SEASONAL POPULATION DYNAMICS OF *AMBLYSEIUS ANDERSONI* (CHANT) ON TWO APPLE CULTIVARS IN DURRËS, ALBANIA

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ABSTRACT

Seasonal population dynamics of *Amblyseius andersoni* (Chant) was recorded on two apple cultivars: Pink lady and Golden delicious from May to October 2014 in a sprayed apple orchard in Durrës (Shëna-Vlash), Albania. On Pink lady apple cultivar, the highest egg densities were reached on 11 June (0.4 eggs/leaf), larval population on 21 June (1.05 larva/leaf) and adult population on 11 July (3.2 adults/leaf). On Golden delicious apple cultivar the highest egg densities were observed on 21 June (1.75 eggs / leaf), larval population on 21 June (5.55 larva/leaf) and adult population on 11 July (15.5 adults/leaf). The highest population densities of tetranychid mite on Pink lady cultivar was observed on 30 August (0.6 mite / leaf) whereas on Golden delicious the number of tetranychid mite was very low and were observed only in three sampling dates, below (0.1 mite/leaf). Significant differences were found among two apple cultivars only between adults ($P < 0.05$) whereas between larval population and eggs no significant differences were found ($P > 0.05$). The population of tetranychid mite differed significantly ($P < 0.01$) among apple cultivars. The temperature had a significant impact ($P < 0.05$) in the abundance of tetranychid mite on Pink lady cultivar whereas in the abundance of predatory mite, temperature on both apple cultivars didn't had a significant impact ($P > 0.05$).

Keywords: *Amblyseius andersoni,* apple cultivars, tetranychids, Albania.

INTRODUCTION

Phytoseiid mite are considered as a successful biocontrol agents against phytophagous mite in several agroecosystem [9]. The performance of phytoseiid mite occurring on apple orchards can be affected by several factors especially climate and the use of pesticide [2]. Phytoseiid mite are able to keep phytophagous mite under the economic damaging levels, thereby reducing the use of pesticides to control pest species [9, 12]. *Amblyseius andersoni* (Chant) is a predatory mite commonly found on apple orchards and its occurrence does not directly depends on prey [17,3,1], because this mite it is considered a generalist predator feeding on various food sources other than mite prey (e.g. pollen, plant exudates, honeydew, fungi and small insects) [12]. The population development of some generalist species seems to be associated with that of their host plants [11] and their ability to control phytophagous mite can be different among apple varieties [7,4,5,10]. Phytoseiid mite abundance can be positively related to leaf pubescence [7,4,5]. Apple cultivar with non-pubescent leaves may expose phytoseiid mite to unfavourable abiotic condition [13, 14] and to hyperpredators [16] whereas apple cultivar with pubescent leaves can protect phytoseiids from intraguild predation and may increase the capture of polen and fungal spores [15] which are very important food sources especially for generalist predators, but in the other hand may increase searching time and reduce encounters with prey [10]. Population dynamics of phytoseiid

mite on apple orchards has been poorly investigated in Albania, however research interest on phytoseiid mite has increased steadily in the last years. From the inventory that we conducted in 2013 in this apple orchard, *Amblyseius andersoni* was the only phytoseiid species identified on Pink lady and Golden delicious apple cultivars. Thus, we undertook this study in order to provide data in the population dynamics of *A.andersoni* in these apple cultivars.

METHODOLOGY

The study was carried out from May to October 2014 in a sprayed apple orchard in Durrës (Shëna-Vlash) (41°18'40'' N; 19°26'21'' E), Albania. During the vegetation period the farmer of the apple orchard has used these insecticides for the disease and pest management: Ramplan (acetamiprid) in May; Fastak EC (alphacypermethrin) in June; Rogor L40 (dimethoate) in July and Nurelle D (cypermethrin) in August. The population dynamics of predatory mite was monitored every ten days and sampling was conducted 16 times from May to October 2014. Leaves were collected from five selected trees (ten leaves/tree) for each apple cultivar and the age of trees was 14 years old. Leaves were taken inside of the rows, in the middle of shoots and were brought to the laboratory in plastic bags. Mites on the leaves were counted under the stereomicroscope and all stages of mite were considered for counting. Daily average temperatures were obtained from the 'Institute of Geoscience, Energy, Water and Environment' Tirana, Albania. Analysis of variance (ANOVA) was used to determine the difference of mite population between two apple cultivars. Linear regression were used to evaluate the relationships between temperature and population development of *Amblyseius andersoni* on two apple cultivars and the relationship between *tetranychids* and temperature only on Pink lady apple cultivar because the number of tetranychid mite found in Golden delicious throughout the study was very low.

RESULTS AND DISCUSSION

Population dynamics of *A. andersoni* on Pink lady apple cultivar

The average number of different life stages (eggs , larva and adults) are shown in Figure 1 (mean ± SE). The highest egg densities were observed from 1st June to 1st July when on 11 June was recorded the highest mean number/leaf (0.4 ± 0.11). From 1st July onwards this number decrease gradually and persisted until end of September; afterwards no egg of *A. andersoni* was observed. Larval population followed almost the same pattern having maximum on 21 June with 1.05 ± 0.25 larva / leaf ; the second peak was observed on 30 July with 0.65 ± 0.18 larva / leaf and the third peak on 20 September with 0.35 ± 0.13 larva/leaf. This population persisted till October even though the number of larva found on leaf samples was low. Adult stage has dominated during the whole sampling period. The first peak of adult population was observed on 11 June with 2.1 ± 0.28 adults/leaf ; the second peak was observed on 11 July when it was recorded the highest adult densities with 3.2 ± 0.4 adults/leaf; afterwards adult population started to decrease and had the third peak on 20 September with 1.1 ± 0.19 adults/leaf (Figure 1).

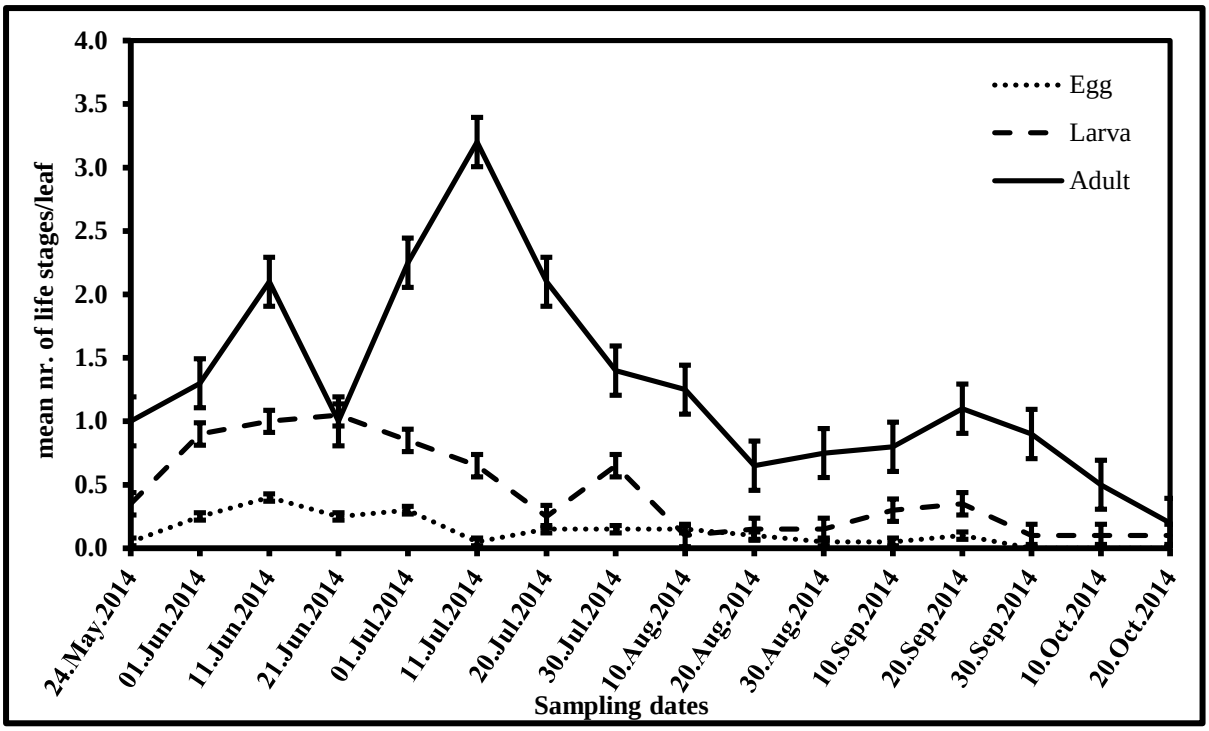

Figure 1. Mean number/leaf of life stages of *A. andersoni* (± SE) on Pink Lady apple cultivar

Population dynamics of *A. andersoni* on Golden delicious apple cultivar

During the period of study of dynamics population of *A. andersoni* on Golden delicious apple cultivar it was observed a very high number of adult population especially in the months of June and July with the peak on 11 July when it was observed the highest adult densities with 15.5 ± 3.71 adult/leaf; afterwards adult population decreased gradually and persisted until October. Larval population reached the maximum level on 21 June with 5.55 ± 1.12 larva/leaf; afterwards this population also decreased and had a very slight increase on 10 August with 0.55 ± 0.19 larva / leaf. Eggs were found mainly in the period May to June with the peak on 21 June with 1.75 ± 0.54 eggs /leaf. The lowest number was observed on 10 August with 0.1 ± 0.06 eggs / leaf. In the other sampling dates no egg of *A.andersoni* was observed (Figure 2). Significant differences were found only between adults (F = 4.42 ; P = 0.04) whereas between larval population (F = 0.91; P = 0.34) and eggs (F = 0.04; P = 0.82) no significant differences were found among two apple cultivars. Given that, both apple cultivars were plant in the same orchard and were undergone to the same applications with pesticides, we think that the differences in the number of phytoseiid mite between two apple cultivars may be due to a certain extent to the morphology of leaf surface because Golden delicious apple cultivar have a less pubescent leaves than Pink lady apple cultivar. Leaf hairs may prevent predators when searching for prey ; this way they need more time and have more difficulty to catch their prey and to complete their development. For this reason, the predators were more abundant in hairless apple cultivar than in the hairy cultivar especially in the first two months of summer. Duso and Pasini (2003) [6] reported that *A. andersoni* prefers the highly pubescent apple cultivars because of the availability of oviposition sites and protection from intraguild predation attack. Laboratory experiments have also demonstrated that generalist predators chose to oviposit more on pubescent leaves rather than on smother leaves [15]. However, Ferreira et al (2010) [8] reported that leaf structure that decrease phytoseiid mortality should not necessarily cause an increase in phytoseiid population. In our study from data collected, mobile stages of *A.andersoni* (larva, adult) where found more frequently on

Golden delicious even though they were found mainly in the period June - August whereas on Pink lady they had an increase also in September. Eggs were found more frequently on less pubescent cultivar than on hairy cultivar with the difference than in the former cultivar they were found only in the period May-June whereas on Pink lady female deposited their eggs till September. The preference of predatory mite shown in this study for a less pubescent leaves can't be absolute and the result of study are confounded because other factors (e.g volatile chemicals produced by a plant) may have interfere by attracting or repelling the predatory mite.

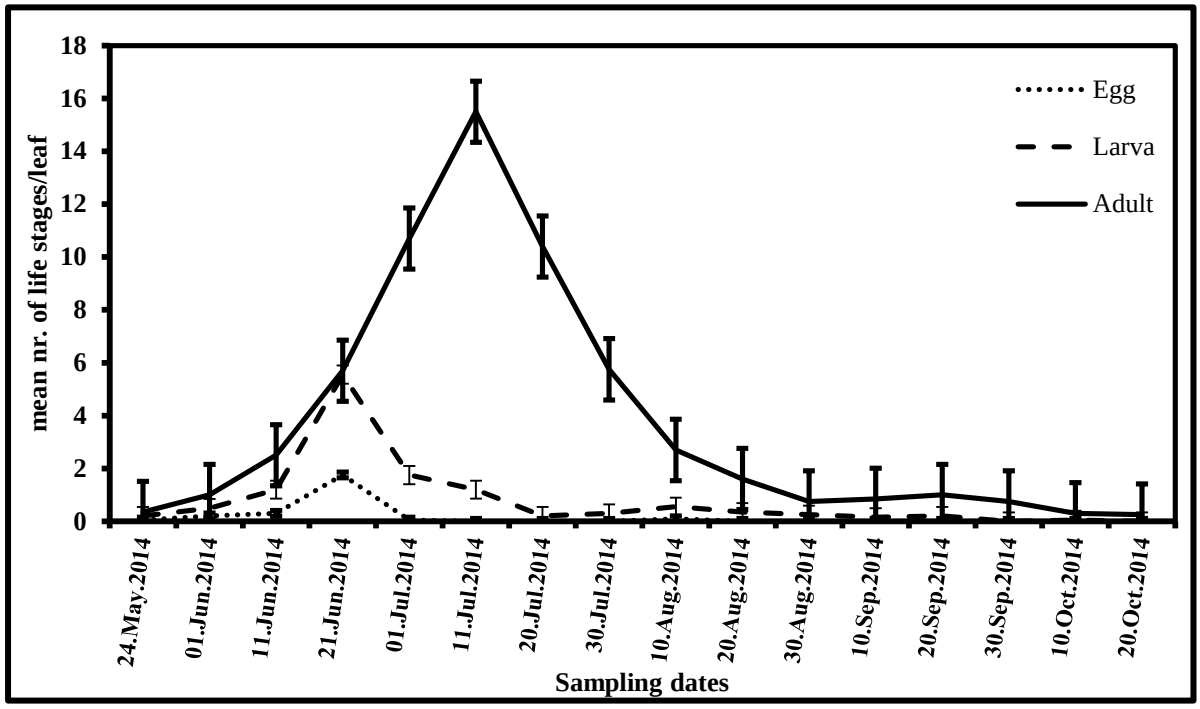

Figure 2. Mean number/leaf of life stages of *A. andersoni* (± SE) on Golden delicious apple cultivar

During the sampling period it was observed the presence of tetranychids mite especially on Pink lady apple cultivar where the first peak it was observed on 11 July with 0.6 tetranychids (eggs + mobile stages) / leaf, and the second peak on 30 August with 0.7 tetranychids / leaf. In contrast on Golden delicious apple cultivar it was observed a very low number of tetranychids / leaf only in three sampling dates ; on 1st July (0.5 mite /leaf) , on 10 August (0.1 mite / leaf and on 10 September (0.5 mite / leaf) (Figure 3). The population of tetranychid mite differed significantly among apple cultivars ($F = 12.19$, $P = 0.001$). Because of the less hairy structure of Golden delicious leaves the predator was able to move faster and find their prey. This may explain the very low number of tetranychids / leaf in this apple cultivar. In the other hand as we mentioned above in this cultivar it was observed a very high mean number of the predatory / leaf. *Amblyseius andersoni* it is considered a generalist predator able to feed on other food sources when the prey is scarce. This may be the reason of the high number of this predatory on Golden delicious apple cultivar even though the number of tetranychids / leaf was low.

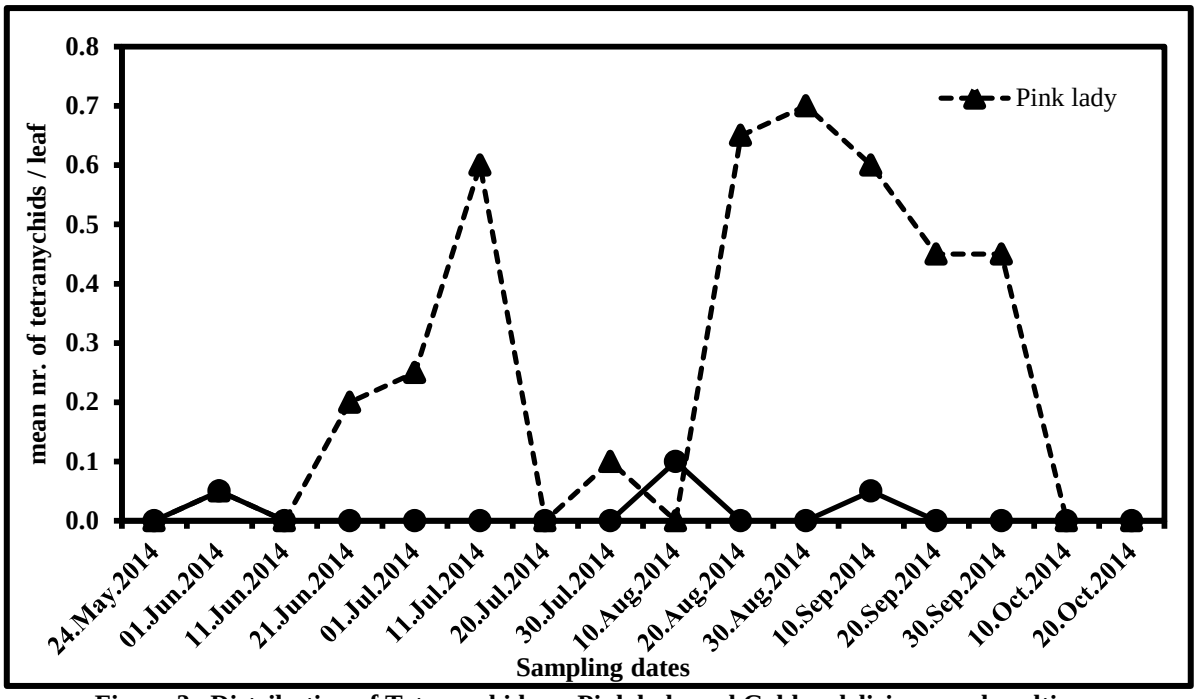

Figure 3. Distribution of Tetranychids on Pink lady and Golden delicious apple cultivar. Figure shows mean number/leaf (egg + mobile stages)

Tetranychids mite population recorded on leaves of Pink lady apple cultivar during the overall observed season was positively correlated with temperature ($R^2 = 0.263$; $P = 0.042$) with regression equation $y = 0.0597x – 1.1518$ (Figure 4). In contrast a no significant linear relation was observed between mean number of *A. andersoni* and temperature on both apple cultivars (Pink lady: $R^2 = 0.033$; $P = 0.501$) with regression equation $y = 0.0836x – 0.1424$ and (Golden delicious: $R^2 = 0.0015$; $P = 0.898$)) with regression equation $y = -0.0902x + 6.4217$ (Figure 5).

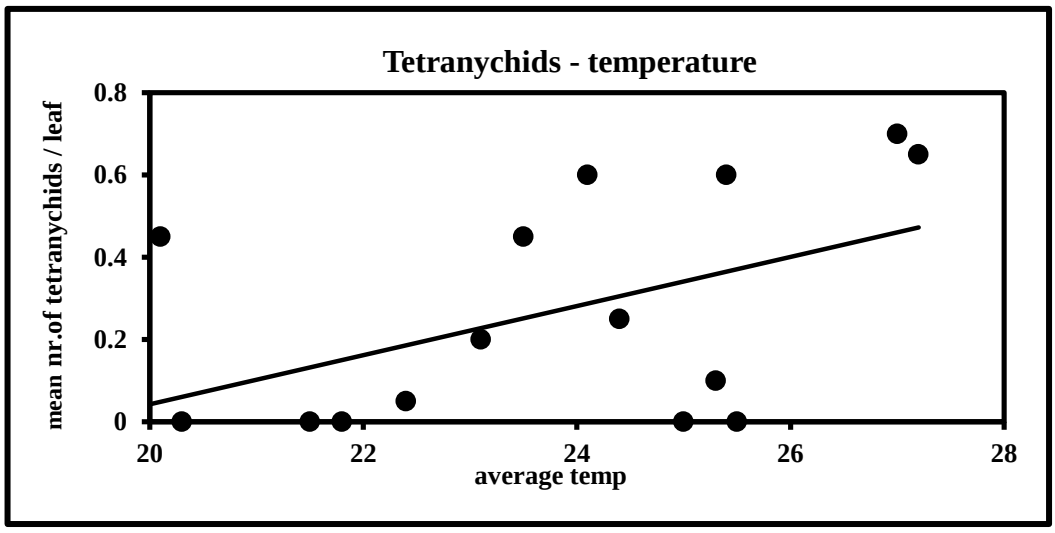

Figure 4. Linear regression of mean number of Tetranychids and temperature on Pink lady apple cultivar

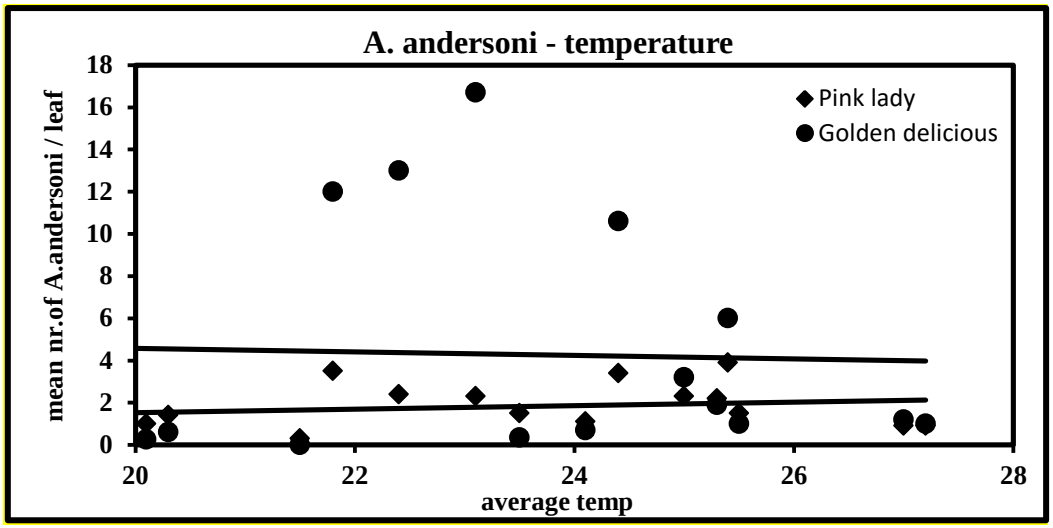

Figure 5. Linear regression of mean number of *A. andersoni* and temperature on Pink lady and Golden delicious apple cultivar.

CONCLUSIONS

From data collected during the study of the dynamics population of *A. andersoni* on two apple cultivars it was observed a considerable number of the predatory mite/leaf especially on Golden delicious apple cultivar whereas on Pink lady the number of predatory mite/leaf was lower. Tetranychids mite were found in higher densities on Pink lady apple cultivar whereas on Golden delicious only in three sampling dates where found a very low number of tetranychids/leaf. From data collected we came to the conclusion that the morphology of the leaf surface can play an important role in the distribution and dynamics population of phytoseiid mite. Although the results of this study are contrary to previous studies conducted from other researchers we think that other observation in this apple orchard should be conducted in order to determine if other factors except physical structure of leaves have influenced phytoseiid behaviour and population dynamics.

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