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Populations Dynamic of Phytoseius Finitimus (Ribaga) During the Two Years of Study in Sheshi Zi Grape Cultivar

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Abstract— *The population's dynamic of Phytoseius finitimus followed in one autochthon Albanian grape cultivar Sheshi zi. The study was carried from May to September 2016-2017. The main objectives of the study was to follow population dynamics of Phytoseius finitimus (Ribaga), to see the difference between life stage of Phytoseius finitimus, to see the difference between Phytoseius finitimus and tetranychid mites population, to see if we have any difference between years and who was the most populated period with phytoseiids. During this study, except Phytoseius finitimus, we have found also tetranychid mites. Phytoseius finitimus was present in all periods of the study. During two years of study we have observed a very high number Phytoseius finitimus population especially in the first period of September 2016. The less populated period with Phytoseius finitimus was the first period of June 2016. During this study in the first and the third period of September 2016 we have found the highest number of adults per leaves. The most populated period with larves was the third period of July 2016. Eggs are found in higher number in the third period of September 2016. During 2016 larves and adults are found in higher number than eggs, we have found significant difference between adults-eggs and larves-eggs, whereas between adults and larves we haven't any significant difference. During 2017 adults are found in higher number than larves and eggs. Also larves are found in higher number than eggs. We have a significant difference between all stages of Phytoseius finitimus (adults-eggs, adults-larves, larves-eggs) during the second year of the study. Tetranychid mites are found in higher number in the first year of study in the third period of July. From both years of the study phytoseiid mite (Ph.finitimus) was found in higher number than tetranychid mites, we have a significant difference between Phytoseius finitimus and tetranychid mites populations during 2016 and 2017. During the study in the first year we found more Phytoseius finitimus than the second year, we have a significant difference between years (P=0.02). In the second year of study the temperature has an impact on the decrease of Phytoseius finitimus population (Significance F=0.004), (R^2 = 0.29), with equation y= -0.1001x-5.0298.*

Keywords—*Cultivars, grape, mites, phytoseiids, Phytoseius finitimus, Sheshi zi.*

I. INTRODUCTION

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 [4]. In European vineyards, these natural enemies play a key role in plant protection as their presence usually makes the use of acaricides unnecessary, [15]. These biological agents are efficient predators in controlling phytophagous mites and small insects in various crops worldwide [11]. Phytoseiid mites have a considerable economic impact because they are predators of several phytophagous mites, including spider mites (Tetranychidae) [20] Some studies have shown its ability to control phytophagous mites, whiteflies and thrips and to develop when fed with pollen [1, 12].

The family Phytoseiidae includes many species of predators involved in the control of mite pests of crops all over the world. The presence of Phytoseiid mites on the grapevine shows a better management from pest and diseases. Most species of this family are generalist predators; they can feed on their prey (especially of the families Tetranychidae and Eriophyidae) but can also develop feeding on pollen, plant exudates, fungi and small insects [10, 17]. Pytoseiid mites of the genus Phytoseius are natural enemies of tetranychid and eriophyid herbivorous mites mostly found on hairy plants where they feed on prey, as well as on pollen [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. [12]. Phytoseius finitimus is a generalist predator and is quite common in Mediterranean vineyards [1, 12, 18]. It was observed to be abundant and more effective as a predator of spider mites on grape varieties with more glabrous leaves [11]. Unfavourable climate conditions and the application of broad spectrum 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 [7, 9]. Each mite species has its optimal temperature for development and reproduction [13]. The mites are poikilotherms; temperature is the main abiotic factor influencing their biology, ecology, and population dynamics [8, 6].

The main objectives of the study was to follow population dynamics of Phytoseius finitimus (Ribaga), to see the difference between life stage of Phytoseius finitimus, to see the difference between Phytoseius finitimus and tetranychid mites population, to see if we have any difference between years and who was the most populated period with phytoseiids.

II. MATERIAL AND METHODS

Experiments were carried for two years 2016-2017 in the autochthon Albanian grape cultivar Sheshi zi. The vineyard is located in Durres, Albania, in Rada village [41°24'22.8"N 19°36'17.7"E]. The vineyard is set on a hill in a surface 0.3

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Ha, age of grape was 25-40 years old. In this vineyard were carried out all the necessary agro-technical services, (paring, fertilization, protection from pest and diseases, etc.). In order to be protected from pest and diseases, the farmer has used fungicides and insecticides with these active substances from April to July 2016-2017. The first treatment was done with copper hydroxide in the middle of April, and continued with other pesticides every 10-16 days: three times in row with copper hydroxide and sulphur, boscalid-pyraclostrobin and, metalaxyl-mancozeb and kresoxim-methyl, copper-metalaxyl and metrafenone metalaxyl-copper and kresoxim-methyl, metiram, metrafenone and dimethoate. The last treatment was done in the middle of July with, boscalid-kresoxim-methyl.

For this study we have taken leaves during vegetative period for five months. Sampling was done every ten days, from May to September for two years 2016-2017, 3 periods per months and in total 15 periods per year. For each cultivar we took 15 leaves, leaves were taken inside of the rows and in the middle of 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. Mites on the leaves were counted under the stereomicroscope and mounted in Hoyer's medium on microscope slide. To determine the species of phytoseiid mites we have worked with many identification keys for Phytoseiidae family [5, 16, 19] 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. [14, 19]. We have used analysis of variance (ANOVA), regression analysis from Excel. Meteorological data were obtained from Weather Underground, “Fig. 1”.

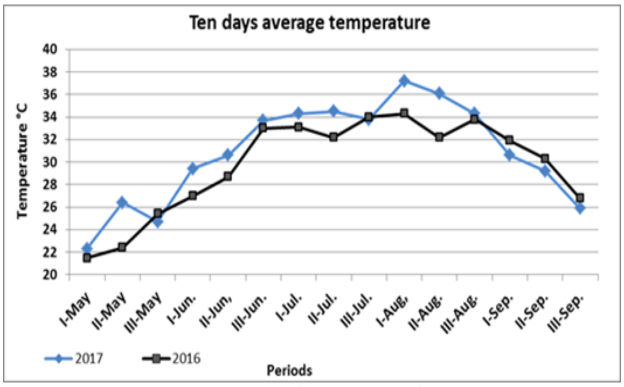

Fig. 1. Average of temperature for two years.

III. RESULTS AND DISCUSSION

During the first year of the study 2016 in Sheshi zi grape cultivar, September was the month with the highest number of Phytoseius finitimus, and the first period of September (I-Sep.) was the most populated period, in this period we have found 6.9±0.48 mites/leaf. The less populated month with Phytoseius finitimus was June, in the first period of June (I-Jun) we have found 0.8±0.47 mites/leaf, “Fig. 3”.

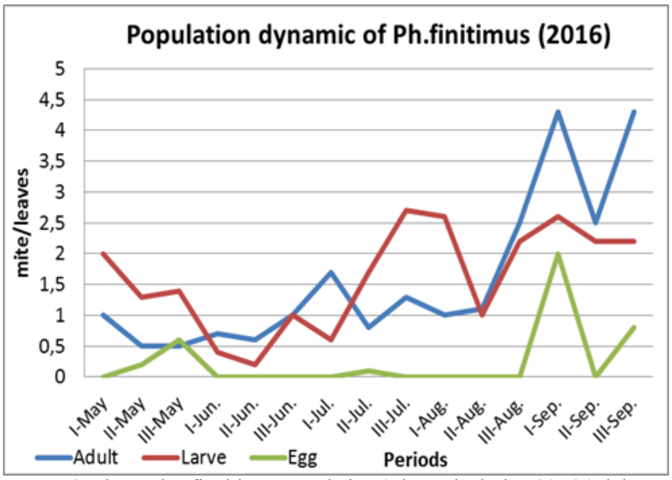

Fig. 2. Phytoseius finnitimus populations' dynamic during 2016 (adults, larves, eggs).

During 2016 September was the most populated month with adults of Phytoseius finitimus,in the first and the third period of which (I-III-Sep.), we have found higher number of adults per leaf (4.3±0.33). May was the least populated month with adults especially the second and the third period of May (II-III May), when were found only 0.5±0.33 adults/leaf. The most populated period with larves was the third period of July (III-Jul.), in this period we have found 2.7±0.22 larves/leaf. The least populated period with larves, was the second period of June (II-Jun.). In this period we have found 0.2±0.22 lavers/leaf. Eggs are found in higher number in the third period of September (II-Sep.), in this period we have found 0.8±0.14 eggs/leaf. In August and in June we haven't found eggs. During this year we have found more adults than eggs and more larves than eggs, we haven't any significant difference between adults and larves (P=0.9). We have a significant difference between adults- eggs (P=0.001) and larves– eggs (P=0.00001), “Fig. 2”.

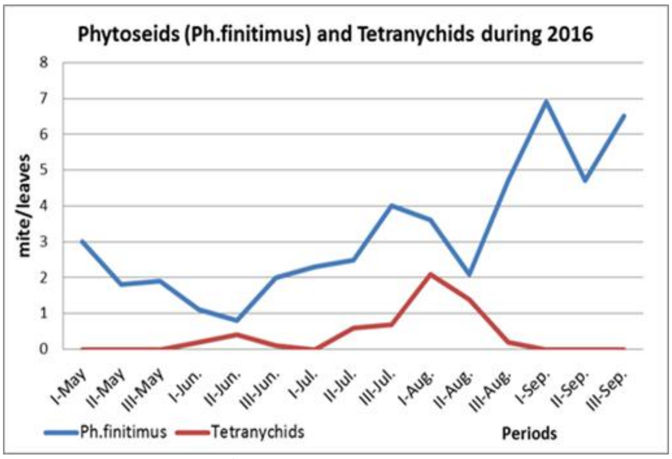

Fig. 3. Mites (Phytoseius finitimus and teranychid mites) present during 2016 in Sheshi zi grape cultivar.

During 2016 Phytoseius finitimus was found in higher number than tetranychid mites. We have a significant difference between populations of Phytoseius finitimus and tetranychid mites (P=0.00001) The most populated period with tetranychid mites was the first period of August (I-Aug.), in this period we have found 2.1±0.16 tetranychid mites/leaf, in May and September we haven't found tetranychid mites, "Fig. 3".

Statistically, we have not a significant influence of tetranychid mites in population of Phytoseius finitimus, (R^2 = 0.012), with equation y = -0,3247x + 3.3167 (Significance F=0.7). Statistically, there is not any significant influence of the temperature, in population of Phytoseius finitimus and in population of tetranychids mites: For Phytoseius finitimus (R^2 = 0,052), with equation y= 0.0987x - 0.2535, (Significance F=0.415), and for tetranychids (R^2 = 0.23), with equation y= 0.0692x - 1.6811 (Significance F=0.07).

During 2017 May was the month with the highest number of Phytoseius finitimus, and the second period of June (II-Jun.) was the most populated period, in this period we have found 3.8±0.21 mites/leaf. The less populated month with Phytoseius finitimus was July, in the third period of July (I-Jul) we have found 0.9±0.21 mites/leaf. "Fig. 5"

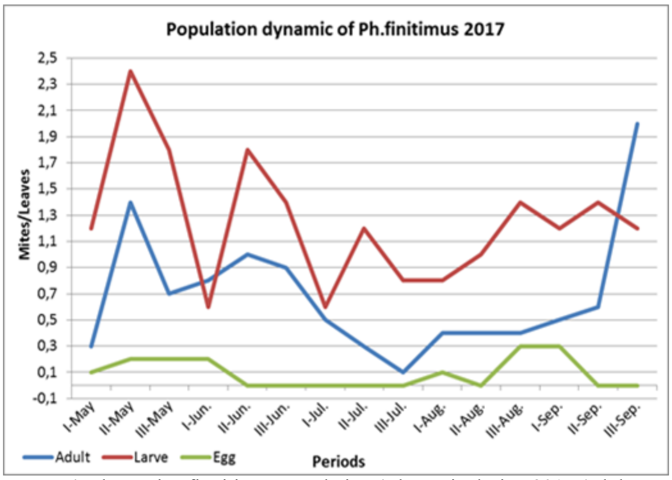

Fig. 4. Phytoseius finnitimus populations' dynamic during 2017 (adults, larves, eggs).

During this year (2017) September was the most populated month with adult of Phytoseius finitimus, in the third period of September (III-Sep.) we have found a higher number of adult per leaves (2±0.13). July was the least populated month with adult especially in the third period of July (III-Jul), we have found 0.1±0.13adults/leaf. The most populated period with larves was the second period of May (I-May.), in this period we have found 2.4±0.13 larves per leaf. The least populated periods with larves were the first period of June (I-Jun.) and the first period of July (I-Jul), when we have found 0.6±0.13 larves/leaf. Eggs were found in higher number in the third period of August (III-Aug) and in the first period September, in these periods we have found 0.3±0.03 eggs/leaf, "Fig. 4."

In population structure of Phytoseius finitimus adults are found in higher number than larves and then eggs, also larves are found in higher number than eggs. We have a significant difference between adults- eggs (P=0.0001) between adults– larves (P=0.004), and larves– eggs (P=0.000000001), "Fig. 5".

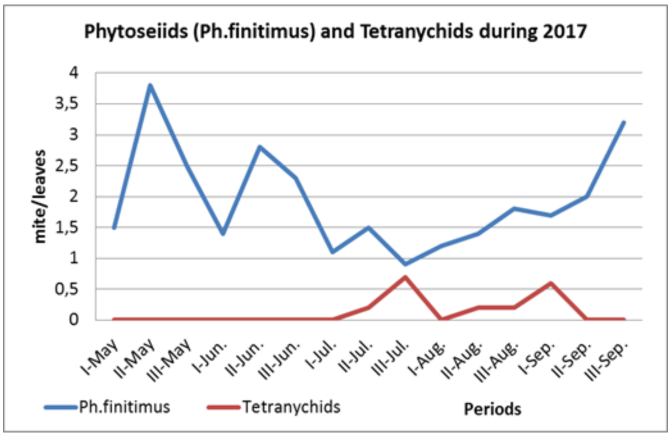

Fig. 5. Mites phytoseids (Phytoseius finitimus) and teranychids present during 2016 in Sheshi zi grape cultivar.

During 2017 population of Phytoseius finitimus was found in higher number than tetranychid mites. We have a significant difference between Phytoseius finitimus and tetranychid mites (P=0.00000001).

The most populated period with tetranychid mites was the third period of July (III-July.), with 0.7±0.05 tetranychid/leaf. In May and June we haven't found tetranychid mites.

Statistically, we have not any significant influence of tetranychid mites in population of Phytoseius finitimus, (R^2= 0.29), with equation y = -1.5027x + 2.1303 (Significance F=0.13).

Each mite species has its optimal temperature for development and reproduction [13]. Statistically temperature has influenced negatively in population of Phytoseius finitimus. During the second year, the temperature has an impact on the decrease of Phytoseius finitimus population (R^2= 0.29), with equation y= -0.1001x-5.0298, (Significance F=0.04). Statistically, there is not any significant influence of the temperature, in population of tetranychid mites: tetranychids (R^2 = 0.09), with equation y= 0.0154x - 0.3498 (Significance F=0.27).

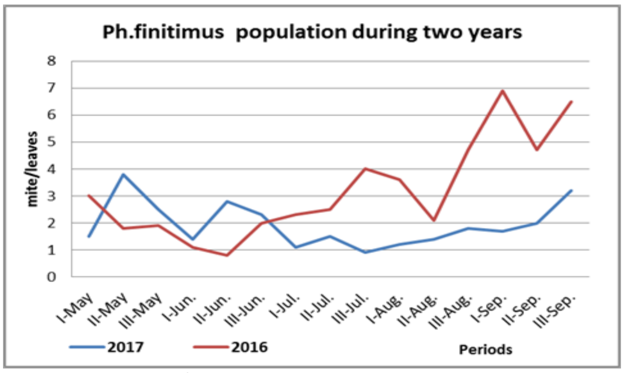

Fig. 6. Phytoseius finitimus populations dynamic during 2016-2017

During the study, in the first year we have found more Phytoseius finitimus than the second year, this difference is significant (P=0.02). We have found more adults during 2016 than 2017; this difference is significant (P=0.02). Larves are also found in higher number in 2016 compared with 2017, this difference is significant (P=0.17). We haven't any significant difference between eggs that are found during 2016 and 2017 (P=0.29) "Fig. 6".

As can be seen in "Fig. 6" during this study, in the second year we have found a lower number of Phytoseius finitimus compared to the first year. This reduction may have come as a result of low temperatures during December 2016-January 2017 where the minimum temperatures reached -10°C.and weather condition (temperature), during sampling season.

The mites are poikilotherms; temperature is the main abiotic factor influencing their biology, ecology, and population dynamics [6, 8]

IV. CONCLUSION

From the collected data during two year study in Sheshi zi grape cultivar it was observed a considerable number of Phtoseius finitimus per leaves, especially in the first year. In the first period of September 2016, we have found the highest number of Phytoseius finitimus per leaves (6.9±0.48). The most populated period with adults was the first and the third period of September 2016. The highest numbers of larves were found in the third period of July 2016 and the most populated period with eggs was the third period of September 2016. In the structure of populations of Phytoseius finitimus during the first year of the study we have found more adults than eggs and more larves than eggs, we have not any significant difference between adults and larves. During 2017 adults are found in higher number than larves and eggs, also larves are found in higher number than eggs, all these differences are significant. From both years of the study Phytoseius .finitimus were found in higher number than Tetranychid mites, with a significant difference (P=0.02).Between two years we have found more Phytoseius finitimus in 2016 than 2017, also we have found more adults and more larves during 2016 than 2017. We haven't any difference between eggs found 2016-2017. From this study during the second year we came to the conclusion that the lower temperatures during winter and weather condition (temperature) during sampling period 2017 have an impact on the decrease of Phytoseius finitimus population. In this vineyard we have found a considerable numbers of Phytoseius finitimus, so farmers have provided a natural control against phytophagous mites.

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