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# Survey of mite species of tea plantations in Rize

## Rize ili çay alanlarındaki akar türlerinin sürveyi

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ABSTRACT

This study was carried out between 2017-2019 to determine the mite species found in the tea gardens of Rize province (Türkiye). During the study, surveys in 9 districts (Ardeşen, Çayeli, Derepazarı, Fındıklı, Güneysu, İyidere, Kalkandere, Centre and Pazar) were carried out between May and September with the random sampling method, corresponding to the tea plant's 1st, 2nd and 3rd shoot period. Studies were conducted in 73 tea gardens in 9 districts in the first shoot period, 107 tea gardens in the 2nd shoot period and in 97 tea gardens in the 3rd shoot period and plant samples were taken. At the end of the study, *Polyphagotarsonemus* latus (Banks) (Acari: Tarsonemidae) was the most common and highest number detected species with 49.7%. Other mites identified are *Calacarus carinatus* (Green) (Prostigmata: Eriophyidae) with 24.3%, *Brevipalpus phoenicis* (Geijskes) (Prostigmata: Tenuipalpidae) with 19.9%, *Tydeus californicus* (Banks) (Prostigmata: Tydeidae) with 17.1%, *Neoseiulus californicus* (Oudemans) (Mesostigmata: Phytoseiidae) with 5.9%, *Czenspinskia transversostriata* (Oudemans) (Acari: Winterschmidtiidae) with 2.9%, *Tuckerella* sp. (Prostigmata: Tuckerellidae) with 1.8%, and Oribatida species, respectively. The mites found in this study have been completed in a way that integrates with previous studies.

## INTRODUCTION

*Camellia sinensis* (L.) Kuntze is a plant from the family Theaceae, grown in humid climates, and its leaves and buds are used as a beverage. The history of this plant is much older than expected, dating back to the BC Chinese Empire. It dates back to 2737 years. Tea, which was started to be used for medical reasons at first, has turned into a beverage that cannot be given up over time. Although its gene center is in China, India, Vietnam, Laos, Cambodia, and Myanmar, it is also grown in tropical and subtropical regions around the World (Üstün and Demirci 2013). While tea cultivation iscarried out for 12 months in tropical and equatorial regions, tea production is carried out only 6 months of the year in countries with high latitudes such as Türkiye and Iran (Anonymous 2022). According to FAO statistics, China has 41%, India 21%, Kenya 8%, Sri Lanka 5%, Vietnam 4%, Türkiye 4%, Indonesia 2%, Iran 2%, and other producing countries 13% of world tea production in 2018 (Anonymous 2022). Tea which has been known for 400 years in Türkiye and has been produced economically for the last 70 years is a type of beverage that is widely consumed and adopted by all segments of society. It is also an important market in which the public and private sectors are active. Türkiye is among the world's leading countries in tea production and consumption. Tea farming is carried out in the Eastern Black Sea Region, from the Georgian border to the Fatsa district of Ordu province (Anonymous 2013). 66.4% of the tea areas are in Rize with 554.4 thousand decares, 20.3% in Trabzon

with 169.6 thousand decares, 10.8% in Artvin with 90.2% and 2.4 of them are located in Giresun with 20.3 thousand decares. All tea-producing areas in Türkiye are located in these four provinces. In the 2020 production period, tea agriculture increased by 6.21% compared to the previous production period and was carried out on 834 thousand hectares. Many pests have been identified in tea plant around the world. Among these, there are very important mite families that damage plants such as Tetranychidae, Tarsonomidae, Tenuipalpidae, Eriophyidae, and Acaridae.

In our country, 14 mite species, 5 of which are harmful, 3 are predators, and 6 are saprophytes and mycophagous, have been found in tea gardens in the Black Sea Region. (Ozman-Sullivan et al. 2006). Also, Ozman-Sullivan et al. (2006, 2007) studied the distribution and population densities of mites found in tea gardens. However, in these studies, the prevalence and density of mites were determined very little and were not found to be at a level that required struggle. Over the years, it has been decided to study this subject after complaints from tea producers. For this purpose, this study was carried out between 2017-2019 to determine the mite species found in the tea gardens in the districts of Rize province (Türkiye). In our study, the densities of the mites were found to be high, especially the yellow tea mite density was at a level that required serious struggle.

## MATERIALS AND METHODS

### *Material*

The main material of the study consisted of clone tea gardens infested with mites.

### *Field studies*

Field studies were carried out in the tea gardens of Rize Province Centre, Ardeşen, Çayeli, Derepazarı, Fındıklı, Güneysu, Iyidere, Kalkandere, and Pazar districts between May and September 2017, coinciding with the 1st, 2nd and 3rd shooting periods (Figure1 a, b and c). Accordingly, surveys were conducted in 73 tea gardens in the first shoot period, 107 tea gardens in the second shoot, and 97 tea gardens in the third shoot. Field studies were carried out according to the random sampling method in cooperation with the Atatürk Tea and Horticultural Research Institute. For this purpose, surveys were carried out to represent these areas, provided that the sampling error is not less than 1% of the tea cultivation area in Rize province and the sampling error is not greater than 0.05 (Yazıcıoğlu and Erdoğan 2014). GPS was used to determine the horizontal and vertical position of the sample area. An average of 25 leaf samples were taken from different edges and shoot tips of the tea plant in each garden, placed in paper bags and then in polyethylene bags, and brought to the laboratory. While the samples were collected from the orchards determined in the study area, the collection date was recorded together with the locality name, altitude and geographical coordinate. The samples brought to the laboratory were examined under a stereomicroscope.

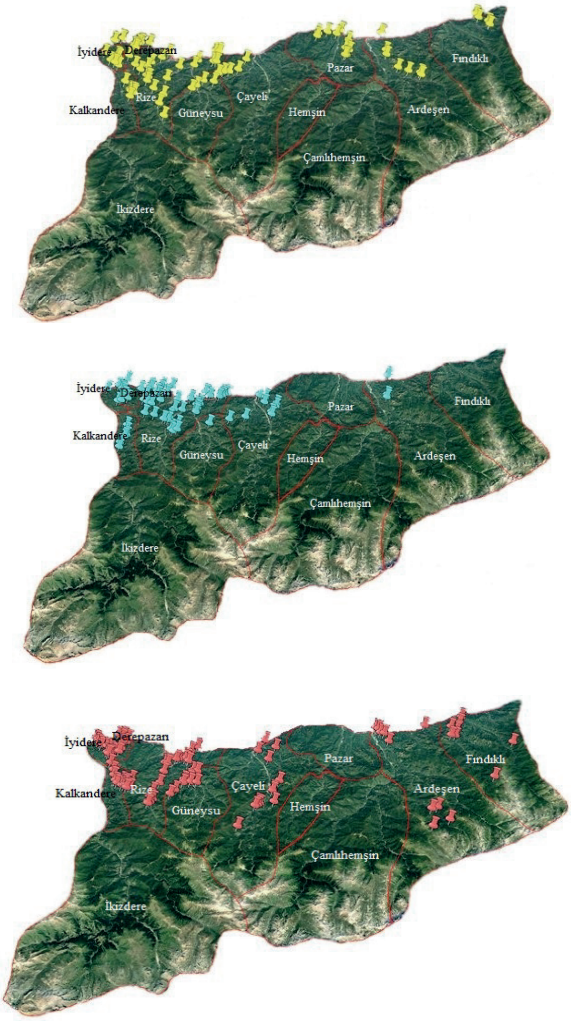


**Figure 1**. a Survey areas of the first exile period, b- Survey areas of the second exile period, c- Survey areas of the third exile period.

### *Laboratory studies*

The upper and lower surfaces of the leaves were checked under a microscope and the mites found were taken into 70% ethyl alcohol. In addition, the same tea samples were extracted using the Berlese funnel method, and different types of mites were obtained (Düzgüneş 1980).

### *Mite preparation*

The method suggested by Ecevit (1976) and Gutierrez (1985) was used in the preparation of mites. All of the mites were mounted on slides by using Hoyer's medium.

A Leica DM LB 2 microscope with phase contrast was used for identification purposes. All measurements are evaluated in micrometers.

*Identification of mites detected in tea gardens*

For species identification, Nucifora (1963), Dhooria and Bindra (1977), Costilla (1980), Fletchman and Rosa (1980), Aubert et al. (1981), Laffi (1982), Smith et al. (1997), Pritchard and Baker (1951, 1958), Baker (1965), Tuttle and Baker (1968), Muma and Denmark (1970), Jeppson et al. (1975), Krantz (1978), Gutierrez et al. (1979), Alaoğlu (1984), Chant and Yoshida-Shaul (1986), Çobanoğlu (1993 a,b,c,d, 1995, 1996, 2000), Geijskes (1939)'s definitions and keys were used. In addition, confirmation of the species descriptions was provided by Prof. Dr. Eddie A. Uckermann (*Neoseiulus californicus* and *Tydeus californicus*), Prof. Dr. Gerald W. Krantz (*Czenspinskia transversostriata*), Dr. Owen D. Seeman (*Tuckerella* sp.).

Identified species are preserved in the collection of the Directorate of Plant Protection Central Research Institute, Department of Agricultural Fauna and Microflora.

## RESULTS AND DISCUSSION

As a result of this study, a total of 7 different mite species from 7 families were determined in the tea fields of 9 districts in Rize between the years 2017-2019. Of these, one species was identified at the genus level and the other at the family level (Table 1).

**Table 1.** Mite species determined in tea gardens in Rize province

| Family | Species | Overall total | (%) Percentage |
|---|---|---|---|
| Tarsonemidae | *Polyphagotarsonemus latus* | 305 | 49.7 |
| Eriophyidae | *Calacarus carinatus* | 149 | 24.3 |
| Tenuipalpidae | *Brevipalpus phoenicis* | 122 | 19.9 |
| Tydeidae | *Tydeus californicus* | 105 | 17.1 |
| Phytoseiidae | *Neoseiulus californicus* | 36 | 5.9 |
| Winterschmidtiidae | *Czenspinskia transversostriata* | 18 | 2.9 |
| Tuckerellidae | *Tuckerella* sp. | 11 | 1.8 |

**Family: Tarsonemidae**

**Species: *Polyphagotarsonemus latus* Banks (1904)**

Synonymous: *Tarsonemus latus* Banks (Lindquist, 1986)

Material examined: (316 ♀, 61 ♂)

Ardeşen: Akdere, 523 m, 20.09.2017, 4 ♀♀, 3 ♂♂, Akyazı, 454 m, 20.09.2017, ♀, Düz, 58 m, 20.09.2019, 2 ♀♀, Işıklı, 7 m, 20.09.2017, 3 ♀♀, ♂, Köprübaşı, 25 m, 20.09.2017, 2 ♀♀, Pinçuk, 125 m, 13.07.2017, 3 ♀♀, Pirinçlik, 165 m, 20.09.2017, ♀, Seslikaya, 223 m,13.07.2017, 5 ♀♀, ♂, Yeniyol (Oce), 2 m, 20.09.2017, ♀, ♂, Yeşiltepe, 360 m, 20.09.2017, 7 ♀♀; Çayeli: Altıntaş, 372 m, 18.07.2017, 2 ♀♀, 2 ♂♂, Aşıklar stream, 70 m, 12.07.2017, 4 ♀♀, Buzlupınar, 283 m, 26.09.2017, 2 ♀♀, ♂, 290 m, 26.09.2017, 3 ♀♀, Büyükköy, 460 m, 26.09.2017, 4 ♀♀, ♂, Çataldere, 719 m, 26.09.2017, 2 ♀♀, Çaykent, 55 m, 06.06.2017, ♀, 170 m, ♀, Gülpaşa, 90 m, 18.07.2017, 4 ♀♀, İncesırt, 20 m, 12.07.2017, 4 ♀♀, Kaptanpaşa, 414 m, 26.09.2017, ♀, 2 ♂♂, Madenli, 123 m, 12.07.2017, 3 ♀♀, ♂, Musadağı, 12 m, 12.07.2017, 4 ♀♀, 2 ♂♂, Sabuncular, 25 m, 26.09.2017, 5 ♀♀, Sarısu, 225 m, 12.07.2017, 2 ♀♀, ♂, Selimiye, 187 m, 26.09.2017, 3 ♀♀, Seslidere, 358 m, 26.09.2017, 3 ♀♀, Yamaç, 135 m, 12.07.2017, ♀, 2 ♂♂, Yeşiltepe, 716 m, 26.09.2017, ♀, 3 ♂♂; Derepazarı: Aşağı Subaşı, 190 m, 07.08.2017, 2 ♀♀, ♂, Bahattinpaşa, 239 m, 14.07.2017, 3 ♀♀, Bürücek, 112 m, 14.07.2017, 3 ♀♀, Centre, 26 m, 14.07. 2017, 2 ♀♀, Çakmakçılar, 87 m, 14.07.2017, 2 ♀♀, Çukurlu, 111 m, 07.08.2017, 2 ♀♀, Kaf Mountain, 235 m, 07.08.2017, 4 ♀♀, 241 m, 07.08.2017, 4 ♀♀, Kirazdağı, 405 m, 05.06.2017, 2 ♀♀, 425 m, 07.08.2017, ♀, Sandıktaş, 142 m, 07.08.2017, ♀, Tersane 50 m, 07.08.2017, ♀, Uzunkaya, 150 m, 14.07.2017, ♀, Yanıktaş, 285 m, 07.08.2017, ♀, Yukarı Fıçıcılar, 266 m, 07.08.2017, ♀; Fındıklı: Dağınıksu, 110 m, 18.07.2017, 3 ♀♀, Derbent, 310 m, 20.09.2019, ♂, Gündoğdu, Yenimahalle, 180 m, 18.07.2017, ♂, Hara, 268 m, 20.09.2019, 4 ♀♀, 3 ♂♂, Hatıra, 94 m, 18.07.2017, 4 ♀♀, Karaali, 317 m, 20.09.2019, 4 ♀♀, Kopuzlar, 358 m, 18.07.2017, 2 ♀♀, Kozmağa, 241 m, 20.09.2019, 2 ♀♀, Meyvalı, 193 m, 20.09.2019, 2 ♀♀, 2 ♂♂, Paçva, 53 m, 20.09.2019, ♀, ♂, Sahil, 14 m, 20.09.2019, ♀, Şentürktepe, 460 m, 20.09.2019, 2 ♀♀, Yukarı Dağınıksu, 128 m, 18.07.2017, 2 ♀♀, Yukarı Manastır, 52 m, 20.09.2019, 2 ♀♀; Güneysu: Adacami, 80 m, 19.09.2017, 3 ♀♀, Aşağı Kiremit, 185 m, 19.09.2017, 2 ♀♀, ♂, Ayane, 342 m, 19.09.2017, 3 ♀♀, Çankana, 140 m, 19.09.2017, 2 ♀♀, 3 ♂♂, Dumankaya, 422 m, 19.09.2017, 4 ♀♀, Kiremit, 343 m, 11.07.2017, ♂, Pazarköy, 102 m, 19.09.2017, ♀, Selamet, 200 m, 11.07.2017, 3 ♀♀, Tepebaşı, 405 m,19.09.2017, 3 ♀♀, Yeşilköy, 437 m, 19.09.2017, 4 ♀♀, Yüksekköy, 441 m, 19.09.2017, 2 ♀♀, Zincirliköprü, 49 m, 19.09.2017, 3 ♀♀; İyidere: Büyükçiftlik, 235 m, 22.09.2017, 3 ♀♀, 269 m, 07.08.2017, 3 ♀♀, Denizgören, 63 m, 12.07.2017, 2 ♀♀, Fethiye, 135 m, 07.08.2017, 4 ♀♀, Hazar, 117 m, 22.09.2017, 2 ♀♀, Kalecik, 128 m, 22.09.2017, 4 ♀♀, 3 ♂♂, 160 m, 22.09.2017, 4 ♀♀, ♂, Köşklü, 167 m, 22.09.2017, 2 ♀♀, Küçükçiftlik, 260 m, 22.09.2017, 3 ♀♀, Sarayköy, 15 m, 07.08.2017, 2 ♀♀, 25 m, 05.06.2017, ♂, 39 m, 22.09.2017, 4

♀♀, 2 ♂♂, Yalıköy, 171 m, 07.08.2017, 3 ♀♀, Yapraklar, 160 m, 07.08.2017, 4 ♀♀; Kalkandere: Adalar, 223 m, 25.09.2017, ♀, 2 ♂♂, Akarsu, 265 m, 06.06.2017, 2 ♀♀, 2 ♂♂, Ambarlık, 337 m, 19.09.2017, 2 ♀, ♂, Ayane, 538 m, 18.07.2017, 3 ♀♀, ♂, Azaklıhoca, 96 m, 14.07.2017, 5 ♀♀, Beştepe, 322 m, 05.06.2017, 4 ♀♀, Çağlayan, 240 m, 25.09.2017, 2 ♀♀, ♂, 336 m, 25.09.2017, 3 ♀♀, Çaykent, 128 m, 19.09.2017, 2 ♀♀, Centre, 55 m, 06.06.2017, ♀, 11.07.2017, ♀, Çiftekavak, 20 m, 14.07.2017, 3 ♀♀, Çorapçılar, 187 m, 17.07.2017, 3 ♀♀, 157 m, 19.09.2017, ♀, Dörtyol, 75 m, 06.06.2017, 2 ♀♀, Düzköy, 200 m, 17.07.2017, 2 ♀♀, Düzler, 526 m, 17.07.2017, 2 ♀♀, Geçitli, 50 m, 25.09.2017, 3 ♀♀, Gölgeli, 190 m, 14.07.2017, 5 ♀♀, 2 ♂♂, Hamzabey, 149 m, 18.07.2017, 4 ♀♀, ♂, 167 m, 19.09.2017, 2 ♀♀, Hayrat, 193 m, 14.07.2017, 3 ♀♀, Kambursırt, 229 m, 14.07.2017, 4 ♀♀, 2 ♂♂, Karayemiş, 246 m, 19.09.2017, 4 ♀♀, Kömürcüler, 193 m, 19.09.2017, 4 ♀♀, Kuruköy, 118 m, 25.09.2017, ♀, Medrese, 137 m, 25.09.2017, 4 ♀♀, 2 ♂♂, Melek, 456 m, 17.07.2017, 3 ♀♀, 2 ♂♂, Muradiye, 327 m, 17.07.2017, 2 ♀♀, ♂, Pekmezli, 130 m, 06.06.2017, ♀, Portakallık, 20 m, 14.07.2017, 3 ♀♀, ♂, 48 m, 19.09.2017, 3 ♀♀, Salarha (Çaykent), 155 m, 17.07.2017, 4 ♀♀, Seyrantepe, 437 m, 25.09.2017, 3 ♀♀, ♂, Topkaya, 99 m, 14.07.2017, 5 ♀♀, Ünalan, 560 m, 25.09.2017, ♀, Yeşildere, 470 m, 19.09.2017, 2 ♀♀, Yolveren, 151 m, 17.07.2017, 2 ♀♀, 125 m, 19.09.2017, 2 ♀♀, Yumurtatepe, 102 m, 25.09.2017, 2 ♀♀, ♂; Pazar: Boğazlı, 56 m, 29.05.2017, ♀, Selimiye, Ayane, 598 m, 06.06.2017, ♀.

Host: The Yellow tea mite has a wide host range in tropical areas. It attacks greenhouse plants in temperate and subtropical regions. Crops listed; apple, avocado, cantaloupe, castor, chilli, citrus, coffee, cotton, eggplant, grapes, guava, jute, mango, papaya, passion fruit, pear, potato, sesame, string or pole beans, tea, tomato, African violet, ageratum, azalea, begonia, chrysanthemum, cyclamen, dahlia, gerbera, gloxinia, ivy, jasmine, impatiens, lantana, marigold, peperomia, pittosporum, snapdragon, verbena, and zinnia (Baker 1997, Peña and Campbell 2005).

Distribution in Türkiye: Antalya, Adana, İçel, Hatay, Rize (Çobanoğlu 1995, Tunç and Göçmen 1995, Uygun et al. 1995, Yabaş and Ulubilir 1995, Bulut and Göçmen 2000, Vatansever and Ulusoy 2002, Ozman-Sullivan et al. 2006, 2007, Akyazı et al. 2019, Aşık-Çuhadar et al. 2019).

Distribution in the World: Found in tropical regions around the World (Zhang 2003). There are no detailed studies on detecting mite species in tea gardens in our country. Yellow tea mite was first detected in our country in 1992 in Antalya. Especially on young plants newly transferred to the greenhouse in autumn (Tunç and Göçmen 1995). It was determined that P. latus was common and a significant pest on pepper plants in the greenhouses of İçel province (Yabaş and Ulubilir 1995). In the world, the Yellow tea mite was first detected in the tea plant in Colombo (Sri Lanka) in 1890. It was later reported on fig and mango plants in New York in 1904 (Lin and Zhang 2002).

**Family: Eriophyidae**

**Species: *Calacarus carinatus*** (Green, 1890)

Synonymous: *Typhlodromus carinatus* Green; *Eriophyes carinatus* Nalepa; *Calacarus carinatus* Keifer; *Epitrimerus adornatus* Keifer

Material examined: (144 ♀, 5 ♂)

Ardeşen; Işıklı, 7 m, 20.09.2017, 6 ♀♀, Seslikaya, Ortamahalle, 302 m, 13.07.2017, 5 ♀♀, ♂; Çayeli: Centre, 230 m, 05.06.2017, 3 ♀♀, Kaptanpaşa, 433 m, 26.09.2017, 5 ♀♀, ♂, Sabuncular, 25 m, 26.09.2017, 5 ♀♀, Sarısu, 225 m, 12.07.2017, 5 ♀♀, Yeşilköy, 110 m, 09.06.2017, 3 ♀♀; Derepazarı: Fıçıcılar, 124 m, 05.06.2017, 4 ♀♀, Tersane, Cumhuriyet, 50 m, 22.09.2017, 4 ♀♀, Yukarı Fıçıcılar, 266 m, 22.09.2017, ♀; Fındıklı: Meyvalı, Ortamahalle, 193 m, 20.09.2017, 4 ♀♀, Sümer, 0 m, 30.05.2017, 2 ♀♀; Güneysu: Aşağı Kiremit, 185 m, 19.09.2017, 2 ♀♀, Pazarköy, 100 m, 11.07.2017, 8 ♀♀, ♂, Tepebaşı, 405 m, 19.09.2017, 5 ♀♀; İyidere: Hazar, 137 m, 22.09.2017, 4 ♀♀, Kalecik, 55 m, 22.09.2017, 6 ♀♀, Köprü, 0 m, 05.06.2017, 4 ♀♀, Sarayköy, 14 m, 12.07.2017, 5 ♀♀; Kalkandere: Akarsu, Valanda, 265 m, 11.07.2017, 8 ♀♀, Azaklıhoca, Çaycılar, 86 m, 14.07.2017, 3 ♀♀, Çağlayan, Karamanlar, 317 m, 25.09.2017, 7 ♀♀, ♂, Çorapçılar, Boyama, 150 m, 19.09.2017, 5 ♀♀, Kuruköy, 104 m, 05.06.2017, 4 ♀♀, Pekmezli, 60 m, 11.07.2017, 5 ♀♀, Portakallık, 0 m, 11.07.2017, 4 ♀♀, ♂, Yemişlik, 600 m, 06.06.2017, 7 ♀♀, Yumurtatepe, 102 m, 25.09.2017, 4 ♀♀; Pazar: Hunarsu, 6 m, 29.05.2017, 6 ♀♀, Sivritepe, 355 m, 06.09.2017, 10 ♀♀.

Host: *Camellia caudata* Wallich, *Camellia sinensis* (L.) Kuntze, *Camellia kissi* Wallich, *Camellia japonica* L., *Camellia sasanqua* Thunb., *Capsicum annuum* L. (Solanaceae), *Viburnum opulus* L. (Adoxaceae) (Anonymous 2022).

Distribution in Türkiye: Giresun (Düzgüneş 1963); Central and Eastern Black Sea Region (Ozman-Sullivan et al. 2007).

Distribution in the World: Korea (JeollaNam-do, Jeju-do); Cambodia, China, Japan, India, Indonesia, Laos, Malaysia, Sri Lanka, Taiwan, Vietnam, Italy, Portugal, Spain, The Soviet Union, America, Australia, New Zealand (Manson 1984,, Channabasavanna 1996, Hong and Zhang 1996).

The *Calacarus carinatus* detected in this study belongs to the Eriophyoidea superfamily and it was first found in Türkiye by Ozman et al. (2006), and first in Indian 1890 in the World

(Green 1890, Watt 1898). It was later determined in China, India, Japan and America, respectively (Li et al. 2014). It was found in the Camellia (Theaceae) plant in Korea (Lee et al. 2014). Ozman-Sullivan et al. (2007) conducted surveys between 2005 and 2006 in the Black Sea Region in order to determine the distribution of mites in tea gardens. As a result of study, *C. carinatus* (80.00%) was determined as the most harmful species and *Brevipalpus* spp. (*Brevipalpus obovatus* Donn. and *B. phoenicis* (34.78%) species followed. *P. latus* was detected at a very low rate (0.87%) in the Georgian border.

**Family: Tenuipalpidae**

**Species: *Brevipalpus phoenicis*** (Geijskes, 1939)

Synonymous: *Tenuipalpus phoenicis* Geijskes; *Brevipalpus phoenicis* Sayed; *Brevipalpus yothersi* Baker; *Brevipalpus mcbridei* Baker; *Brevipalpus papayensis* Baker; *Brevipalpus pseudocuneatus* Baker

Material examined: (120 ♀)

Ardeşen: Akyazı, 454 m, 20.09.2017, ♀, Işıklı, 7 m, 20.09.2017, 3 ♀♀, Köprübaşı, 250 m, 20.09.2017, 4 ♀♀, Tunca, 455 m, 09.06.2017, 2 ♀♀; Çayeli: Büyükköy, Esentepe, 460 m, 18.07.2017, 5 ♀♀; Derepazarı: Kirazdağı, 252 m, 22.09.2017, 6 ♀♀; Güneysu: Dörtyol, 75 m, 11.07.2017, 2 ♀♀, Dumankaya, 422 m, 19.09.2017, 2 ♀♀, Gündoğdu, Taşlık, 105 m, 12.07.2017, 6 ♀♀, Selamet, 200 m, 11.07.2017, 3 ♀♀, Tepebaşı, 405 m, 19.09.2017, 5 ♀♀, Yeşilköy, 437 m, 19.09.2017, 4 ♀♀, Zincirliköprü, 49 m, 19.09.2017, 3 ♀♀; Fındıklı: Derbent, 310 m, 30.05.2017, 10 ♀♀, Hürriyet, 55 m, 21.07.2017, 8 ♀♀, Karaali, 317 m, 20.09.2017, 5 ♀♀, Meyvalı, Ortamahalle, 193 m, 20.09.2017, 8 ♀♀; İyidere: Ambarlık, 337 m, 19.09.2017, 5 ♀♀, Boyama, 150 m, 19.09.2017, 10 ♀♀, Hamzabey, 167 m, 19.09.2017, 6 ♀♀, Sarayköy, 39 m, 22.09.2017, 4 ♀♀, Yeşildere, 527 m, 19.09.2017, 10 ♀♀; Pazar: Boğazlı, 43 m, 29.05.2017, 5 ♀♀, Centre, 0 m, 06.09.2017, 8 ♀♀.

Host: 146 plant species belonging to families Acanthaceae, Aizoaceae, Altingiaceae, Amaranthaceae, Anacardiaceae, Annonaceae, Apocynaceae, Aquifoliaceae, Araceae, Araliaceae, Apocynaceae, Asparagaceae, Balsaminaceae, Begoniaceae, Bignoniaceae, Bixaceae, Boraginaceae, Cannabaceae, Caricaceae, Clethraceae, Combretaceae, Compositae, Convolvulaceae, Cucurbitaceae, Dioscoreaceae, Euphorbiaceae, Garryaceae, Geraniaceae, Hydrangeaceae, Juglandaceae, Lamiaceae, Phyllanthaceae, Poaceae, Rubiaceae and Salicaceae are its hosts (McGregor 1916, Pritchard and Baker 1951, 1958, Morishita 1954, Michelbacher 1956, Dosse 1957, Carmona 1960, 1962, Milne et al. 1962, DeLeon 1965 a, b, Cranham 1966, Manson 1967, Ehara 1969, Haramoto 1969, CABI 1970, 1975, 1988, Livshitz et al. 1972, Chandra and ChannaBasavanna 1974, Chaudhri 1974, Roa 1974, Wahab et al. 1974, Baker et al. 1975, Gonzalez 1975, Jeppson et al. 1975, Murray 1976, Sadana and Joshi 1976, Lal and Mukharji 1977, 1979, Lal 1978;, Smith Meyer 1979, Moralde et al. 1982, Sadana and Gupta 1982, Sadana et al. 1982, 1983, Jagadish et al. 1983, Ghai and Shenhmar 1984, Goyal et al. 1984, 1985, Ochoa 1985, Sadana 1985, Hatzinikolis 1986, Heugens 1986, Baker and Tuttle 1987, Kumari and Sadana 1990, Evans et al. 1993, Trinidade and Chiavegato 1994, Ochoa et al. 1994, O'Dowd 1994, Smiley and Gerson 1995, Yano et al. 1995, Morse et al. 1996, Randeep et al. 1999, Walter 1999, Kitajima et al. 2003).

Distribution in Türkiye: Ankara (Sağlam and Çobanoğlu 2010).

Distribution in the World: America, Germany, Argentina, Hawaii Island, India, Holland, Spain, Cuba, Ceylon, Egypt, Trinidat, Tanjanika, Kongo, Kenya, Malaya, Sinaloa, Vera Cruz, Oaxaca, Mexican, Greece, Portugal, Sicily, Italy, Ethiopia, Taiwan, Brazil, Venezuela, Philippines and Australia (Düzgüneş 1965, Baker and Tuttle 1987, Jeppson et al. 1975, Baker et al. 1975).

*Brevipalpus phoenicis*, which belongs to the Tenuipalpidae family, was first identified in Türkiye by Düzgünes (1963). It was first found in the coffee plant in Brazil (Geijskes 1939). This mite causes brownish coloration in its hosts as a result of feeding. It is also the vector of *Citrus leprosis virus* (CiLV) (USDA 2004).

**Family: Tuckerellidae**

**Species: *Tuckerella* sp.**

Material examined: (11 ♀)

Çayeli: Kaptanpaşa, 433 m, 26.09.2017, 5 ♀♀; Derepazarı: Kirazdağı, 252 m, 22.09.2017, 6 ♀♀.

**Family: Tydeidae**

**Species: *Tydeus californicus*** (Banks)

Synonymous: *Tetranychoides californicus* Banks 1904; *Tydeus spathulatus* (Oudemans)

Material examined: (105 ♀).

Ardeşen: Düz, 58 m, 13.07.2017, 6 ♀♀; Çayeli: İnce Sırt, 20 m, 12.07.2017, 7 ♀♀; Derepazarı: Çakmakçılar, 87 m, 14.07.2017, 6 ♀♀, Kafdağı, 323 m, 22.09.2017, 8 ♀♀; Fındıklı: Şentürktepe, 460 m, 20.09.2017, 7 ♀♀; Güneysu: Çankana, 140 m, 19.09.2017, 6 ♀♀, Zincirliköprü, 49 m, 19.09.2017, 3 ♀♀; Kalkandere: Azaklıhoca, Çaycılar, 86 m, 14.07.2017, 5 ♀♀, Çorapçılar, 187 m, 17.07.2017, 10 ♀♀, Çağlayan, Eminoğulları, 272 m, 05.06.2017, 4 ♀♀, Çaykent, 128 m, 19.09.2017, 8 ♀♀, Hamzabey, 204 m, 19.09.2017,

9 ♀♀, Ortapazar, 386 m, 06.06.2017, 2 ♀♀, Pekmezli, 314 m, 11.07.2017, 4 ♀♀; Pazar: 0 m, 06.09.2017, 8 ♀♀, Kesikköprü, 180 m, 21.07.2017, 6 ♀♀, Sivritepe, 355 m, 06.09.2017, 6 ♀♀.

Host: Common worldwide in fruit, citrus and ornamental plants (Tempfli et al. 2015). Obtained from plum, apricot, cherry, peach, cherry, mahaleb and different plants in Türkiye (Çobanoğlu 1991, 1992, Çobanoğlu and Kazmierski 1999, Ozman and Çobanoğlu 2001, İncekulak and Ecevit 2002, Akyazı and Ecevit 2003, Yanar and Ecevit 2005, Kasap and Çobanoğlu 2007, Kumral and Kovancı 2004, Özşişli and Çobanoğlu 2011, Yeşilayer and Çobanoğlu 2011, Kasap et al. 2013, Kasap 2014, Akyazı et al. 2017, Soysal and Akyazı 2018).

Distribution in Türkiye: Bursa, Çanakkale, Denizli, İstanbul, İzmir, Manisa, Ordu, Tokat, Samsun (Akyazı and Ecevit 2003, Kumral and Kovancı 2004, Göven et al. 2009, Yeşilayer and Çobanoğlu 2011, Kasap et al. 2014, Erdoğan and Yanar 2015, Yeşilayer and Çobanoğlu 2016, Akyazı et al. 2018, Altunç and Akyazı 2019).

Distribution in the World: Türkiye, Hungary, Azerbaijan, Lebanon, Syria, Egypt, Jordan, Israel, Iranian, Iraq and North Africa (Anonymous 2008).

*Tydeus californicus* belongs to the family Tydeidae. Although there is no evidence of this mite species feeding on leaves, it has been observed that these species generally coexist with predatory mite species on the leaves. It is probably thought that they form the food of beneficial mites and serve as an additional food source for these species, especially when phytophagous mite species are not present in the environment. There are not many studies on the Tydeidae family in our country and the world. Generally, this family is considered a neutral species and feeds on lichens, fungi, plant and insect residues (Yanar and Erdoğan 2013). Yanar and Ecevit (2005) reported that *T. californicus* and *Tydeus* sp. species, and their findings support our results. Castagnoli (1989) determined that *T. californicus* is a common species and is found in grape, pear and peach plants in Italy. It has not been determined whether this species is harmful to plants in general or not.

**Family: Phytoseiidae**

**Species: *Neoseiulus californicus*** (McGregor)

Synonymous: *Typhlodromus californicus* McGregor, 1954; *Amblyseius californicus* Schuster and Pritchard, 1963; *Cydnodromus californicus* Athias-Henriot 1977; *Amblyseius (Amblyseius) californicus* Ueckerman

Material examined: (34 ♀, 2 ♂)

Ardeşen: Pirinçlik, 165 m, 20.09.2017, ♀, Seslikaya, 223 m, 13.07.2017, 2 ♀♀, 2 ♂♂; Çayeli: Madenli, Yenimahalle, 123 m, 12.07.2017, 2 ♀♀, Musadağı, 12 m, 09.06.2017, ♀, Yenipazar, 5 m, 26.09.2017, ♀; Derepazarı: 283 m, Yanıktaş, 22.09.2017, 2 ♀♀; Fındıklı: Derbent, 310 m, 30.05.2017, 2 ♀♀, Gündoğdu, Taşlık, 105 m, 12.07.2017, 2 ♀♀, Şentürktepe, 460 m, 20.09.2017, ♀; Güneysu: Selamet, 200 m, 11.07.2017, 2 ♀♀, Yüksekköy, 511 m, 19.09.2017, ♀; İyidere: Denizgören, 63 m, 05.06.2017, 2 ♀♀, Küçükçiftlik, 260 m, 22.09.2017, 2 ♀♀; Kalkandere: Çağlayan, Seymenler, 313 m, 25.09.2017, ♀, Çiftekavak, 20 m, 14.07.2017, 3 ♀♀, Dörtyol, 90 m, 06.06.2017, 2 ♀♀, Kendirli, Beştepe, 322 m, 05.06.2017, ♀, Pekmezli, 314 m, 11.07.2017, ♀, Salarha, Güneşli, 272 m, 17.07.2017, ♀, Selimiye, Centre, 380 m, 06.06.2017, ♀, Yeşildere, 470 m, 19.09.2017, ♀; Pazar: Kocaköprü, 52 m, 21.07.2017, ♀, Topluca, 120 m, 06.09.2017, ♀.

Host: *Neoseiulus californicus* usually feeds on tetranychid mites, but in the absence of its prey, it can survive by feeding on pollen and other harmful mites such as *P. latus* and *Tarsonemus pallidus* Banks (Castagnoli and Liguori 1994, McMurtry and Croft 1997).

Distribution in Türkiye: Ankara, Aydın, Balıkesir, Bursa, Çanakkale, Isparta, Ordu, Yalova (Çakmak and Çobanoğlu 2006, Yorulmaz and Ay 2012, Kasap et al. 2013, Çobanoğlu and Kumral 2014, Soysal and Akyazı 2018).

Distribution in the World: Algeria, Argentina, Azores, Brazil, Canada, Canary Islands, Chile, Colombia, Cuba, Cyprus, France, Greece, Guatemala, Italy, Japan, Mexico, Morocco, Peru, Portugal, Reunion Island, Senegal, Serbia, Slovenia, South Africa, South Korea, Spain, Syria, Taiwan, Tunisia, USA, Venezuela, Vietnam and Türkiye (Sahraoui et al. 2012, Demite et al. 2022).

*Neoseiulus californicus*, belonging to the Phytoseiidae family, was found for the first time in the world in 1954 by McGregor on lemon trees in California (Rhodes and Liburd 2005). It was found for the first time on strawberry, peach, bean, and pepper plants in Kuşadası, Aydın. It was found together with *Tetranychus urticae* Koch and *Panonychus ulmi* (Koch) (Acari: Tetranychidae) between 2001 and 2003 (Çakmak and Çobanoğlu 2006). This predator usually feeds on tetranychid mites. But in the absence of prey, they feed on harmful mites such as *Polyphagotarsonemus latus* and *Tarsonemus pallidus* Banks (Acari: Tarsonemidae) (Castagnoli and Liguori 1994, McMurtry and Croft 1997).

**Family: Winterschmidtiidae**

**Species: *Czenspinskia transversostriata*** Oudemans, 1931

Material examined: (15 ♀, 3 ♂)

Ardeşen: Kambursırt, 229 m, 14.07.2017, ♀, Pinçuk, 125 m, 09.06.2017, 2 ♀♀; Çayeli: Gülpaşa, 90 m, 12.07.2017, 3 ♀♀; Derepazarı: Fıçıcılar, 124 m, 05.06.2017, ♀; Fındıklı: Paçva, 53 m, 20.09.2017, ♀; Güneysu: Çaykent, 128 m, 19.09.2017, ♀, Düzler, 526m, 17.07.2017, ♀, Muradiye, Kayalık, 510 m, 17.07.2017, ♀, Yüksekköy, 511 m, 19.09.2017, 2 ♀♀; Pazar: Hunarsu, 6 m, 29.05.2017, ♀.

Distribution in Türkiye: Central and Eastern Black Sea Region (Ozman and Çobanoğlu 2001, Ozman-Sullivan et al. 2007).

Distribution in the World: Costa Rica, Brazil (Vega et al. 2008, Lofego et al. 2013).

*Czenspinskia transversostriata* (Oudemans), belonging to the Winterschmidtiidae family, was detected for the first time in hazelnut orchards in Türkiye (Ozman and Çobanoğlu 2001). This species usually inhabits decaying matter, fungi, plant leaves, and stored food (Barbosa and Moraes 2021).

**Species: Oribatidae Family**

Oribatid mites were first successfully cultured by Michael (1884) (Shereef 1972). In our study, individuals belonging to the Oribatidae family were found. But species has not been determined.

With this study, many individuals belonging to harmful and beneficial mite fauna were obtained in the tea gardens and contributed to the mite fauna of the country. We believe that the obtained beneficial fauna, especially phytoseid and other predator mites, will be helpful for future studies on the use of biological control. In particular, it should be aimed to determine the distribution area of the yellow tea mite, to protect the beneficial ones at the right time of struggle, to explain the importance of this issue to the farmers and to provide training.

It is thought that the results of the study will be decisive in terms of preventing erroneous applications and will shed light on future studies.

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**ÖZET**

Bu çalışma, Rize ili çay bahçelerinde bulunan akar türlerini tespit etmek amacıyla 2017-2019 yılları arasında gerçekleştirilmiştir. Çalışma süresince, 9 ilçede (Ardeşen, Çayeli, Derepazarı, Fındıklı, Güneysu, İyidere, Kalkandere, Merkez ve Pazar) tesadüfi örnekleme yöntemi ile çay bitkisinin 1., 2. ve 3. sürgün dönemine denk gelecek şekilde mayıs-eylül ayları arasında sürvey çalışmaları yürütülmüştür. Birinci sürgün döneminde 9 ilçede toplam 73 çay bahçesinde, ikinci sürgün döneminde 107 çay bahçesinde ve üçüncü sürgün döneminde ise 97 çay bahçesinde arazi çalışmaları yapılmış ve çay örnekleri toplanmıştır. Çalışma sonunda en yaygın ve en yüksek sayıda tespit edilen tür %49.7 ile *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) olmuştur. Belirlenen diğer akarlar ise sırasıyla; %24.3 ile *Calacarus carinatus* (Green) (Prostigmata: Eriophyidae), %19.9 ile *Brevipalpus phoenicis* (Geijskes) (Prostigmata: Tenuipalpidae), %17.1 ile *Tydeus californicus* (Banks) (Prostigmata: Tydeidae), %5.9 ile *Neoseiulus californicus* (McGregor) (Mesostigmata: Phytoseiidae), %2.9 ile *Czenspinskia transversostriata* (Oudemans) (Acari: Winterschmidtiidae), %1.8 ile *Tuckerella* sp. (Prostigmata: Tuckerellidae) ve Oribatida türleridir. Bu çalışmada bulunan akarlar, daha önceki yıllarda yapılan çalışmalarla bütünleşecek şekilde tamamlanmıştır.

**Anahtar kelimeler:** çay, *Polyphagotarsonemus latus*, Acarina, fauna, Türkiye.

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