

Determination of Food Preference of *Tetranychus urticae* Koch (Acari: Tetranychidae) in Different Strawberry Varieties

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Abstract – This study was carried out to determine the food preference of *Tetranychus urticae* Koch (Acari: Tetranychidae) of the spider mites in 5 different greenhouse strawberry cultivars (Albion, Monterey, Rubygem, Amiga and Sweet Ann). In the leaf samples taken from strawberry varieties, spider mite nymphs and adults were counted. In the study, the average spider mite population per leaf was lowest in Rubygem (2.02) and Amiga (9.22) strawberry varieties. The average number of spider mites per leaf was determined as 28.03 in the Sweet Ann strawberry variety, 46.12 in the Albion variety and 52.48 in the Monterey variety. Observations during the study showed that the plants of the Albion and Monterey varieties suffered great damage due to the spider mite population. As a result, it was determined that the spider mites prefer the Albion and Monterey strawberry varieties.

Keywords – Spider Mites, *Tetranychus urticae*, Strawberry, Variety, Food Preference.

I. INTRODUCTION

Strawberry (*Fragaria x ananassa* Duch.) is one of the most important fruit in the berry family due to its distinctive flavor, rich vitamins, other fruity ingredients and very different consumption patterns, and it belongs to the Rosales order of the Rosaceae family of *Fragaria* genus (Hancock, 1990). Strawberry can be economically produced in various climatic and soil conditions. Besides being a fruit that is much liked, it also has various consumption alternatives (jam, cake, marmalade, fruit juice). Nowadays, there is much research done on the effects of fruits on human health, so the importance of strawberries has increased. Strawberries, with its rich mineral content and unique flavor and aroma, are also an important source of antioxidant compounds such as anthocyanins and phenolic acids (Beattie *et al.*, 2005). The return on investment in Strawberry cultivation is fast and the gain per unit area is higher than many other products. For these reasons, strawberry cultivation in the world and our country has continuously expanded in production and as a field. In the world, Turkey is in the 4th biggest in strawberry production (FAO, 2014) with 376.070 tons of produce, followed by China (3.122.036 t), America (1.371.573 t) and Mexico (458.972 t). Strawberry production in our country is concentrated in the Mediterranean (217.094), Aegean (86.021) and Marmara (64.446 t) regions, respectively (TUIK, 2016). In the Western and Central-Eastern Anatolia Region and the

Black Sea Region, the interest in strawberry production is also increasing (Demirsoy and Serce, 2016). Strawberry is a fruit that requires great care both in the production and also in the marketing phases. Pests, diseases, and problems caused by weeds are the most important factors negatively affecting strawberry production. Pests that cause productivity to go down in strawberries are *Chaetosiphon fragaefolli* Cockerell (Homoptera: Aphididae), *Tetranychus urticae* Koch and *T. cinnabarinus* (Boisduval) (Prostigmata: Tetranychidae), *Aphis gossypii* Glover (Homoptera: Aphididae). And the spider mites (*T. urticae* and *T. cinnabarinus*) are known to be the pests that do the most harm to production (Erkilic *et al.*, 1996; Madanlar and Yoldas, 1996). As one of the most important pests of cultivated plants, the spider mites cause serious damage since their population increases rapidly and they feed on the plant (Jeppson *et al.*, 1975). Generally, producers prefer to apply acaricide to prevent the harmful effects of spider mites. Since medicinal treatment of strawberries is difficult and harvest is made at frequent intervals, it is necessary to considerably reduce the use of medicine in the chemical struggle against spider mites due to the residual problem. For this reason, using resistant plant varieties is very important (Bulut *et al.*, 2004). There is also biological struggle, though limited. Due to the negative effects of chemicals on the environment and human health, alternative methods to chemicals have been gaining importance in recent years. Biological combat and cultural measures have an important place in alternative methods against pests. Particularly, one of the cultural measures in the struggle against pest is determining the varieties that the pests do not prefer and steer production towards those. In this study, it was aimed to determine the populations of spider mites, which an important problem in strawberry cultivation, in Albion, Monterey, Rubygem, Amiga and Sweet Ann strawberry cultivars produced in greenhouses.

II. MATERIAL AND METHOD

The main material of the study is the strawberry varieties (Albion, Monterey, Rubygem, Amiga and Sweet Ann) produced in greenhouses at Ondokuz Mayıs University, Faculty of Agriculture, and the spider mites living on these varieties. Monterey is moderate to weak in expressing the day-neutral character. It originates from California and has a high yield and fruit quality. The plant

structure is similar to Albion, but it has bigger and higher growing plants than Albion (Shaw *et al.*, 2009). Albion originates from California and is moderate to weak in expressing the day-neutral character. It is known for its high fruit quality, long conical fruit shape, dark fruit color, and high fruit firmness. The plants are open in structure, its leaf stalks are short and leaves are thick (Shaw *et al.*, 2006). It has exceptional fruit quality. Sweet Ann, originating from California, is a day-neutral variety and stands out with its high efficiency, exceptional fruit flavor, and large or very large fruits. It has an open structure and strong growing plants (Bagdasarian, 2011). Rubygem originates from Australia and is a high yielding short-day variety. Its known for its attractive, medium-sized, bright red, firm and very tasty fruits. Its fruits have a highly desirable sugar/acid ratio (Herrington *et al.*, 2007). It has open structured strong growing plants. Amiga, which originates from Spain, is an early short-day variety. It is known for its high fruit firmness, high yield, and long shaped fruits. Its plants are strong and tend to produce numerous runners (Carmen *et al.*, 2008). Two species of *T. urticae* (*T. cinnebarinus* and *T. urticae*) were counted separately in the study conducted. However, studies conducted in recent years indicate that *T. cinnebarinus* is the red form of the *T. urticae* (Auger, 2013). For this reason, these two species were considered as *T. urticae* in our study.

Planting in the experiment was carried out with frigo seedlings on plots prepared in plastic greenhouses. For the planting of the strawberry seedlings, plots with a top width of 65 cm, base width of 80 cm, and height of 25-30 cm were prepared. During the preparation of the soil, burnt farm fertilizer was mixed with 5 ton/da on the plots. The planting was done in two rows using the triangle planting method with 30 x 30 cm between rows. The experiment was carried out according to the randomized plot design; 4 replications with 20 plants each. After planting, plants were irrigated with a drip system. During the season, recommended fertilization and cultural maintenance procedures for strawberries were regularly carried out. In addition, no acaricide was applied until the date of observation in the parcels where the study was done. In the period when the spider mite population was intensive, a total of 100 strawberry leaves were taken from each of the varieties (randomly 25 for each replication) and brought to the laboratory and the spider mite adults and nymphs on these leaves were counted. The One-way ANNOVA Duncan multiple comparison test was performed on the obtained data in the SPSS program to evaluate the spider mite population in the varieties.

III. RESULT AND DISCUSSION

The results obtained in the study are given in table 1. As can be seen in the table, the average number of spider mite per leaf was determined to be the lowest in the Rubygem (mean 2.02 /leaf) and Amiga (mean 9.22 /leaf) strawberry varieties. In the Sweet Ann strawberry variety, the average was 28.03 per leaf, in Albion 46.12 and in Monterey 52.48. As a result of analytical statistics, Albion

and Monterey were in the same group, Sweet Ann was in a different group, Rubygem and Amiga were in a separate group. Observations during the course of the study showed that plants in each of Albion and Monterey varieties were severely damaged due to the spider mite populations.

Table 1. The average number of spider mite per leaf population in the strawberry varieties.

Strawberry varieties	The number of <i>Tetranychus urticae</i> (mean/per leaf)
Rubygem	2.02 ± 0.88 c
Amiga	9.22 ± 2.72 c
Swtty Ann	28.03 ± 5.78 b
Albion	46.12 ± 9.25 a
Monterey	52.48 ± 7.81 a

Many researchers from different countries claim that the most important pests of the strawberry are the spider mites (Raworth, 1990; Benuzzi and Nicoli, 1993; Decou, 1994; Watanabae *et al.*, 1994; Chang and Huang, 1995; Shibao *et al.*, 1995; Easterbrook, 1998; Gauthier *et al.*, 1998). It is known that *T. urticae* and *T. cinnabarinus* are the most important strawberry pests in Turkey (Erkilic *et al.*, 1996; Madanlar ve Yoldaş, 1996; Anonymous, 2008; Kışmalı *et al.*, 1999; Kaplan and Yucel, 2014). Similarly, *T. urticae* and *T. cinnabarinus* species were observed in all strawberry varieties examined in this study. In recent years *T. cinnebarinus* has been reported to be the red form of *T. urticae* (Auger *et al.* 2013).

As a result of the study, it has been determined that the spider mites can form different populations in different strawberry species and can do different levels of damage. In this study, it was observed that spider mites prefer Monterey and Albion varieties especially for feeding, and that Rubygem and Amiga varieties are less harmed. According to this study, it is beneficial to produce Rubygem and Amiga varieties in regions where strawberry cultivation is a problem.

Many studies in the world have also reported that spider mites lead to major problems in strawberries. (Port and Scopes, 1981; Raworth, 1990; Easterbrook, 1992; Benuzzi and Nicoli, 1993; Decou, 1994; Pagona *et al.*, 1994; Watanabae *et al.*, 1994; Chang and Huang, 1995; Shibao *et al.*, 1995; Easterbrook, 1998; Gauthier *et al.*, 1998).

Bulut *et al.* (2004) have concluded that a study of *Tetranychus cinnabarinus* in two strawberry species (*Fragaria vesca* and *Fragaria ananassa*) suggests that *F. vesca* is a less preferred host than *F. ananassa*.

In addition, pesticides are widely used today, resulting in pests resistant to pesticides. Also, environmental pollution, residues and many other problems are emerging. During the fruit-bearing period of strawberry cultivation, particularly mites are seen. There is the flower, immature fruit and ripe fruit during the period. The use of pesticides is very disadvantageous when ripe fruits are present.

For these reasons, an integrated approach to combat has been widespread, aiming at keeping agricultural combat methods harmonious in order to solve plant protection problems and to keep the diseases, pests, and weeds, which is a problem in plant production, below the level of

economic damage. Because of this approach, biological and cultural methods of struggle against harmful mites are very important. This study showed that selection of resistant strawberry varieties could be a very effective cultural measure in the struggle against pests.

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