Çukurova Tarım Gıda Bil. Der. *Çukurova J. Agric. Food Sci.*
40(1): 193-199
doi: 10.36846/CJAFS.2025.190

Araştırma Makalesi

Population Development of Thrips Species Harmful in Onion Planting Areas in Adana Province

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ABSTRACT
It has been determined that *Thrips tabaci* and *Frankliniella occidentalis*, which have caused economic damage in onion production in recent years, *Thrips vulgatissimus*, *Melanthrips fuscus*, *Haplothrips reuteri* and *Rhipidothrips gratiosus* species are harmful to onions. Population development of these species was studied in three different regions of Adana (Sarıçam, Yüreğir, Karataş) between October 2017 and May 2018. It was determined that the most common and harmful thrips species in onion cultivation areas were *T. tabaci* at 81%, followed by *F. occidentalis* at 18%, while other species were found at a rate of only 1%. The population density of thrips was found to be high in all three onion fields. The reason for the high density of these pests in the onion fields was interpreted as their coming between the onion leaves for both wintering and feeding purposes.
Keywords: Onion, *Thrips tabaci*, population development, Adana/Türkiye

Adana İli Soğan Ekiliş Alanlarında Zararlı Olan Thrips Türlerinin Popülasyon Gelişmesi

ÖZ
Soğan üretiminde son yıllarda ekonomik zarara oluşturan *Thrips tabaci* ve *Frankliniella occidentalis* ile *Thrips vulgatissimus*, *Melanthrips fuscus*, *Haplothrips reuteri* ve *Rhipidothrips gratiosus* türlerinin de soğanlarda zararlı olduğu tespit edilmiştir. Bu türlerin popülasyon gelişmesi Adana'nın üç farklı yöresinde (Sarıçam, Yüreğir, Karataş) Ekim 2017- Mayıs 2018 tarihleri arasında çalışılmıştır. Soğan ekiliş alanlarında en yaygın görülen ve zararlı olan thrips türlerinin %81 ile *T. tabaci* olduğu ve bunu %18 ile *F. occidentalis*'in izlediği, diğer türlerin ise ancak %1'lik bir oranda bulunduğu tespit edilmiştir. Thripslerin popülasyon yoğunluğu 3 soğan ekiliş alanında da yüksek bulunmuştur. Bu zararlıların soğan alanlarında yüksek yoğunlukta bulunmalarının nedeni gerek kışlama ve gerekse beslenme amacıyla soğan yapraklarının arasına gelmeleri şeklinde yorumlanmıştır.
Anahtar Kelimeler: Soğan, *Thrips tabaci*, popülasyon takibi, Adana/Türkiye

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Yayın Kuruluna Geliş Tarihi: 07.03.2025
Kabul Tarihi: 27.06.2025
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Introduction

The first production of the onion (*Allium cepa* L.) dates back to five thousand years ago in ancient Egypt.

The origin of the onion is the Asia Minor Region, where it naturally spreads up to the 50th latitude of the Northern Hemisphere, and its cultivation has spread to very large areas around the world depending on its consumption (Vural et al., 2000). Although onion cultivation is carried out in almost every region and region of our country, the provinces with the highest production are Kırklareli, Balıkesir, Bursa, Amasya, Çorum, Tokat, Kastamonu, Hatay, and Denizli (Vural et al., 2000). The climate demand of the onion plant changes according to the development time. While the plant needs cool weather in the early development stage, it needs temperatures and low humidity for head attachment and growth of the head.

While diseases and weeds are at the forefront of plant protection problems in onion production, harmful species also cause economic losses. Yield loss due to diseases, weeds, and pests varies between 10-50% (Apan, 1972).

Thrips tabaci Lindeman (Thysanoptera: Thripidae), *Delia antiqua* (Meigen) (Diptera: Anthomyiidae), *Rhizoglyphus robini* Claparede (Acarina: Acaridae) ve *Bactericera tremblayi* (Wagner) (Hemiptera: Psylloidea: Triozidae) are one of the important pests that cause economic losses in onions(Straub, 2004; Ulusoy et al., 2016).

In this study, population monitoring of *Thrips tabaci* on onions planted in winter in Adana province was determined to cause damage.

Material and Methods

The main material of this study, which was carried out in winter onion cultivation areas of Adana province, between 2017 and 2018, consisted of thrips species detected on onions and shallot. The study was carried out in three different regions of Adana province (Sarıçam, Yüreğir and Karataş) between September and May when fresh head onion production is carried out.

Determination of Population Density of Thrips

Population development of onions, specifically *T. tabaci* and other thrips species, was studied in three regions of Adana between October 2017 and May 2018. Each field was divided into 5 equal sub-plots by us according to their size, and sampling was carried out on 5 onion plants from each parcel and a total of 25 plants in the whole field.

All individuals found between two leaves (50 leaves) in the middle part (navel) of onion plants were counted. Counts were carried out in the early morning hours when thrips began to be active. The larvae and adults on each plant were noted separately, and the eggs were not included in the counts because they were in the plant tissue. The population follow-up of the pest was carried out from the date the onion was planted until the last harvest and once a week during the periods when the daily average temperature was above 18 °C, and every two weeks during the periods when the temperature fell below this temperature.

In order to determine the different thrips species thought to be complex in onions and to reveal their proportional changes in the field and the plant, 10 onion plants were randomly taken at each sampling date and brought to the laboratory by placing them in separate paper bags. After the samples were kept in the freezer for a few hours, they were shaken into white cuvettes.

Then, after counting according to their morphological distinctions under a binocular microscope, 10 adults were prepared for diagnosis.

In this way, on the one hand, thrips species that cause damage to the onion were detected, on the other hand, the rate of their presence in the field and on the plant was determined.

The preparation of thrips was made according to Silveria and Haro, (2016), and the diagnoses

were made by Çukurova University Plant Protection Department Faculty Member Prof. Dr. Ekrem ATAKAN.

Results and Discussion

It was determined that the species that caused the most damage to onions were *Thrips tabaci* and *Frankliniella occidentalis*, especially *Thrips tabaci*. As a matter of fact, it was determined that the most common 6 thrips species detected in onion fields were *T. tabaci* (81%) and *F. occidentalis* (18%), while the other 4 thrips were only around 1%. Adults and nymphs of thrips species feed on plant sap on leaves, stems, and fruits of plants, the leaves they feed on turn a whitish or silvery color after a while. In this study, it was observed that thrips were intensely present in onion plants, causing discoloration and deformation in onion leaves, but both the economic loss threshold value of 30 thrips/plant number was not reached and a damage situation that required control was not detected. In a similar study, it was stated that *T. tabaci* population was more dominant than *F. occidentalis* among the thrips species detected in the onion fields of İzmir province and the pests did not reach the level of economic damage in the region (Kılıç and Yoldaş, 2012). On the other hand, Minaei and Azemayeshfard (2007) stated in their study that *T. tabaci* is the most important pest of onions in Iran, that plants prefer leaves rather than flowers and fruits, and they feed there. As a result of our observations, it has been determined that thrips prefer the leaves of the onion plant the most.

Population Monitoring of Harmful Thrips Species in Onion Planting Areas in Adana Province

Population Density of Thrips Species in Karataş Region

In the Solaklı neighborhood of Karataş region, the population density of thrips species was followed at regular intervals in 2017-2018 as specified in the method. Land emergence started with onion planting, and after onion plants emerged, thrips population was encountered, though in very low numbers.

In the field exits, as seen in Figure 1, it was observed that thrips were present in all months when the onion was in the field, and the thrips population increased slowly, then geometrically, with the increase in temperatures after March. As a matter of fact, the highest population density close to harvest was determined in late April with 26.90 thrips/plant/unit in adults and 81.64 thrips/plant/unit in nymphs. With the harvest of onions, the population of thrips dropped to zero (Figure 1, 2).

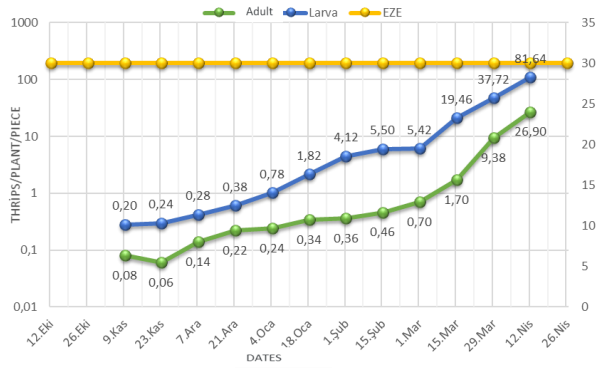

Figure 1. Population fluctuation of *Thrips* species in Karataş region between 2017 and 2018

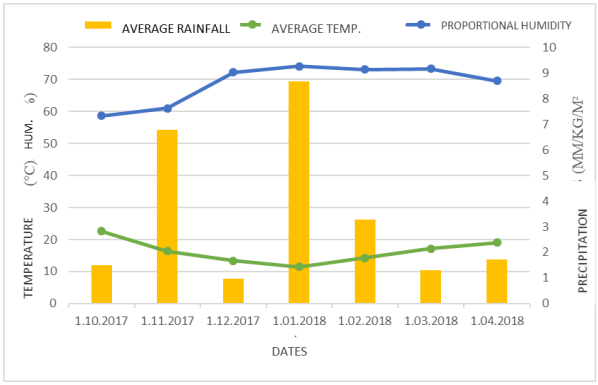

Figure 2. Average temperature (°C), average precipitation (mm), and proportional humidity (%) values of thrips species belonging to Karataş region for the years 2017-2018

It was determined that *T. tabaci* (81%), *F. occidentalis* (18%) and other species (*T. vulgatissimus, H. reuteri*) were found at high rates in the Karataş region, around 1%.

In the study, the average temperature, average precipitation, and proportional humidity graphs were drawn by evaluating the climate data of the onion planting areas in which the population change of thrips species was observed for the years 2017-2018 (Figure 2) (Anonymous, 2018).

When Figure 2 is examined; in the onion planting areas in the Karataş region, the monthly average minimum temperature is 11.45℃ (Min. 8.40 °C; Max. 14.50 °C) in January, with an average minimum precipitation of 0.98 mm/kg per m² (Min.m² 0.20 mm/kg; Max. m² 8.60 mm/kg) in December and the lowest average proportional humidity is 58.72% (Min. 34.80%, Max. 79.50%) in November took place in the month. According to the data we obtained throughout the study. The sudden drops and spikes in the thrips population on some dates can be attributed specifically to precipitation. For example; there appears to be a decrease in the adult thrips population (0.02 thrips/plant/piece) between 9 and 23 November.

It was concluded that the decrease was due to the precipitation being 2.0 mm/kg per m² on these dates and therefore the decrease in the ambient temperature.

After this date, a regular increase was observed in the adult population in the period until March 15, 2018, and high increases were detected in the population of adults between the end of March and mid-April.

The reason for this increase is due to the increase in air temperatures since mid-March and the average temperature suitable for the development and reproduction of thrips is 16 °C and above per day.

Although the nymph population of thrips species increased regularly at certain intervals until March 1, it was determined that the nymph population after this date decreased from 5.50 thrips/plant/unit to 5.42 thrips/plant/unit.

The reason for this decrease can be attributed to the fact that the amount of precipitation per m² was 24.4 mm/kg on that date and the corresponding decreases in temperatures. After this date (March 1), an increasing density has occurred in the nymph population, as in the adult population, due to the fact that the temperature is generally 16 °C and above in the period until the harvest of the onion plant.

Population Density of Thrips Species in Yüreğir Region

In the Misis neighborhood of Yüreğir region, the thrips population was encountered in 2017-2018, although in very low numbers, after the emergence of onion plants. It has been observed that thrips are present in the environment in all months when the onion is in the field, and the thrips population increases regularly with the increase in temperatures after March. As a matter of fact, the highest population density close to harvest was determined in late April with 20.92 thrips/plant/unit in adults and 75.88 thrips/plant/unit in nymphs.

With the harvest of onions, the population of thrips decreased to zero (Figure 3).

It was determined that 80% of *T. tabaci*, 19% of *F. occidentalis*, and other species (*M. fuscus, R. gratiosus*) were found at high rates in Yüreğir region.

In the study, the average temperature, average precipitation, and proportional humidity graphs were drawn by evaluating together the climate data of 2017-2018 of the onion cultivation areas where the population change of thrips species is monitored (Figure 4) (Anonymus, 2018).

Figure 4. When examined, the average minimum temperature of 10.45 °C (Min. 8.10 °C; Max. 13.30 °C) for the months sampled in the onion planting areas in Yüreğir region, and the average minimum precipitation m² in January to 0.92 mm/kg (Min. m² 0.20 mm/kg; Max. m² 8.80 mm/kg) in December and the average lowest proportional humidity is 54.09% (Min. 27.80%; Max. 83.20%) in October.

According to the data we obtained throughout the study; sudden drops and spikes are seen in the thrips population on some dates (Figure 3). For example; A sudden decrease of 0.04 thrips/plant/unit occurred in the adult thrips population between 23 November and 7 December.

The reason for this decrease; with the precipitation of 2.4 mm/kg per m² on this date and the sudden decrease in temperature, the

suitable environment for the reproduction and development of thrips disappeared. From this date, until the harvest time of the onion plant, there was a continuous increase in the adult population, albeit slightly, but it increased geometrically from mid-March. Throughout the study, the thrips nymph population in this region has been increasing continuously, albeit slightly, at regular intervals. On March 15-29, when the air temperatures became suitable for the reproduction and development of thrips, significant increases were observed in the nymph population due to the increase in temperature (Figure 4).

Population Density of Thrips Species in Sarıçam Region

In the Balcalı neighborhood of Sarıçam region, in 2017-2018, thrips population was detected, albeit in very low numbers, after the onion plants emerged. As seen in Figure 5, it has been observed that thrips are present in all months when the onion is in the field, and the thrips population gradually increases with the increase in temperatures after March. As a matter of fact, the highest population density close to harvest was reached at the end of April with 22.26 thrips/plant/unit in adults and 74.68 thrips/plant/unit in nymphs. With the harvest of onions, the population of thrips has decreased to zero (Figure 5).

It was determined that 80% of *T. tabaci*, 19% of *F. occidentalis*, and other species (*T. vulgatissimus, M. fuscus, H. reuteri, R. gratiosus*) were found at high rates in Sarıçam region.

In the study, the average temperature, average precipitation, and proportional humidity graphs were drawn by evaluating the climate data of 2017-2018 of the onion planting areas where the population change of thrips species is monitored (Figure 6) (Anonymus, 2018)

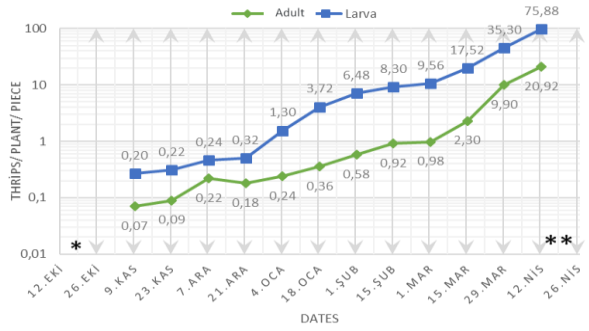

Figure 3. Population fluctuation of Thrips species in Yüreğir region between 2017 and 2018 (***Graphs are made by taking the average of two-week counts.)

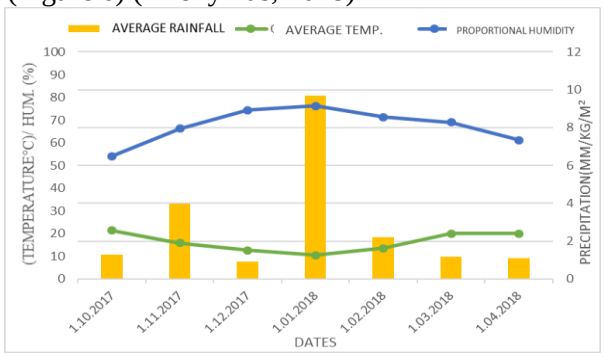

Figure 4. Average temperature (°C), average precipitation (mm), and proportional humidity (%) values of Thrips species belonging to Yüreğir region for the years 2017-2018

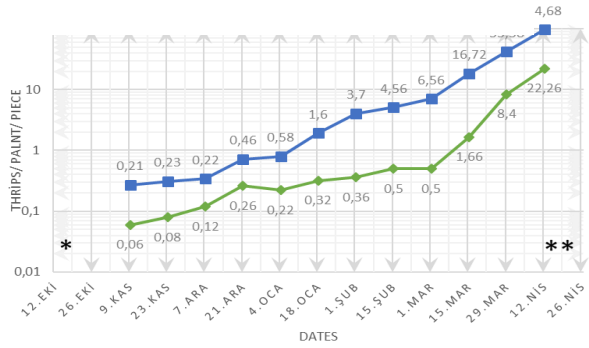

Figure 5. Population fluctuation of Thrips species in the Sarıçam region between 2017 and 2018

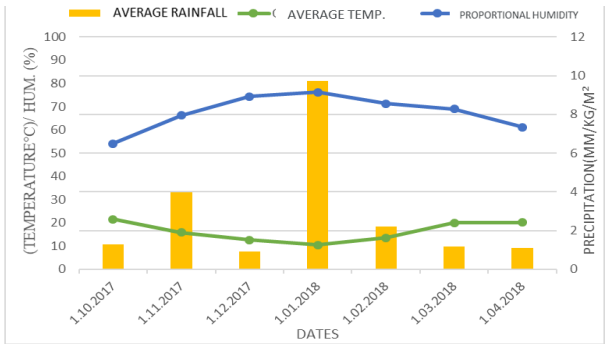

Figure 6. Average temperature (°C), average precipitation (mm), and proportional humidity (%) values of Thrips species belonging to the Sarıçam region for the years 2017-2018

When Figure 6 is examined, In the onion planting areas in the Sarıçam region, the lowest average temperature for the months sampled is 10.59 °C (Min. 8.70 °C; Max. 13.70 °C) and the minimum average precipitation is 0.64 mm per m² in January. /kg (Min. m² 0.10 mm/kg; Max. m² 6.90 mm/kg) in December and the lowest proportional humidity 49.62% (Min. 23.00%; Max. 83.40%) took place in October.

When we evaluate the data we obtained throughout the study; sudden decreases and spikes are seen in the thrips population on some dates. For example; Between 21 December and 4 January, a decrease of 0.04 thrips/plant/piece occurred in the adult thrips population. The reason for this decrease; We believe that it was caused by the decrease in temperature with the proportional humidity increase to 80.4% due to the precipitation amount of 54.3 mm/kg per square meter on this date. After this date, there was no increase or decrease in the adult population between February 15 and March 1, and the population remained stable, and it is clearly seen that there was a significant increase in the conditions between March 29 and April 12, as the ambient conditions became suitable for the reproduction and development of thrips.
If we look at the thrips nymph population, there was a sudden decrease to 0.01 thrips/plant/number on November 23-7 December. We can say that the reason for this decrease was the decrease in temperature due to the precipitation of 3.7 mm/kg per m² in this region, as in other regions, and therefore, the decrease in the nymph population as a result of the effect of these factors. As in the adult population, significant increases were seen in the nymph population from March 29 to April 12 when temperatures became suitable for reproduction and development of thrips. After these dates, the nymph population continuously increased at regular intervals until the harvest of the onion plant (Figure 5).
In this study, which was carried out to determine the population density of thrips, it was determined that thrips species were found together in 3 onion planting areas, which were monitored periodically, and that *T. tabaci* was found at a rate of 81% in Karataş region and 80% in Yüreğir and Balcalı regions. It was determined that *F. occidentalis* has a population density of 18% in the Karataş region, and 19% in the Yüreğir and Balcalı regions, while the other species are found in the same environment at a rate of 1%. *T. tabaci* has the highest amount of thrips species, while *F. occidentalis* comes second. According to the analyzes made by evaluating these data, it was determined that the difference detected in the places where the population was followed was statistically insignificant. In this study, it was observed that thrips feed and survive in the mid-core of the onion plant, and in the spring months when the temperatures are suitable for thrips, they move towards the leaves outside the core of the onion.
A similar study on the population fluctuation of *T. tabaci* in summer onion planting areas in Bursa and Balıkesir; It has been reported that *T. tabaci* is the dominant species (Sürer, 2006). As a result of the researches carried out in Colorado (USA) between 2004-2005, *T. tabaci* constituted 82.6% - 84.9% of the samples collected in the two seasons in the onion cultivation areas. It has been reported that it is *F. occidentalis* with values of 12.2% - 12.6% (Mahaffey, 2008). Franco et al. (1998) in their study on onions, garlic, and leeks in France; observed thrips species and population density using colored sticky traps to detect thrips population. As a result of the studies, they determined that more than 90% of the species found were *T. tabaci*. It is clearly seen that these studies and the results obtained from this study support each other.

Conlusion

This study highlights the significant presence and impact of *Thrips tabaci* and *Frankliniella occidentalis* in onion cultivation areas of Adana, with *T. tabaci* being the dominant species. The findings emphasize the need for targeted pest management strategies to mitigate the economic losses caused by these thrips. While other

species were present at minimal levels, their potential role in onion damage should not be overlooked. Future research and integrated pest control measures are essential to ensure sustainable onion production in the region.

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