this population.

The objectives of the study were: to follow seasonal population dynamics of *Phytoseius finitimus* in two grape cultivars Sheshi i bardhë and Sheshi i zi; to find the most abundant period with phytoseiids [with each phytoseiids stage (adult, larvae, egg)]; to see the difference between life stages; to see the difference between *Ph. finitimus* and tetranychid mite populations (the difference between *Ph. finitimus* and tydeids as well); to see if cultivars impact on the population of *Ph. finitimus*. To see if there is any significant impact of temperature or tetranychid mites in the population of *Ph. finitimus*.

METHODOLOGY

The study was carried out during 2015, in Sheshi i bardhë and Sheshi i zi grape cultivars. The vineyard is set on the hill in a surface 0.3 ha, located in Durrës, Albania (41°24'23.0" N & 19°36'17.6" E). Form of cultivation was double Guyot and the age of grape was 20-40 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 and also winter treatments. For this study, we have taken leaves during the vegetative period for five months. Sampling was done every ten days, from May to September 2015 - three periods per month and in total 30 periods for both years. We have taken 15 leaves [8] per period. Leaves were taken inside the rows and in the middle of the sprig [3] (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 (tetranychids, tydeids) that are present in the leaves were counted under the stereo microscope. We have mounted in Hoyer's medium on microscope slide only mites of Phytoseiidae (*Ph. finitimus*, species). To determine the species of phytoseiid mites we have worked with identification keys for the Phytoseiidae family [4;17; 20]. 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. [15;20]. In this case we have worked with keys for identification of the *Phytoseius* genus [17]. We have used T-test, regression analysis, etc., for statistical analysis. Meteorological data were obtained from the 'Institute of Geoscience, Energy, Water and Environment, Albania.

RESULTS AND DISCUSSION

During the results of this study, we have identified species and studied population dynamics of *Phytoseius finitimus*. During this time, we have numbered and recorded: all life stages of *Phytoseius finitimus*, tetranychid mites and tydeid mites.

Results of the study in Sheshi i bardhë grape cultivar

From the results on Sheshi i bardhë, it results that from 31.05.2015 to 08.09.2015 we have found the highest number of phytoseiid mites per leaf. August was the most populated month with *Ph. finitimus*. The first period of August (09.08.2015) results the most abundant period with *Ph. finitimus*. In this period, we have found 10 ± 0.6 phytoseiid mites per leaf. The least populated month with *Ph. finitimus* was May. In the second period of May we have found

0.67±0.6 phytoseiid mites per leaf (Figure1). Adult stages are found in the highest number in the second period of June (20.06.2015), in the first period of August and in the first period of September. The most abundant period with adult stages was the second period of June (20.06.2015). In this period we have found 2.4±0.18 adults per leaf. May was the least populated month with adults. The least populated periods were the first period of May (11.05.2015) and the third period of July (30.07.2015). The highest larval densities were observed from the third period of May (31.05.2015) and reached the peak in the first period of August (09.08.2015). In this period, we have found 8±0.49 larvae per leaf. The least populated periods with larvae were the second period of May (21.05.2015), the second period of August (19.08.2015) and the third period of September (28.09.2015). Eggs are found in low densities in all sampling periods. The most populated period with eggs was the second period of July (20.07.2015). In this period, we have found 0.73±0.07 eggs per leaf. In all periods of September, we have not found eggs (Figure 2).

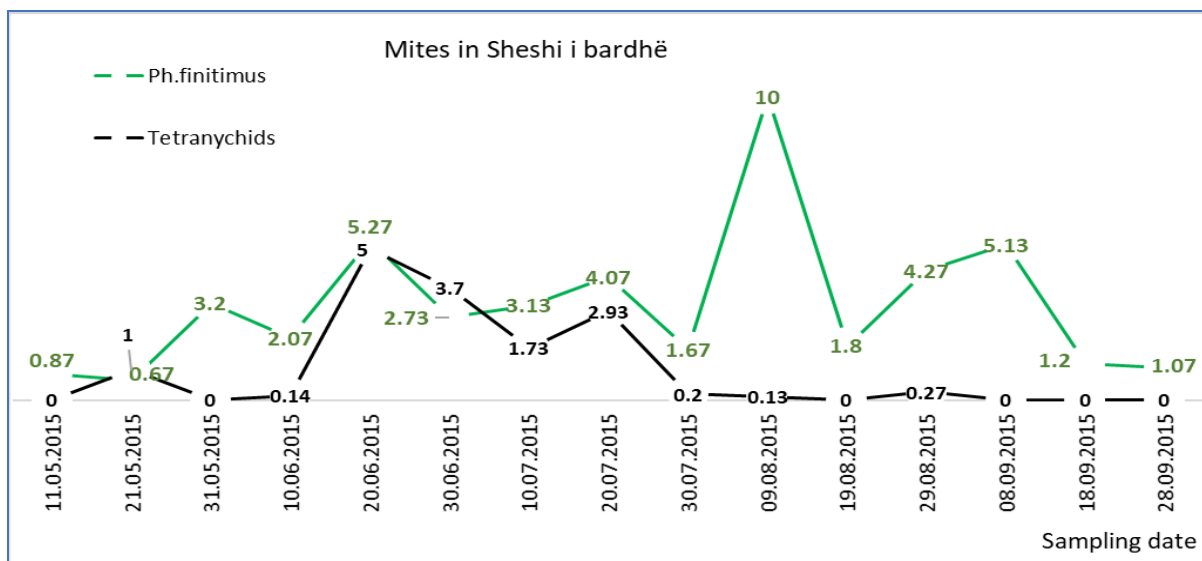


Figure 1 Mites present in Sheshi i bardhë

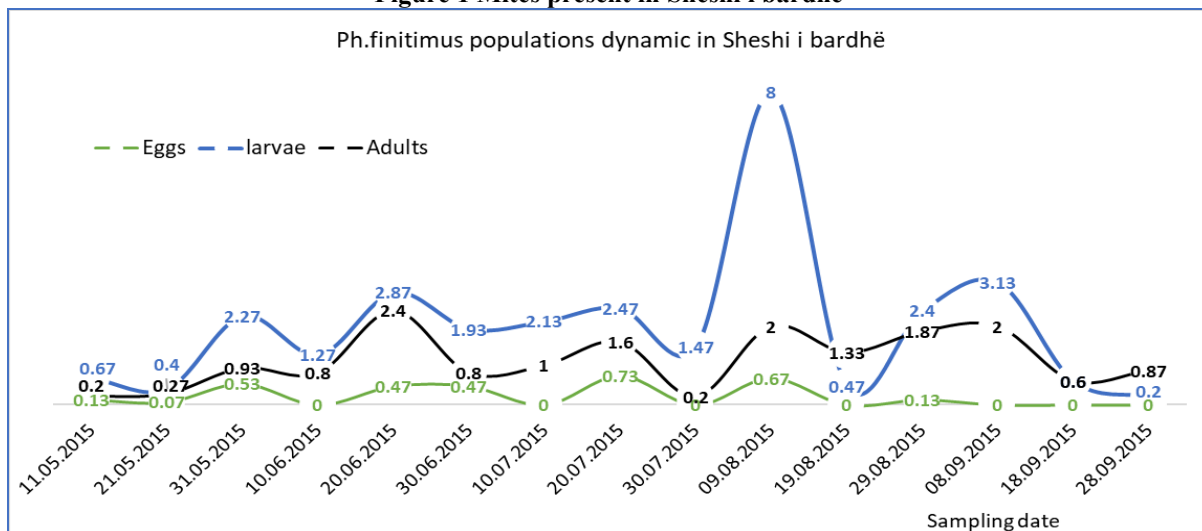


Figure 2 *Phytoseius finitimus* population dynamics in Sheshi i bardhë, all life stages

In this cultivar we have found more adults than eggs and more larvae than eggs. These differences are statistically validated. We have a significant difference between adults- eggs (P=0.0002) and larvae- eggs (P=0.003). We don't have a significant difference between adult

and larval stages ($P=0.1$) ($\alpha=0.05$). Although the graph (Figure 2) clearly shows that the larval stage curve in most sampling periods is higher than the adult stage curve. This difference is more evident especially in the first period of August (09.08.2015), in the third period of May (31.05.2015) and in the first period of September (08.09.2015).

During this study on Sheshi i bardhë grape cultivar, it results that *Phytoseius finitimus* was found in higher density than tetranychid mites and this is a significant difference ($p=0.01$). The populations of tetranychid mites, from the first period of May (11.05.2015) to the first period of June (10.06.2015), have been low in density. Then, in the second period of June (20.06.2015) they reached the peak (2.93 ± 0.4 tetranychid mites per leaf) and continued to be in a considerable number until the second period of July (20.07.2015). The density of tetranychid mites starts to decrease from the third period of July until the end of September. In all periods of September, we haven't found tetranychid mites (Figure 1). Statistically, we have not a significant influence of tetranychid mites in the population of *Phytoseius finitimus* ($R^2=0.0341$), with equation $y=0.2781x+2.8633$ (Significance $F=0.51$, $\alpha=0.05$). Statistically, we don't have a significant influence of seasonal temperature on populations of *Ph. finitimus* ($R^2=0.2111$, with equation $y=0.34x-4.862$, significance $F=0.08$, $\alpha=0.05$) and in the population of tetranychid mites. ($R^2=0.0029$), with equation $y=-0.0264x+1.6288$, significance $F=0.849$, $\alpha=0.05$). During the observation of the leaves with stereomicroscope in this cultivar we have recorded tydeid mites that coexist with Phytoseiid mites [3]. Tydeid mites are found in the highest density in the second period of June (1.33 ± 0.12 tydeids per leaf) and in the second period of July (1.33 ± 0.12 tydeids per leaf) (Figure 3). *Ph. finitimus* populations are found in higher numbers than tydeid mites. This difference is statistically significant ($p=0.0008$), ($\alpha=0.05$).

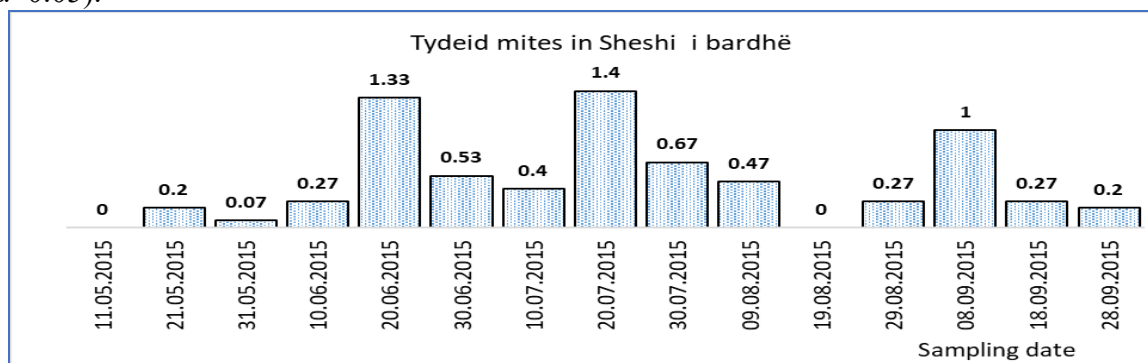


Figure 3 Tydeid mites populations density in Sheshi i bardhë grape cultivar

Results of the study in Sheshi i zi grape cultivar

During the study in Sheshi i zi, it results that from 31.05.2015 to 18.09.2015 we have found the highest number of phytoseiid mites per leaf. August was the most populated month with *Ph. finitimus*. The first period of August (09.08.2015) results the most abundant period with *Ph. finitimus*. In this period, we have found 7.27 ± 0.49 phytoseiid mites per leaf. The least populated month with *Ph. finitimus* was May. The least abundant period was the first period of May (11.05.2015). In this period, we have found 0.87 ± 0.49 phytoseiid mites per leaf (Figure 4). Adult stages are found in higher numbers in all periods of August and in the second period of September. The most abundant period with adult stages was the third period of August (29.08.2015). In this period, we have found 2.47 ± 0.13 adults per leaf. May was the least populated month with adults. The least populated periods were the first period of May (11.05.2015) and the second period of May (21.05.2015). The highest larval densities were observed from the third period of May (31.05.2015) and reached the first peak in the third period of June (30.06.2015) 4.6 ± 0.41 larvae per leaf. The most abundant period with larvae

was the first period of August (09.08.2015). In this period, we have found 5.87 ± 0.41 larvae per leaf. The least populated periods with larvae were the first period of May (11.05.2015), the second period of May (21.05.2015) and the third period of September (28.09.2015). Eggs are found in low densities in all sampling periods. The most populated period with eggs was the second period of July (20.07.2015). In this period, we have found 1 ± 0.08 eggs per leaf. May was the least populated month with eggs (Figure 5).

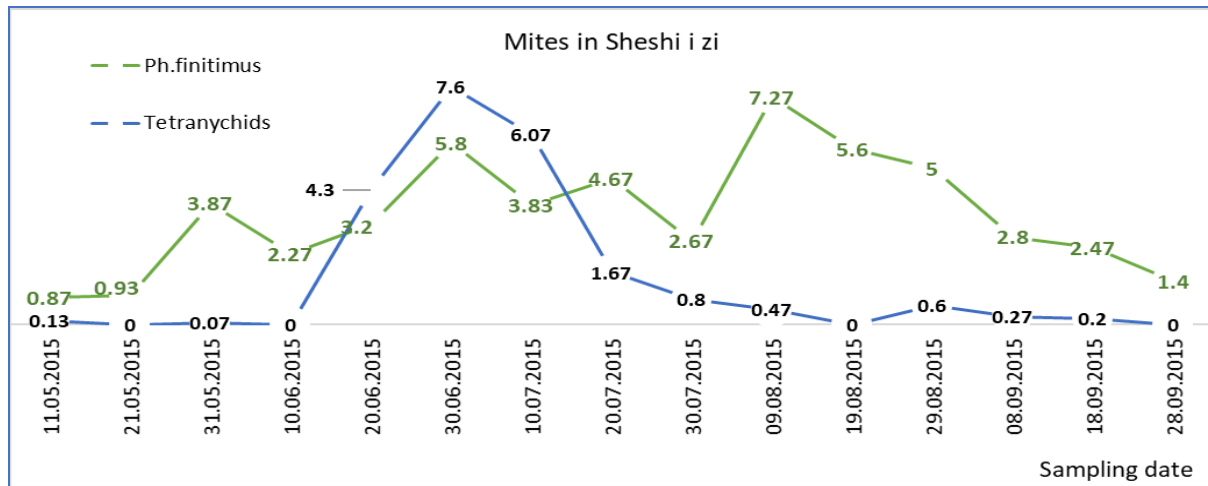


Figure 4 Mites present in Sheshi i zi

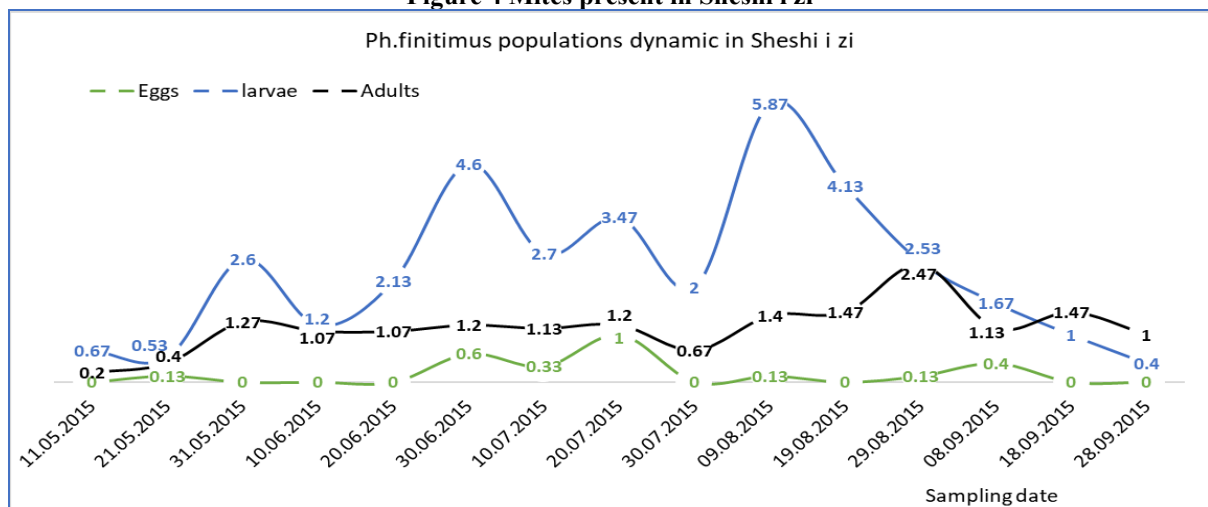


Figure 5 Phytoseius finitimus population dynamics in Sheshi i zi, all life stages

The graph in figure 5 shows clearly the difference between *Ph. finitimus* life stages. In this cultivar larvae were the dominant stage. We have found more larvae than eggs and more larvae than adults. These differences are statistically validated. We have a significant difference between larvae-adults ($P=0.01$) and larvae- eggs ($P=0.0001$). Adults are found in higher numbers than eggs. We have a significant difference between adult and egg stages ($P=0.000003$) ($\alpha=0.05$). During this study on Sheshi i zi grape cultivar, it results that *Phytoseius finitimus* was found in higher density than tetranychid mites and this is a significant difference ($p=0.02$). The populations of tetranychid mites from the first period of May (11.05.2015) to the first period of June (10.06.2015) have been low in density. Then in the second period of June (20.06.2015) the populations started growing and reached the peak in the third period of June (30.06.2015), 7.6 ± 0.64 tetranychid mites per leaf. Tetranychid

mites continued to be in a considerable number until the first period of July (10.07.2015). The density of tetranychid mites started to decrease from the second period of July until the end of September. May was the least populated month with tetranychid mites per leaf (Figure 4). Statistically, we don't have a significant influence of tetranychid mites in the population of *Phytoseius finitimus* ($R^2=0.1076$), with equation $y=0.2513x+3.1384$ (Significance $F=0.23$, $\alpha=0.05$). Statistically, we don't have a significant influence of seasonal temperature on populations of *Ph. finitimus* ($R^2=0,2552$, with equation $y=0.2901x-3,3208$ significance $F=0.054$, $\alpha=0.05$) and in the population of tetranychid mites. ($R^2=0.0009$), with equation $y=-0.022x+1.9968$, significance $F=0.91$, $\alpha=0.05$).

During the observation of the leaves with stereomicroscope in this cultivar we have recorded Tydeid mites. These mites coexist with Phytoseiid mites [3]. Tydeid mites are found in the highest density in the third period of August (2.8 ± 0.19 tydeids per leaf) and in the first period of September (1.53 ± 0.19 tydeids per leaf) (Figure 3). *Ph. finitimus* populations are found in higher numbers than tydeid mites. This difference is statistically significant ($p=0.00005$, ($\alpha=0.05$)).

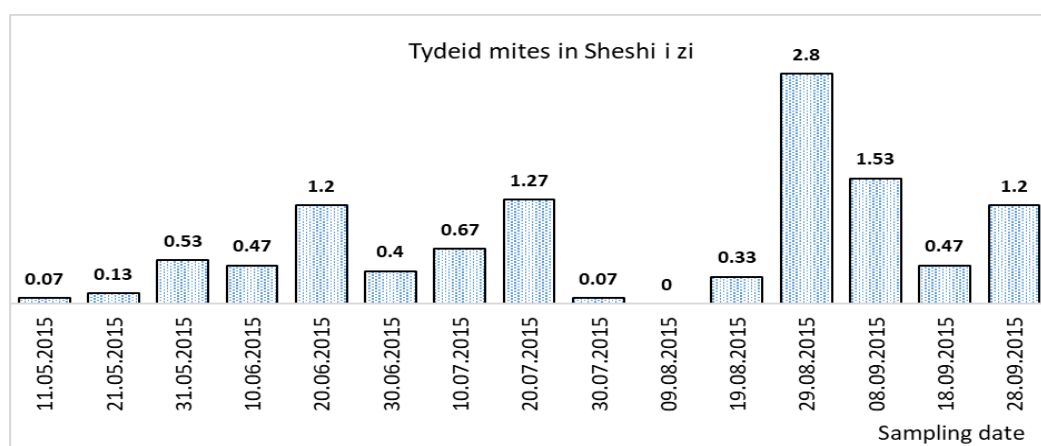


Figure 6 Tydeid mites populations density in Sheshi i zi grape cultivar

From the data collected in both cultivars August was the most abundant month with *Ph. finitimus*, and the first period of August was the most abundant sampling period with *Ph. finitimus*. The least populated month with *Ph. finitimus* for both cultivars was May. We don't have a significant difference between the population of *Ph. finitimus* found in both cultivars ($p=0.6$) and between life stages (between adult stages $p=0.9$, between larvae stages $p=0.3$, between egg stages $p=0.8$).

CONCLUSIONS

From the results of this study, we came to the conclusion that there isn't a significant difference between populations and life stages of *Phytoseius finitimus* found in both cultivars. August was the most abundant month with *Ph. finitimus*, and the first period of August (29.08.2015) was the most abundant sampling period with *Ph. finitimus*. The least populated month with *Ph. finitimus* for both cultivars was May. The highest number of *Ph. finitimus* per leaf was found in the third period of August (29.08.2015), in Sheshi i bardhë grape cultivar (10 ± 06). In Sheshi i bardhë cultivar we have found more adults than eggs and more larvae than eggs. These differences are statistically validated, whereas between adults and larvae we don't have a significant difference. In Sheshi i zi grape cultivar larvae was the dominant stage. We have found more larvae than eggs, more larvae than adults, and more adults than

eggs. These differences are statistically validated. In both cultivars, we don't have a significant influence of tetranychid mites and temperature in the population of *Ph. finitimus*. Tetranychid mites and tydeid mites are found in less numbers compared with *Ph. finitimus*. Tetranychid mites are found in higher numbers in the second period of June (20.06.2015) in Sheshi i bardhë and in the third period of June (30.06.2015) in Sheshi i zi. The most populated periods with tydeid mites were the second period of July in Sheshi i bardhë and the third period of August in Sheshi i zi grape cultivar.

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