Journal of Multidisciplinary Engineering Science and Technology (JMEST)
ISSN: 2458-9403
Vol. 8 Issue 6, June - 2021

The trend of A. andersoni (Chant) population in Merlot grape cultivar during two years of study

Aris Huqi
Department of plant protection
Agricultural University of Tirana
Durrës ALBANIA

***Abstract*— The aim of the study was to follow the trend of population dynamics of A. andersoni in Merlot grape cultivar during two years. The samples were taken every ten days from May to September during 2016-2017. During this study, it was observed a considerable number of the A. andersoni/leaf, especially in: August, September during 2016 and July, September during 2017. The most populated period with A. andersoni was the second period of August, (6.87±0.51mites /leaf). In the second period of May 2016, we haven't found A. andersoni. During the first year of the study, we have not a significant difference between life stages of A. andersoni. From the results during the second year of the study, adults and larves are in higher numbers than eggs, and this difference is significant. Between adults and larves stage, we have not a significant difference. The most populated period with adults was the second period of August 2016 (4.67±0.33 adults/leaf). Larves are found in high density in the first period of September 2016, whereas eggs are found in higher number in the second period of August 2016. We haven't any significant difference between: A. andersoni found in 2016 and in 2017 (p=0.54), adults found in 2016 and in 2017 (p=0.42), eggs found in 2016 and in 2017 (p=0.12), larvae found in 2016 and in 2017 (p=0.11). From both years of the study, temperature has not a significant impact on population of A. andersoni. In the second year of the study, we have a moderate positive correlation between tetranychid mites and A. andersoni population. The increase in the population density of tetranychid mites has a positive effect on the growth of A. andersoni populations, and these facts can guarantee the biological control of tetranychid mites in this vineyard, but not only for tetranychid mites.**

Keywords*— *A. andersoni; Merlot; mites; period; phytoseiids; August, September; grape vine.

I. INTRODUCTION

Grape vines are vulnerable to a range of pests, including mites, which are the most successful and diverse of the chelicerates [23]. 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 [8;15;21].

In European vineyards, these natural enemies play a key role in plant protection as their presence usually makes the use of acaricides unnecessary [19]. Phytoseiid mites (*Parasitiformes, Phytoseiidae*) are free-living gamasid mites, existing in various habitats. A large number of species are contingent upon the plants; they inhabit vegetative parts and feed on herbivorous mites, insect eggs and larvae, plants pollen and juice, as well as some insect's excretion [15; 24; 7; 16]. Mites of the family *Phytoseiidae* are known mostly for their predatory habit on phytophagous mites and small insects, like thrips and whiteflies, on cultivated plants and plants of the natural vegetation [11]. 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].

The predatory mites, *Amblyseius andersoni* are naturally found in apple, grapevine, hazelnut and peach orchards, etc. [18]. This predator is classified as a type III generalist predator that feeds on a variety of prey and non-prey foods [13; 12; 15]. *Amblyseius andersoni* was observed to be abundant and more effective as a predator of spider mites on grape varieties with more glabrous leaves [1; 5]. Unfavorable 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 [10; 14].

The aim of the study was to follow the trend of population dynamics of *A. andersoni* in Merlot grape cultivar during two years.

II. MATERIAL AND METHODS

The study was carried during the two years 2016, 2017 in Merlot grape cultivar. The vineyard is set on a field area in a surface 0.3 ha, is located in Radë, Durrës, Albania. Form of cultivation was tent and the age of grape was 9 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 from May to September for five months every ten days. We have taken 15 leaves [9] per periods, 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 that are present on the leaves were counted under the stereo microscope. We have mounted in Hoyer's medium on microscope slide only mites of Phytoseiidae family. To determine the species of phytoseiid mites we have worked with many identification keys for Phytoseiidae family [6, 20, 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. [17, 22]. In this case we have worked with keys for identification Amblyseius genus [20]. We have used analysis of variance (ANOVA), T-test, regression analysis from Excel. Meteorological data were obtained from Weather Underground, "Fig.1".

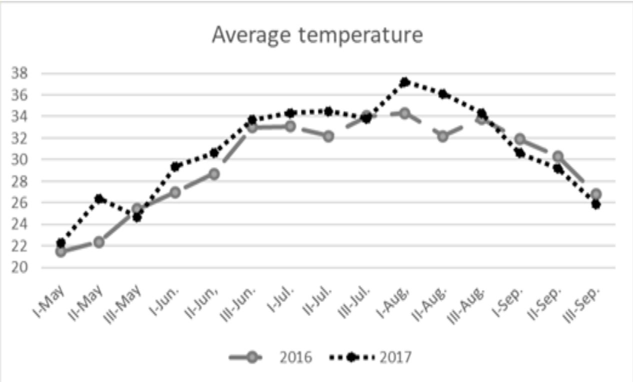

Fig. 1.*Ten days average high temperature, 2016-2017*

III. Results and Discussion

During two years of the study, we have identified, studied the trend of population of *Amblyseius andersoni*, specie and we have registered the trend of tetranychids mites.

The trend of *Amblyseius andersoni* population during the first year of the study:

The highest egg densities were observed in the first period of July, in the second period of August, in the first period of September and in the second period of September. In the second period of August was recorded the highest number off eggs/leaf (3 ± 0.22). From the first period of May to the third period of June, we have found the lowest amount of eggs/leaf. The highest larves densities were observed from the first period of August to the second period of September. The increase of larval stage density starts from the first period of August (1.6±0.21 larvae/leaf) and reached the first peak in the second period of August (2.2±0.21 larvae/leaf) and the second peak in the first period of September (3±0.21 larvae/leaf). Adult stage was found in less number from the first period of May to the third period of July. We haven't found adults in the second and the third period of May. The increase in the density of the adults per leaf starts from the second period of August (2.2±0.33 adults/leaf). The peak of the adult stage was observed in the second period of August (4.67±0.33 adults/leaf). The average number of different life stages (eggs, larva and adults) per leaf is shown in "Fig 2" (mean/15leaf ± SE). During the first year of the study, results showed that we haven't a significant difference between stages of A. andersoni. The statistical results tested are: adults-eggs (P=0.87); larves– eggs (P=0.13); adults-larves (p=0.31).

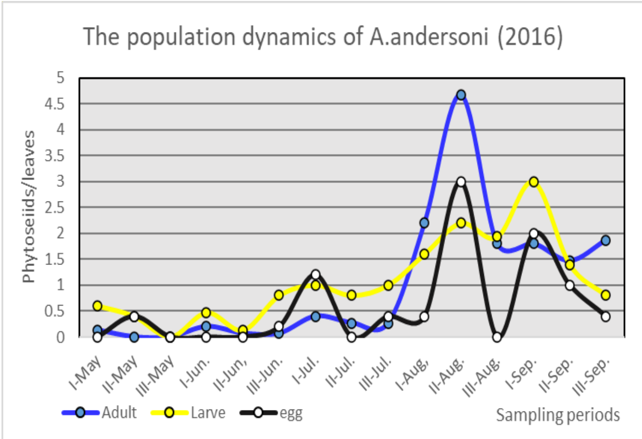

Fig. 2. *The population dynamics of A. andersoni during 2016*

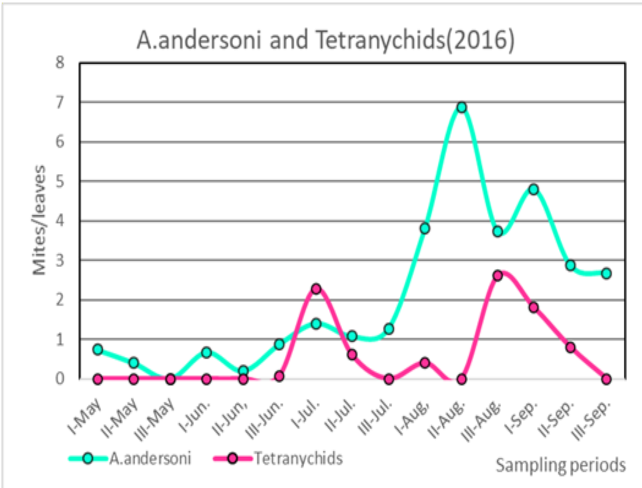

Fig. 3. *The population trend of A. andersoni and tetranychid mites during 2016*

From the results of the first year, it results that *A. andersoni* was found in higher numbers than tetranychid mites, and we have a significant difference (p=0.01). August and September were the months with the highest number of *A. andersoni*. In the second period of August and in the first period of September were found the highest number of *A. andersoni*/leaf, exactly we have found and 6.87±0.51mites /leaf (II-Aug) and 4.8±0.51mites/leaf (I-Sep.). The less populated month with *A. andersoni* was May; in the third period of May (III-May) we haven't found *A. andersoni.* In July and August, we have found the highest number of tetranychids per leaf, especially in the third period of August was the most populated period with tetranychids; in this period, we have found 2.6±0.23 mites/leaf, "Fig.3". May and June were the months with the least number of tetranychids per leaf.

Especially in May we have not found tetranychid mites. Statistically, we have not a significant influence of seasonal temperature on populations of *A. andersoni* (R^2=0,2341), with equation y=0.2261x-4.6425 (Significance F=0.067). Seasonal temperature has not a significant impact on populations of tetranychid mites (R^2=0.2297), with equation y=0.1021x-2.4715 (Significance F=0.071). We have not a significant influence of tetranychid mites in a population of *Amblyseius andersoni* (R^2=0.1062), with equation y=0.7146x+1.6832 (Significance F=0.237). This increase in the population of *A. andersoni* may be related to the behavior of this predator as a generalist (the possibility of feeding on alternative food, is classified is a type III generalist predator that feeds on a variety of prey and non-prey foods) [12; 13; 15].

The trend of *Amblyseius andersoni* population during the second year of the study:

During 2017, eggs are present in the first and in the second period of May, in all periods of August, during the first period of September and in the third period of September. In the first period of September was recorded the highest number of eggs /leaf (1.6 ± 0.11). From the third period of May to the third period of July we haven't found eggs. The highest larves densities were observed from the third period of June to the second period of September. The most populated period with larves was the first period of September. In this period we have found (2.4±0.14 larvae/leaf). In the third period of June, in the second period of July, in the third period of August and in the second period of September, we have found the same results (1.4±0.14 larvae/leaf). In the third period of May, we have found the least number of larvae per leaf. (0.2±0.14 larvae/leaf). The highest densities of adults per leaf were found in September and July. The most populated period with adults was the third period of September (1.47±0.13 adults/leaf). The second most populated periods with adults were the first period of July and the first period of September. In both these periods we have found (1.33±0.13 adults/leaf). In the second period of May and in the first period of September, we haven't found adults. The average number of different life stages (eggs, larva and adults) per leaf is shown in "Fig 4" (mean/15leaf ± SE). During the second year of the study, we have found more adults than eggs and more larves than eggs. These differences are statistically validated, adults- eggs (P=0.0053) and larves– eggs (P=0.0001). Whereas between adults and larves stages of A. andersoni we haven't a significant difference (P=0.11).

From the results of the second year, it results that *A. andersoni* was found in higher numbers than tetranychid mites, and we have a significant difference (p=0.002). July and September were the months with the highest number of *A. andersoni*. In the second period of July, in the second period of September and in the first period of September were found the highest numbers of *A. andersoni*/leaf. The peak of *A. andersoni* was observed in the first period of September (3.73±0.25 mites/leaf). The less populated month with *A. andersoni* was May. In July and September, we have found the highest number of tetranychids per leaf. Especially the first period of September was the most populated period with tetranychids, in this period we have found 2.8±0.21 mites/leaf. May was the month with least number of tetranychids per leaf. We haven't found tetranychids mites in the second period of May, in the third period of May, in the third period of July, in the second period of August and in the second period of September, "Fig.5".

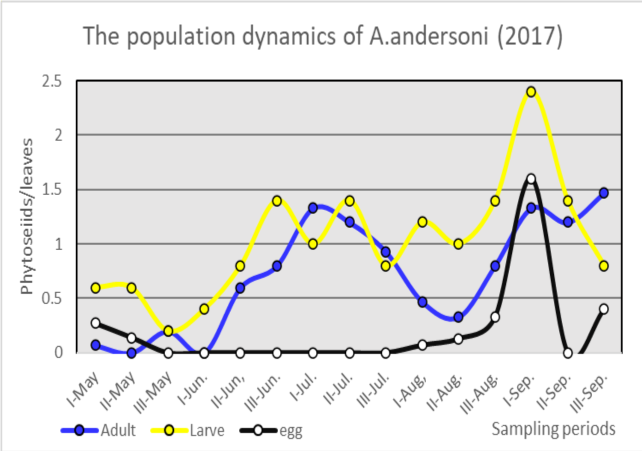

Fig. 4. *The population dynamics trend of A. andersoni during 2017*

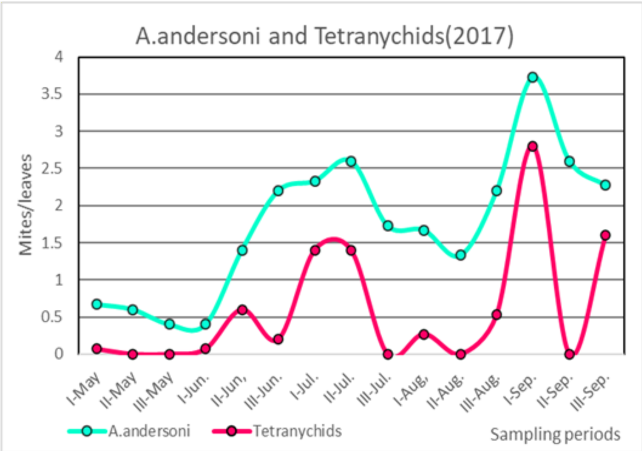

Fig. 5. *The population trend of A. andersoni and tetranychid mites during 2017*

Statistically, we have not a significant influence of seasonal temperature on populations of *A. andersoni* (R^2=0,1784), with equation y=0.0901x-1.0376 (Significance F=0.12). Seasonal temperature has not a significant impact on populations of tetranychid mites (R^2=0.0071), with equation y=0.0157x+01107 (Significance F=0.76).

The graph ("Fig. 5".) shows that the phytoseiids populations were growing at the same time with the tetranychids populations. The population density of *A. andersoni* is higher than the population density of tetranychid mites. We have a significant moderate positive influence of tetranychid mites in the population of *Amblyseius andersoni* (R^2=0.5612), with equation y=0.8586x+1.2303 (Significance F=0.001). These facts can guarantee the biological control of tetranychid mites in this vineyard. This increase in the population of *A. andersoni* except the impact of tetranychid mites, may be related to the behavior of this predator as a generalist (the possibility of feeding on alternative food, is classified is a type III generalist predator that feeds on a variety of prey and non-prey foods [12; 13; 15].)

During this study from both years, it results that the difference in population of *A. andersoni* between years is not statistically significant (P=0.54). Although the graph ("Fig. 6") clearly shows a higher density of *A. andersoni* in the period of August-September 2016. From both years results that the second period of August 2016 was the most populated period (6.87±0.51mites /leaf). We haven't any significant differences between: adults found in 2016 and in 2017 (p=0.42), eggs found in 2016 and in 2017 (p=0.12), larvae found in 2016 and in 2017 (p=0.11). The most populated period with adults of *A. andersoni* was the second period of August, whereas the most populated period with larvae was the first period of September 2017 (2.4±0.14larves/leaf). The most populated period with eggs was the second period of August 2016 (3±0.22eggs/leaf). We have not a significant difference between tetranychids populations found in 2016 and 2017 (p=0.93).

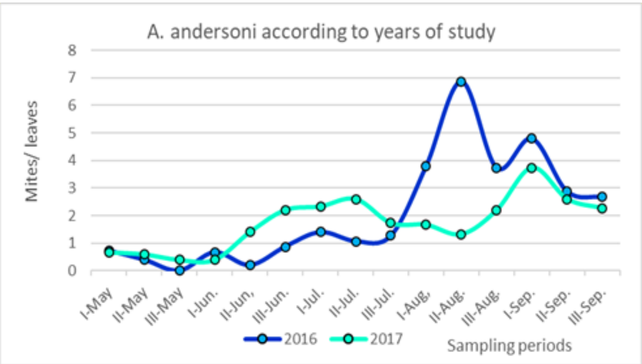

Fig. 6. *A. andersoni population trend during the study (2016-2017)*

IV. CONCLUSIONS

From data collected during the study, the trend of *A. andersoni* (Chant) population in Merlot grape cultivar during two years of study, it was observed a considerable number of the *A. andersoni* per leaf especially in: August, September during 2016 and July, September during 2017. The most populated period with *A. andersoni* was the second period of August. (6.87±0.51mites /leaf). In the second period of May 2016, we haven't found *A. andersoni.* During the first year of the study, we have not a significant difference between life stages of *A. andersoni*, whereas in the second year of the study, adults and larves are in higher numbers than eggs; this difference is significant. We have not a significant difference between adults and larves stage. The most populated period with adults was the second period of August 2016 (4.67±0.33 adults/leaf). Larves are found in high density in the first period of September 2016, whereas eggs are found in higher number in the second period of August 2016. We haven't any difference between: *A. andersoni* found in 2016 and in 2017, all life stages (adults, larves, eggs) found in 2016 and in 2017. From both years of the study, temperature has not a significant impact on population of *A. andersoni* and on tetranychid mite populations. Tetranychid mites were found in higher densities in the first period of September 2017, and in the third period of August 2016. In the third year of the study, we have a moderate positive correlation between tetranychid mites and *A. andersoni* population. The increase in the population density of tetranychid mites has a positive effect on the growth of *A. andersoni* populations. From this study it is observed that the density of tetranychids is lower than the density of *A. andersoni* and these facts can guarantee the biological control of tetranychid mites in this vineyard. The presence of *A. andersoni* in these densities during the season is a very good indicator in the natural control of some mites and insect pests.

REFERENCES

[1] P. Camporese and C. Duso, "Life history and life table parameters of the predatory mite *Typhlodromus talbii*". Entomologia Experimentalis et Applicata, 1995, vol. 77, pp. 149–157.

[2] B.A. Croft, "Arthropod Biological Control Agents and Pesticides". John Wiley and Sons, Inc., New York, 1990, pp 723.

[3] N. Duraj, "Distribution of useful mites in different stems of vineyard." "Shpërndarja e këpushave të dobishme në pjesë të ndryshme të lastarit të hardhisë," Buletini i Shkencave Bujqësore, 2000, no. 3, pp. 73-77.

[4] N. Duraj, "Agricultural acarology", "Akarologjia Bujqesore," Biological control, Tirana, 2006 pp. 28-38.

[5] C. Duso, A. Pozzebon, C. Capuzzo, P.M. Bisol and S. Otto, "Grape downy mildew spread and mite seasonal abundance in vineyards: evidence for predatory mites *Amblyseius andersoni* and *Typhlodromus pyri*", Biological Control, 2003, vol. 27, pp. 229–241.

[6] F Faraji, S. Çobanoğlu and I. Çakmak, "A checklist and a key for the *Phytoseiidae* species of Turkey with two new species records (Acari: Mesostigmata)," International Journal of Acarology, 2011, vol. 37, sup. 1, pp. 221-243.

[7] A. Farazmand, Y. Fathipour and K. Kamali, "Functional response and mutual interference of *Neoseiulus californicus* and *Typhlodromus bagdasarjani* (Acari: *Phytoseiidae*) on *Tetranychus urticae* (Acari: Tetranychidae)", International Journal of Acarology, 2012, vol. 38, no.5, pp. 369–376.

[8] U. Gerson, R. L. Smiley and T. Ochoa, "Mites (Acari) for Pest Control. Blackwell Science, Oxford, UK, 2003, pp. 539.

[9] V. Girolami, C. D'uso, E. Refati and R. Osler, "Integrated war in vineyards, Diseases of the grape vine", "Lotta Integrata in viticoltura. Malattie della vite" I.R.I.P.A. Coldiretti; 1989.

[10] I. Kasap, "The Biology and fecundity of the citrus red mite *Panonychus citri* (McGregor) (Acari:Tetranychidae) at different temperatures under laboratory conditions". Turk.J. Agri.For, 2009, 33, pp.593-600.

[11] S. Kreiter and M. Douin, "Phytoseiid mites of the French Guiana (Acari: Mesostigmata)", Acarologia, 2021, vol. 61, no. 2, pp. 468-478.

[12] Y.J. Li, Q.Y. Liu, J. Chang, Y.H. Jia and R.X. Meng, "Effects of temperature on a Chinese population of *Amblyseius andersoni* (Acari: Phytoseiidae) fed with Tetranychus urticae". Acarologia, 2019, vol. 59, pp. 475–483.

[13] M. Lorenzon, A. Pozzebon and C. Duso, "Effects of potential food sources on biological and demographic parameters of the predatory mites *Kampimodromus aberrans, Typhlodromus pyri* and *Amblyseius andersoni*". Experimental & Applied Acarology, 2012, vol.58, pp. 259–278.

[14] J.A. Mc.Murtry, "Some predaceous mite (*Phytoseiidae*) on citrus in the Mediterranean region Entomophaga", 1977, vol. 22 no. 1, pp.19-30.

[15] J.A. McMurtry, G. J. De Moraes and N. F. Sourasso, "Revision of the lifestyles of phytoseiid mites (Acari: *Phytoseiidae*) and implications for biological control strategies," Systematic and Applied. Acarology, 2013, vol. 18, no. 4, pp. 297-320.

[16] J.A. McMurtry, N.F. Sourassou and P.R. Demite, "The Phytoseiidae (Acari: Mesostigmata) as Biological Control Agents. Prospects for Biological Control of Plant Feeding Mites and Other Harmful Organisms", Progress in Biological Control, 2015, vol. 19, pp. 133–149.

[17] H.J. Rowell, D.A. Chant and R.I.C. Hansell, "The determination of setal homologies and setal patterns on the dorsal shield in the family *Phytoseiidae* (*Acarina: Mesostigmata*)," The Canadian Entomologist, 1978, vol. 110, no. 8, pp. 859–876.

[18] A. Szabo and B. Penzes, "A new method for the release of *Amblyseius andersoni* (Acari: *Phytoseiidae*) in young apple orchards". European Journal of Entomology, 2013, vol. 110, pp. 477-482.

[19] K. Talebi, A. Kavousi and Q. Sabahi, "Impacts of Pesticides on Arthropod Biological Control Agents, Pest technology," Global Science Books, 2008, pp. 87-97.

[20] M.S. Tixer, A. Baldassar, C. Duso and S. Kreiter, "Phytoseiidae in European grape (*Vitis vinifera* L): bioecological aspects and keys to species (Acari: Mesostigmata)," Zootaxa, 2013, vol. 3721, no. 2, pp. 101–142.

[21] M.S. Tixer, M. Douin, R. O. Molina, O. Rocio, L. Gonzales, B. Pount and S. Kertier, "Distribution and biological features of *Typhlodromus (Anthoseius) recki* (Acari:Phytoseiidae) on T*etranychus urticae, T. evansi (Acari: Tetranychidae*) and Aculops lycopersici (Acari: Eriophyidae)" Acarologia, 2020, vol. 60, no. 4, pp. 684–697.

[22] S. Toyoshima, H. Kishimoto, M. Kaneko and H. Amano, "Occurrence of *Amblyseius andersoni* (Chant) (Acari: *Phytoseiidae*) in deciduous fruit tree orchards in Japan", Journal of the Acarological Society of Japan 2016, vol. 25, no. 1, pp. 37-43.

[23] D.E. Walter and H.C. Proctor, "Mites: Ecology, Evolution & Behaviour. Life at Microscale", Springer, 2013, New York.

[24] A. Walzer and P. Schausberger, "Sex-specific developmental plasticity of generalist and specialist predatory mites (Acari: *Phytoseiidae*) in response to food stress". Biological Journal of the Linnean Society, 2011, vol. 102 no.3, 1, pp. 650–660.