



Population development of European red mite, *Panonychus ulmi* (Koch) (Acari: Tetranychidae) on apple orchards in Çanakkale, Turkey

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ABSTRACT: The aim of this study was to determine the seasonal population dynamics of the European red mite, *Panonychus ulmi* (Koch) (Acari: Tetranychidae) on different apple varieties in apple orchards in Çanakkale, Turkey, during 2010-2011. Surveys were carried out weekly from April to November in sprayed and unsprayed orchards on cultivated Golden Delicious, Starking Delicious and Grany Smith apple varieties. The results of the study indicated that the population density of spider mites began to increase generally in early May, and reached the maximum level from mid June to late August. Afterwards, it preserved to late September in both years. During the both years, *P. ulmi* more preferred the Starking Delicious than Golden Delicious and Grany Smith apple varieties in the all orchards. In this period, the population density of *P. ulmi* reached to maximum level with 115.9 and 75.3 mites/per leaf on the Starking Delicious apple variety in 2010 and 2011 years, respectively in sprayed orchards. In unsprayed orchard, spider mites remained at very low levels certainly because of the presence of *Typhlodromus athiasae* Porath and Swirski (Acari: Phytoseiidae) which was only one predator species on spider mites. On the other hand in sprayed orchards, although *Stethorus punctillum* (Col.: Coccinellidae) and *Zetzellia mali* (Acari: Stigmaeidae) were the most abundant predatory species on spider mites, they could not control the spider mites on both apple cultivar and years.

Keywords: Apple, Çanakkale, *Panonychus ulmi*, population dynamics, Tetranychidae

INTRODUCTION

Apple is one of the most common crops in the world, and also Turkey. About 3.032.164 tons of apple are produced per year in Turkey. Also, apple is one of the major fruit crop in the Çanakkale region of Turkey, where approximately 101.943 tons of apple including 3.36 % of Turkey's total apple production are produced per year in 41.767 ha area (Anonymous, 2017).

Although many arthropod species and diseases cause economic losses on apple areas, spider mites are one of the most important pests of apple production areas throughout the world. The European Red Mite, *Panonychus ulmi* Koch. (Acari: Tetranychidae) is the most serious species of these spider mites in apple areas. It can be damaged nearly all apple growing areas in both Çanakkale province and Turkey (Huffaker et al., 1970; McMurtry et al., 1970; Jeppson et al., 1975; Düzgüneş, 1977; Şekeroğlu, 1977; Yiğit and Uygun, 1982; Erkam and Gürkan, 1983; Çiftçi et al., 1985; Uygun et al., 1992; Karaca, 1994; Erol and Yaşar, 1996; İncekulak and Ecevit, 2002; Bulut and Madanlar, 2004; Kasap, 2004; Yanar and Ecevit, 2005; Kasap and Çobanoğlu, 2007). In many commercial apple orchards, the chemical applications are used for management of the European Red Mite, *P. ulmi* and other pest mites. The disruptive effects of these pesticides, especially due to development of resistance by pests, have led to greater reliance on natural enemies for their control in the Çanakkale region (Erol and Yaşar,

1996; Atlihan et al., 2002; Yardım et al., 2002). However, as a result of the use of intensive pesticides, the elimination of natural enemies from the environment has been causing spider mites outbreaks. The effects of predatory mites on the seasonal abundance of spider mites have not been previously investigated in commercial apple orchards in Çanakkale.

In recent years, population densities and economical importance of spider mites has greatly increased in Çanakkale. However, population dynamics of the European red mite *P. ulmi* and their natural enemies in apple orchards has been poorly investigated. The present study was primarily designed to provide data on the population dynamics of the European red mite *P. ulmi* and their natural enemies in Çanakkale province of Turkey.

MATERIAL AND METHODS

Ten apple orchards (4 orchards in Bayramiç-Evciler, 2 orchards in Çanakkale-Kepez, 1 orchard in Çanakkale-Kepez and 3 orchards in Yapıldak Lepseki-Umurbey) were selected to determine the population dynamic of *Panonychus ulmi* on apple orchards (Starking Delicious, Golden Delicious and Grany Smith apple varieties) in the Çanakkale province during 2010 - 2011 years. In 2011, two apple orchards (1 orchard in Bayramiç-Evciler, (Golden Delicious, Starking Delicious apple varieties) 1 orchard in Çanakkale-Kepez and 1 orchard in Çanakkale-Umurbey) were added to these orchards. Of these or-

chards, Evciler 3-4 and Yapıldak, Umurbey 3 are completely without pesticides and other orchards, especially Kepez 1-2 and Evciler 1-2, are heavily sprayed with pesticides. The apple cultivars, Golden Delicious and Starking Delicious, were planted in a mosaic in these orchards, but the Grany Smith apple cultivar was also planted. The size of these gardens is about 20-80 decares, and the age of trees ranged between 8-20 years. Samplings were carried out from selected apple trees in every week from March to November for the both years. For sampling, 10 apple trees that the best represent of the orchard were determined for every apple orchards using in experiments and 10 leaves from every apple trees in these orchards were collected. In total, one hundred leaves of apple trees were collected from every apple orchards. Three leaves were collected randomly from the periphery (1.2—2.3 m high) of the marked trees. The leaves were brought to the lab in plastic containers and stored at 4 °C in the refrigerator. The *P. ulmi* on leaves collected from apple orchards were counted using the spider mite brushing machine. Firstly, the mites were brushed from the leaves with brushing machine onto a collecting plate and then all stages such as egg and motile stages of *P. ulmi* were counted under stereomicroscope (magnification 40 x) in the Acarology and Systematic Laboratory of Çanakkale Onsekiz Mart University within three days after collection from apple trees. Afterwards, the results obtained as total leaves were then rated to be individual per leaf (Henderson and McBurnie, 1943).

RESULTS

Seasonal fluctuations of the European Red Mite, *P. ulmi* varied in sprayed and unsprayed orchards throughout the study period (Fig 1). The population of *P. ulmi* reached the highest density in different period in different apple orchards of Çanakkale Province (Kepez, Evciler, Yapıldak and Umurbey) during 2010 and 2011 (Fig 1). As a result of counting in the Kepez 1 orchard, it was determined that population of *P. ulmi* showed an increase from May to October during 2010. In Kepez 1 orchard, this population reached the peak twice in the year with 49.9 and 48.1 mites per leaf on the Starking Delicious apple cultivar and 24.6 and 25.1 mites per leaf on the Golden Delicious apple cultivar and then continued to decrease until the end of the year. In 2011 year, *P. ulmi* population peaked with 66.8 and 53.6 mites per leaf on the Starking Delicious apple cultivar and 52.4 and 53.9 mites per leaf on the Golden Delicious apple cultivar. In the Kepez 2 orchard, population of *P. ulmi* reached to the peak twice both July and August during 2010 with 28.4 and 23.1 mites per leaf on the Starking Delicious apple cultivar and 15.2 mites per leaf on the Golden Delicious apple cultivar. But, in 2011 year, on Starking and Golden Delicious apple cultivars, the *P. ulmi* population had a lower peak with 19.4 and 4.0 mites per leaf respectively. However, it was determined that population density of *P. ulmi* in the Kepez 2 orchard lower than other orchard. In this period, Evciler 1 and 2 orchards, the population densities of *P. ulmi* reached the maximum level with 115.9 and 75.3 mites/per leaf on the Starking Delicious apple variety in 2010 and 2011 years, respectively in sprayed orchards. But, in the same orchards on Golden Delicious apple culti-

vars, the *P. ulmi* population had a lower peak with 69.6 and 14.8 mites per leaf, respectively.

From untreated orchards with pesticides, the Yapıldak 1, population of *P. ulmi* almost never observed on all apple varieties during both 2010 and 2011. In Kepez and Evciler orchards, population densities of *P. ulmi* were quite high level because of the fact that natural enemies were not effective due to intensive use of chemicals against *P. ulmi*. However, *Typhlodromus athiasae* (Acari: Phytoseiidae) which natural enemy of spider mites was effective against *P. ulmi* in Yapıldak 1 orchard where pesticides were not used. As a result of the present study, population density of *P. ulmi* showed an increase from April to October during both 2010 and 2011 in sprayed orchards. In these orchards, *Stethorus punctillum* (Coleoptera: Coccinellidae) and *Zetzellia mali* (Acari: Stigmaeidae) that is an important natural enemy of spider mites was effective on *P. ulmi* during both years.

DISCUSSION

This study strongly suggests that pesticide applications changed the population development and the pattern of dominance of spider mites in apple orchards. Also, pesticide application apparently resulted in an increase in *P. ulmi* populations in the two sprayed orchards and years on apple cultivars in Çanakkale. These results are in agreement with Amano and Chant (1990), Hardman et al. (1997), Van de Vrie (1985) and Yanar and Ecevit (2008). Kasap (2011) reported that the population densities of *P. ulmi* began to increase generally in early May, reached the maximum level from mid June to late August and maintained until late September in 2002 and 2003 years in Van province. He informed that the dominant species on Golden and Starking Delicious apple cultivars was *P. ulmi* in Van province. In addition, Kasap (2011) indicated that in unsprayed orchards, spider mites remained at very low levels because of the presence of predaceous mite *Kampimodromus aberrans* (Oudemans) (Acari: Phytoseiidae) which was the only predator of spider mites. On the other hand, in sprayed orchards, although *S. punctillum* and *Z. mali* were the most abundant predatory species on spider mites. Also, Yanar & Ecevit (2008) reported that the dominant phytophagous mites in sprayed orchards in Tokat, Turkey, were *A. viennensis* and *P. ulmi*, whereas in unsprayed orchards they were *Eotetranychus uncatus* Garmann (Tetranychidae) and *Cenopalpus pulcher* Can. and Fanz. (Tenuipalpidae). Predatory mites could able to control spider mites in no pesticide application orchards, but not in the sprayed orchards. İncekulak & Ecevit (2002) also reported that spider mites populations were suppressed by predators in unsprayed orchards in Amasya, Turkey. The results obtained in this study are consistent with the results of studies on the other spider mites and also *P. ulmi*.

The results of this study suggest that predatory phytoseiids may play a major role in the control of spider mites in the Çanakkale province of Turkey, if not killed by the use of pesticides.

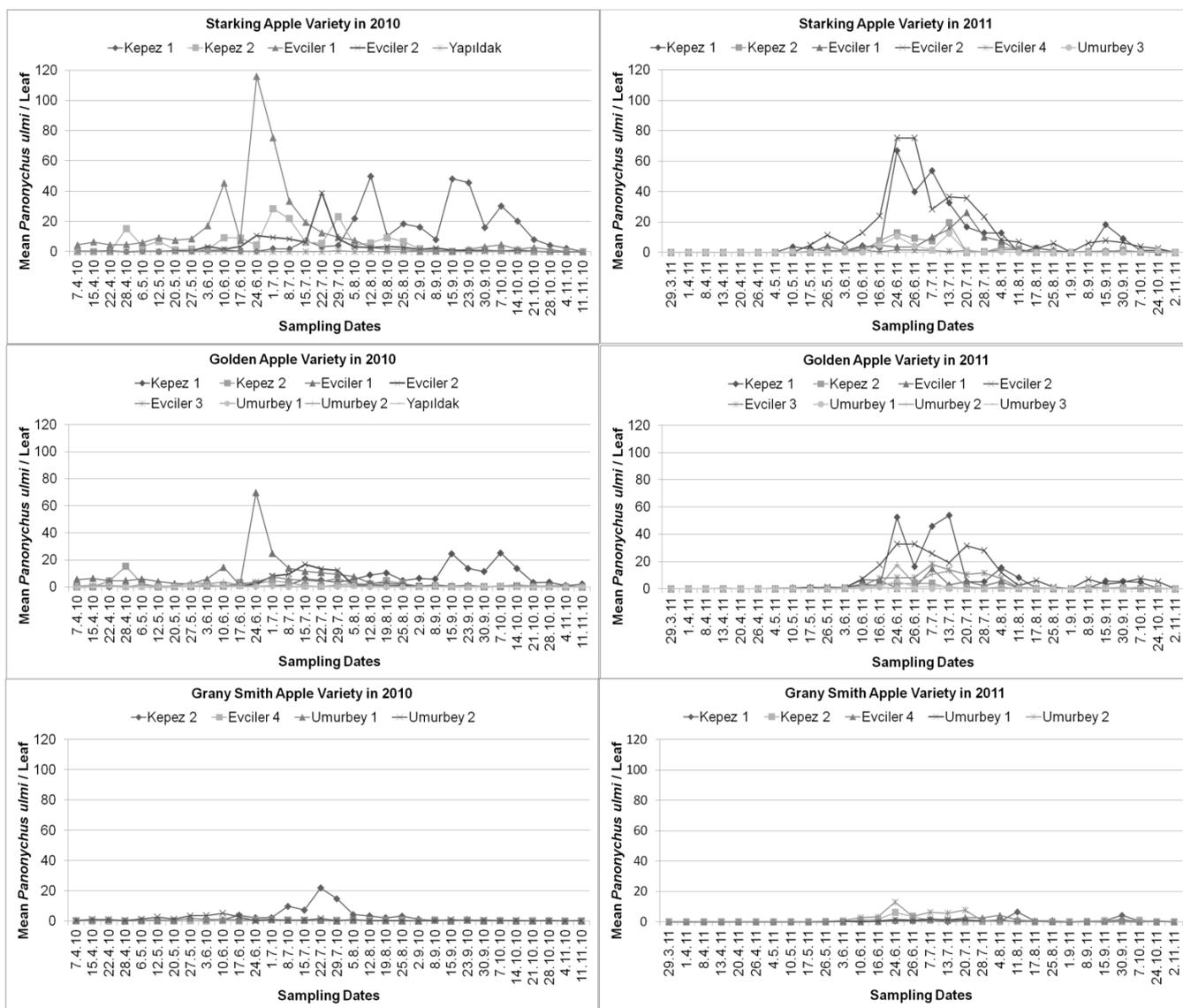


Figure 1. The population of *Panonychus ulmi* on different apple cultivars in 2010 and 2011

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