African Journal of Biotechnology Vol. 10(36), pp. 7063-7070, 18 July, 2011
Available online at http://www.academicjournals.org/AJB
DOI: 10.5897/AJB11.090
ISSN 1684–5315 © 2011 Academic Journals

Full Length Research Paper

Population densities of wheat thrips, *Haplothrips tritici* Kurdjumov (Thysanoptera: Phlaeothripidae), on different wheat and barley cultivars in the province of Kahramanmaraş, Turkey

Tülin Özsisli*

Kahramanmaraş Sütçü Imam University, Department of Plant Protection, Agricultural Faculty, Avşar Campus, 46100, Kahramanmaraş, Turkey.

Accepted 13 May, 2011

Population densities of *Haplothrips tritici* (*H. tritici*) Kurdjumov (Thysanoptera: Phlaeothripidae) were studied in Kahramanmaraş, Turkey. In 2002, bread wheat cultivars, Bocro 4, Pehlivan and Yüreğir 89, durum wheat cultivars, Balcali 85, Ceylan 95 and Harran 95 and barley cultivars, Esterel and Pacific, were used. In 2003, Sham IV and Firat 93 were used instead of Pehlivan and Ceylan 95. Hege was also added to the barley cultivars. *H. tritici* (mostly second-stage larvae) population densities on Bocro 4, Pehlivan and Yüreğir 89 on the 6th of June in the first year were 54.8, 59.5 and 33.0/ear, respectively. Populations on durum wheat reached their highest value twice (during the egg and second larvae stages) in the first year. The first one was on the 10th May, when *H. tritici* densities in Balcali 85, Ceylan 95 and Harran 95, were 42.1, 52.0 and 40.5/ear, respectively, and the second one was on the 6th of June, when they were 47.5, 60.9 and 58.9/ear, respectively. In the second year, *H. tritici* on Bocro 4 reached their highest level (26.9/ear) on 17th May and *H. tritici* populations on Sham IV and Yüreğir 89 on 29th May were also at their highest level with 48.4 and 20.1/ear, respectively. Population densities on durum wheat cultivars were not as high as in the first year and changed between 0.2 and 9.7/ear. *H. tritici* on barley also stayed at low levels for the first (0.1 to 3.2/ear) and second (0.1 to 1.2/ear) years.

Key words: Thysanoptera*, Haplothrips tritici,* population density*,* bread wheat, durum wheat, barley, cultivars.

INTRODUCTION

Some thrips types of the order Thysanoptera constitute one of the harmful groups found on grains (Minaei and Mound, 2008). The most common species observed on grains in Turkey is *Haplothrips tritici* (*H. tritici*) Kurdjumov from the Phlaeothripidae family (Tunç, 1978; Lodos, 1984; Tunç, 1992). Tunç and zur Strassen, (1984), with reference to Tunç (1975), stated that the dominant species on almost all of the grains was *H. tritici. H. tritici* causes the most damage on spicas; on those that are damaged fungus and bacteria developing, and the quality of the product is reduced and its commercial value decreases (Bielza et al, 1996; Bournier and Bernaux, 1971; Anonymous, 2002). Using chemicals to fight against *H. tritici* is relatively difficult and costly and can cause the wheat to be burnt during the milk generation process (Veselinov, 1976). Studies have been carried out on *H. tritici* to detect enduring wheat types (Shcherbakova, 2008). One of the main elements of an integrated plant protection system is that the enduring types are used among cultural cautions. For this reason, in order to increase wheat types that are resistant to wheat thrips, studies were conducted on a variety of bread wheat, durum wheat and barley types in the province of Kahramanmaraş to detect the population density of *H. tritici*.

MATERIALS AND METHODS

To determine the population densities of *H. tritici* on different wheat and barley cultivars under field conditions, experiments were carried in the field at the Kahramanmaraş Agricultural Research

*Corresponding author. E-mail: tulin@eksu.edu.tr. Tel: +90 (344) 219 1544. Fax: +90 (344) 219 1526.

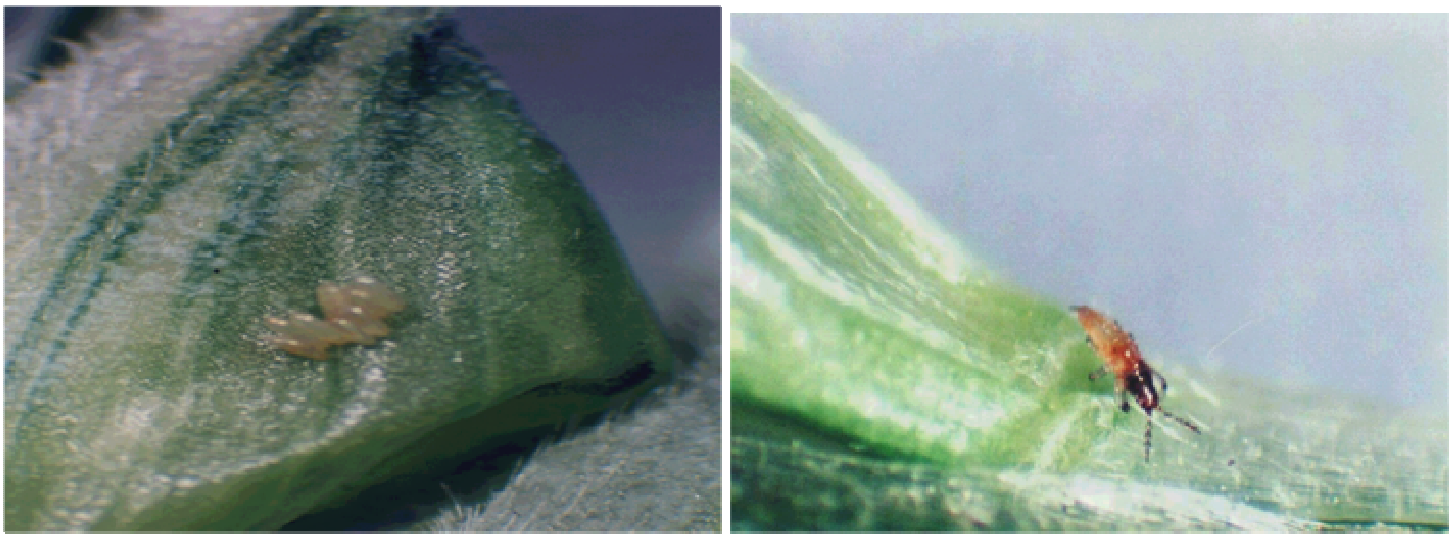

Figure 1. An egg group on hull and first larvae stage on ear axis of *H. tritici*.

Institute during 2002 and 2003. In the first year of the study, the bread wheat cultivars, Bocro 4 (candidate for registration), Pehlivan and Yüreğir 89, the durum wheat cultivars, Balcali 85, Ceylan 95 and Harran 95 and the barley cultivars, Esterel and Pacific, were used. In the second year, Sham IV and Firat 93 were used instead of Pehlivan and Ceylan 95, respectively and Hege was also added to the barley cultivars.

The study was arranged according to a randomized block design with replication. In the first year, three separate plots were created from each variety and in the second year four were created. The area of each plot was 5.0 m x 1.2 m and each plot consisted of eight rows. For each of the wheat and barley plots, 550 and 450 seeds were sown, respectively.

In 2002, cereal cultivars were planted on the 25th of January and emerged on the 15th February. In the experimental plots, the samples were taken during the beginning of the heading stage of the plants when the *H. tritici* adults began to emerge on the wheat crops in the first week of May in the first year. The cereal varieties were sown on the 9th November of the second year. Plants began to emerge on the 18th November and the heading began on the 28th April 2003. In the second year, the samples were first collected at the beginning of the heading period for all the varieties.

From the inner rows of each plot, in the first year, five ear samples were taken randomly and in the second year four were taken. Each ear, together with its appropriate label, was placed in a separate plastic bag. The plot number, cultivar name and date were written on the labels that were placed into the bags. The ear samples collected were brought into the laboratory. The samples were kept in a freezer for a day to prevent the *H. tritici* adults from escaping until the counting was completed.

The number of *H. tritici* adults, eggs and first and second larval stages on the ears were recorded during the counting. Pupae stages of *H. tritici* were not found in the samples taken during the study. For this reason, the pupa stages were not counted. The counting was carried out under a stereoscopic microscope. The egg group and first larvae stage of *H. tritici* are given in Figure 1.

In general, although the sampling process was carried out in roughly weekly intervals, the last sample was collected 11 to 12 days after the previous one. In the first year (2002), the cereal grains matured between the 15th and 20th June and were harvested on the 5th July. In the second year (2003), the grains matured between the 5th and 10th June and were harvested on the 23rd June. The counting continued until it was time for the harvest. The sampling continued until 10 days before the harvest.

RESULTS

Population densities of *H. tritici* on the bread wheat cultivars in 2002

The population densities of *H. tritici* on Bocro 4, Pehlivan and Yüreğir 89 are given in Figure 2. During the first and last two counts of the study, *H. tritici* adults were not only found on the Yüreğir 89 and Bocro 4 varieties, respectively. For the other counting dates, *H. tritici* adults (0.1 to 3.2/ear) continued to survive on all the cultivars. During the month of May, *H. tritici* eggs were found on all the varieties. The number of *H. tritici* eggs was an important part of the population, especially on the 10th May. At this time, the numbers of *H. tritici* eggs on Bocro 4, Pehlivan and Yüreğir 89 were 8.7, 13.9 and 15.4 per ear, respectively. On the final day of the sampling, on the 6th June, a very small number of eggs (0.1/ear) were observed.

The first-stage larvae of *H. tritici* began to emerge on the bread wheat varieties on the 16th May. At this time, the numbers of first-stage larvae of *H. tritici* on Bocro 4, Pehlivan and Yüreğir 89 were 20.3, 1.1 and 8.2 per ear, respectively. At the counting on 16th and 22nd May, majority of the population consisted of the first larval stage together with the egg stage. It was determined that a small number first-stage larva were only on the Pehlivan cultivar in early June.

The first data (13.4/ear) for the second-stage larvae of *H. tritici* on the Bocro 4 cultivar were obtained on 22nd May, which was one week after the first-stage larvae of *H. tritici* were seen for the first time on the cultivar. The second-stage larvae of *H. tritici* on all the cultivars

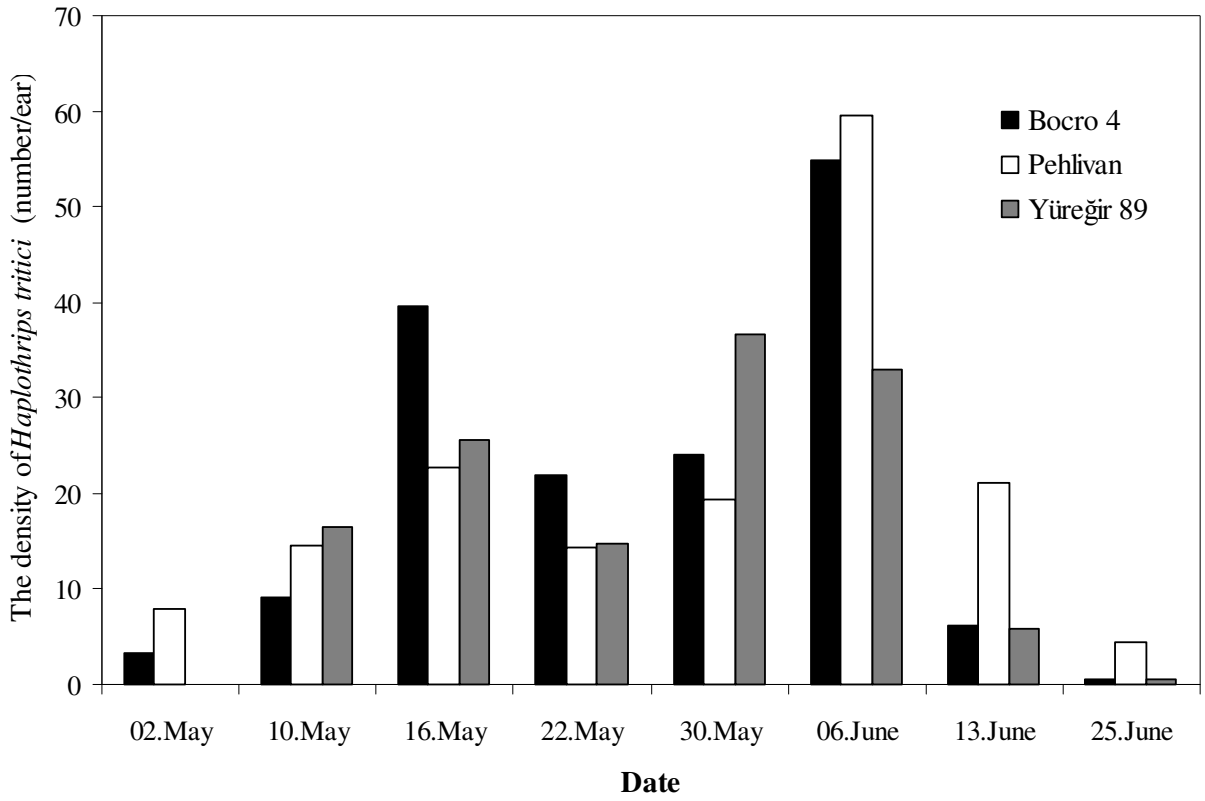

Figure 2. Population densities of *H. tritici* on different bread wheat cultivars, Bocro 4, Pehlivan and Yüreğir 89, (per ear) in 2002.

constituted a significant portion of the population between the 30th May and 13th June. On the 6th June, in particular, the numbers of second-stage larvae of *H. tritici* on Bocro 4, Pehlivan and Yüreğir 89 were 54.5, 58.7 and 32.8 per ear, respectively. At this time, the population density of *H. tritici* reached its highest value on the Pehlivan cultivar and this value showed significant differences when compared with that of Yüreğir 89. The population density of *H. tritici* on the Bocro 4 cultivar took second place after that of the Pehlivan cultivar and it was similar to those of both the other cultivars. On the later counting dates, the population density of *H. tritici* also decreased because the wheat plants dried up gradually in the plots and only the second-stage larvae and adults of *H. tritici* were seen on the spikes. The population density of *H. tritici* (21.1/ear) on the 13th June was much higher on the Pehlivan cultivar compared with those of the other cultivars (Figure 2).

Population densities of *H. tritici* on the durum wheat cultivars in 2002

The population densities of *H. tritici* on Balcali 85, Ceylan 95 and Harran 95 are given in Figure 3. The adult and egg stages of *H. tritici* were only seen in the first two weeks after heading began (between 2nd and 10th May). On 2nd May, the adult densities of *H. tritici* on the Balcali 85, Ceylan 95 and Harran 95 cultivars were found to be 5.2, 1.6 and 7.1 per ear, respectively. On the next counts, the number of adult individuals changed between 0.1 and 0.6 per ear and they continued to survive on all the varieties during the study and continued to lay eggs during the month of May (Figure 3).

On 10th May, the numbers of *H. tritici* eggs on the Balcali 85, Ceylan 95 and Harran 95 cultivars were 39.9, 50.9 and 39.4 per ear, respectively and the egg numbers increased, which led to the first peak for all the three cultivars. On this date, although the first-stage larvae of *H. tritici* were also present on the cultivars, their numbers only ranged between 0.5 and 1.3 per ear (Figure 3).

The numbers of *H. tritici* first-stage larvae gradually increased on all the cultivars on the 16th and 22nd May; their numbers on the Balcali 85, Ceylan 95 and Harran 95 cultivars were 7.6, 8.9 and 9.5 per ear, respectively on the 16th May and 15.3, 20.9 and 12.7 per ear, respectively, on the 22nd May. During the next two weeks, although the first-larvae stage of *H. tritici* continued to be present on the cultivars it remained at low levels, especially when the second-stage larvae had emerged.

The second-stage larvae of *H. tritici* on Balcali 85, Ceylan 95 and Harran 95 were 31.3, 30.6 and 25.7 per ear, respectively, on the 30th May and 46.7, 60.7 and

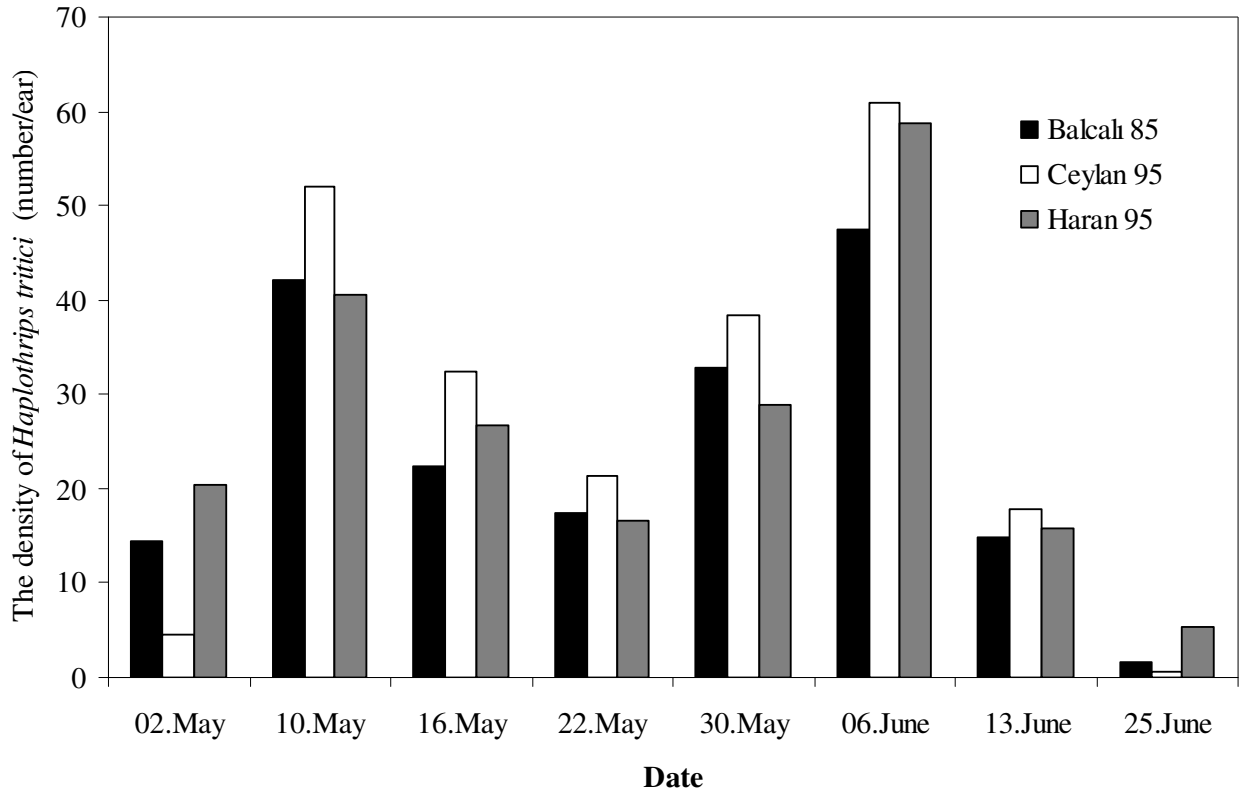

Figure 3. Population densities of *H. tritici* on different durum wheat cultivars, Balcali 85, Ceylan 95 and Harran 95, (per ear) in 2002.

58.4 per ear, respectively, on the 6th June. The *H. tritici* population reached its second-highest point on 6th June. The *H. tritici* population densities gradually decreased at later dates and only the second-stage larvae and adults remained on the cultivars.

In the period from heading until harvesting, the population densities of *H. tritici* on durum wheat varieties were similar to each other. The fluctuations of the population on each cultivar were almost similar (Figure 3).

Population densities of *H. tritici* on the barley cultivars in 2002

The population densities of *H. tritici* on Esterel and Pacific are given in Figure 4. *H. tritici* appeared on the barley cultivars eight days after their appearance on the bread and durum wheat cultivars and their existence continued from the middle of May until the middle of June. *H. tritici* eggs were first observed on the Pacific cultivar on 10th May and last observed on the Esterel cultivar on 30th May. The first and second stages of the *H. tritici* larvae were found one and two weeks, respectively, after the first eggs were observed. *H. tritici* adults were no longer found on the 25th June. However, they did not reach the highest population densities seen on the wheat varieties but remained at very low levels (0.1 to 3.2/ear).

Population densities of *H. tritici* on the bread wheat cultivars in 2003

The population densities of *H. tritici* on Bocro 4, Sham IV and Yüreğir 89 are given in Figure 6. Until the first half of May, the adult densities of *H. tritici* on Bocro 4, Sham IV and Yüreğir 89 were 0.1, 0.3 and 0.1 per ear, respectively. The number of adults, generally, were at the level of 0.0 during the following other counts of the study. Their numbers on Yüreğir 89 and Sham IV on the 21st May and 6th June, respectively, were 0.1 per ear. On or after 29th May, no *H. tritici* eggs were found.

The *H. tritici* population density on the Bocro 4 cultivar reached its highest value (26.9/ear) on 17th May. At this time, the first and second stages, especially, of the *H. tritici* larvae were seen on the Bocro 4 cultivar and their numbers were 13.0 and 13.8 per ear, respectively. Then the density gradually decreased. On 21st and 29th May, the numbers of the second stage of *H. tritici* larvae on Bocro 4 were 14.3 and 20.1 per ear, respectively.

The population densities of *H. tritici* on Sham IV and Yüreğir 89 reached their highest values on 29th May. In particular, the second larvae stage of *H. tritici* was observed on 29th May and their numbers on Sham IV and Yüreğir 89 were 47.0 and 20.1 per ear, respectively (Figure 5). From this date until the time of harvesting, the population density gradually decreased due to the grains

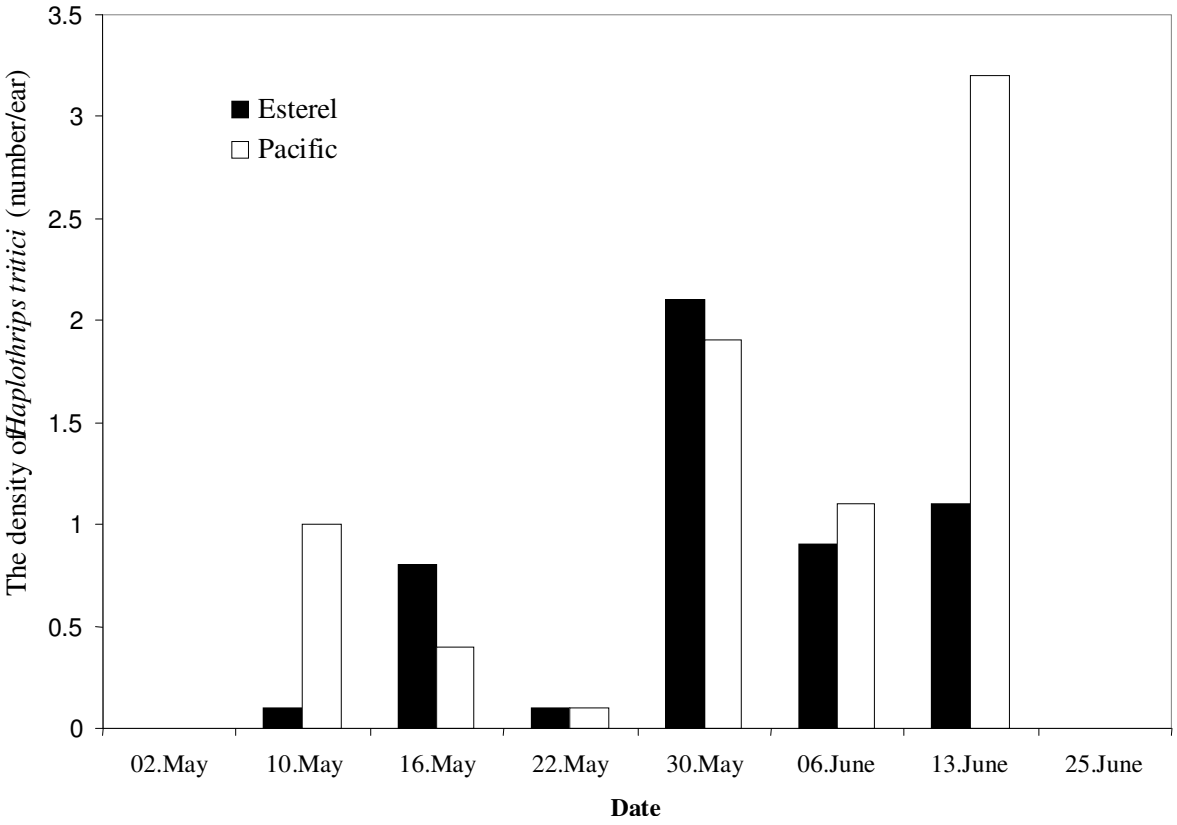

Figure 4. Population densities of *H. tritici* on the barley cultivars, Esterel and Pacific, (per ear) in 2002.

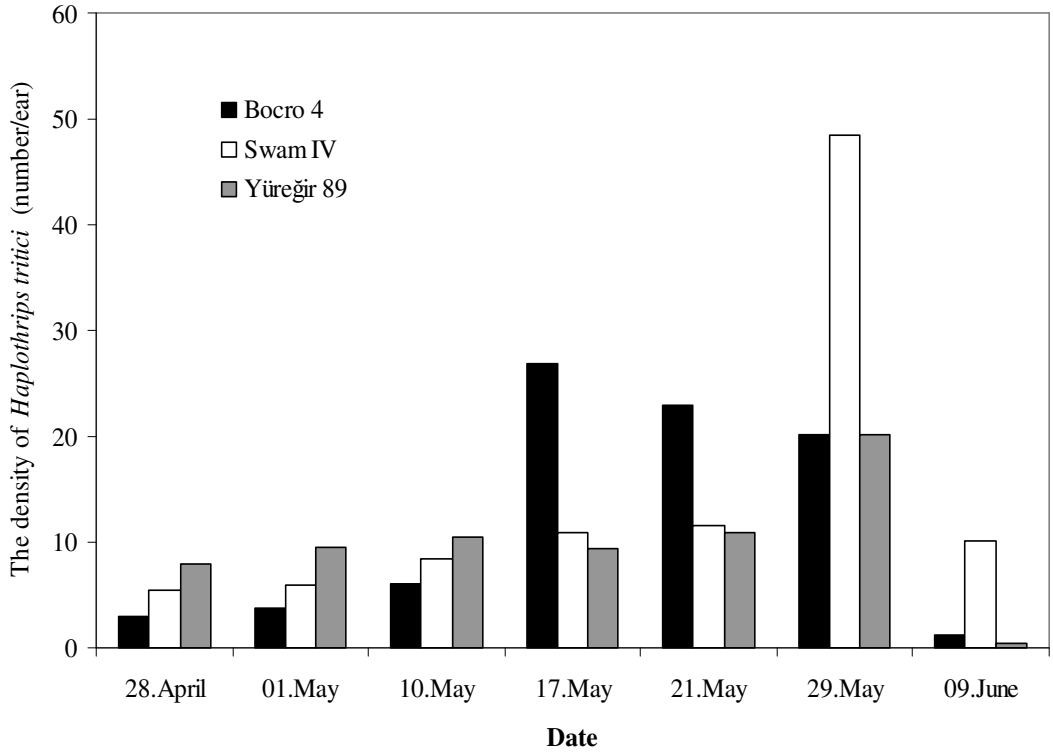

Figure 5. Population densities of *H. tritici* on the bread wheat varieties, Bocro 4, Sham IV and Yüreğir 89, (per ear) in 2003.

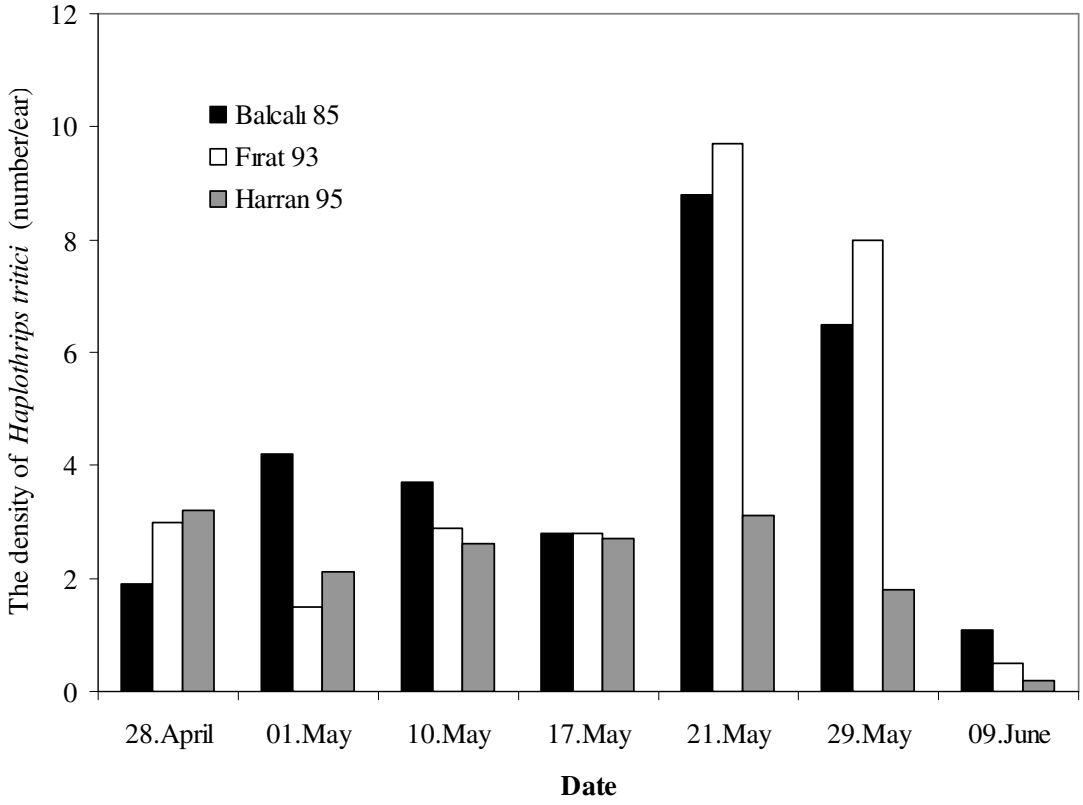

Figure 6. Population densities of *H. tritici* on the durum wheat varieties, Balcali 85, Firat 93 and Harran 95, (per ear) in 2003.

becoming more and more dry and only the second stage of the *H. tritici* larvae was observed on the ears.

Population densities of *H. tritici* on the durum wheat cultivars in 2003

The population densities of *H. tritici* on Balcali 85, Fırat 93 and Harran 95 are given in Figure 6. On 21st May, the maximum population densities of *H. tritici* on the Balcali 85 and Fırat 93 cultivars were 8.8 and 9.7 per ear, respectively. On the same date, the numbers of the second larvae stages of *H. tritici* on Balcali 85 and Firat 93 were 6.2 and 7.8 per ear, respectively. The *H. tritici* population density on the Harran 95 cultivar ranged from 0.2 to 3.2 per ear. Due to the grain becoming more and more dry, the population density gradually decreased and only the second-stage larvae were seen on the ears.

Population densities of *H. tritici* on the barley cultivars in 2003

The population densities of *H. tritici* on Esterel, Hege and Pacific are given in Figure 7. On the first day of counting (28th April), the eggs and adults of *H. tritici* were only seen on the spikes. At the beginning of May, the first-stage larvae of *H. tritici* started to emerge. From 10th May until harvesing, second-stage larvae of *H. tritici* were found. After the second half of May, eggs were not found on any of the varieties. On 9th June, only the second-stage larvae of *H. tritici* were found.

The population of *H. tritici* on the barley cultivars did not reach the highest level. The population densities of *H. tritici* on Esterel, Hege and Pacific ranged from 0.1 to 0.8, 0.1 to 0.9 and 0.1 to 1.2 per ear, respectively (Figure 7).

DISCUSSION

On the 6th June 2002, *H. tritici* populations on the bread wheat cultivars, Bocro 4, Pehlivan and Yüreğir 89, distinctively increased with the second larvae stage. In the first year, the *H. tritici* populations on the durum wheat cultivars, Balcali 85, Ceylan 95 and Harran 95, reached their highest point at the egg stage (10th May) and the second larvae stage (6th June). In the second year, the first and second larval stages on the bread wheat cultivar Bocro 4 (17th May) led to an increase in almost equal proportions of the *H. tritici* population. In the

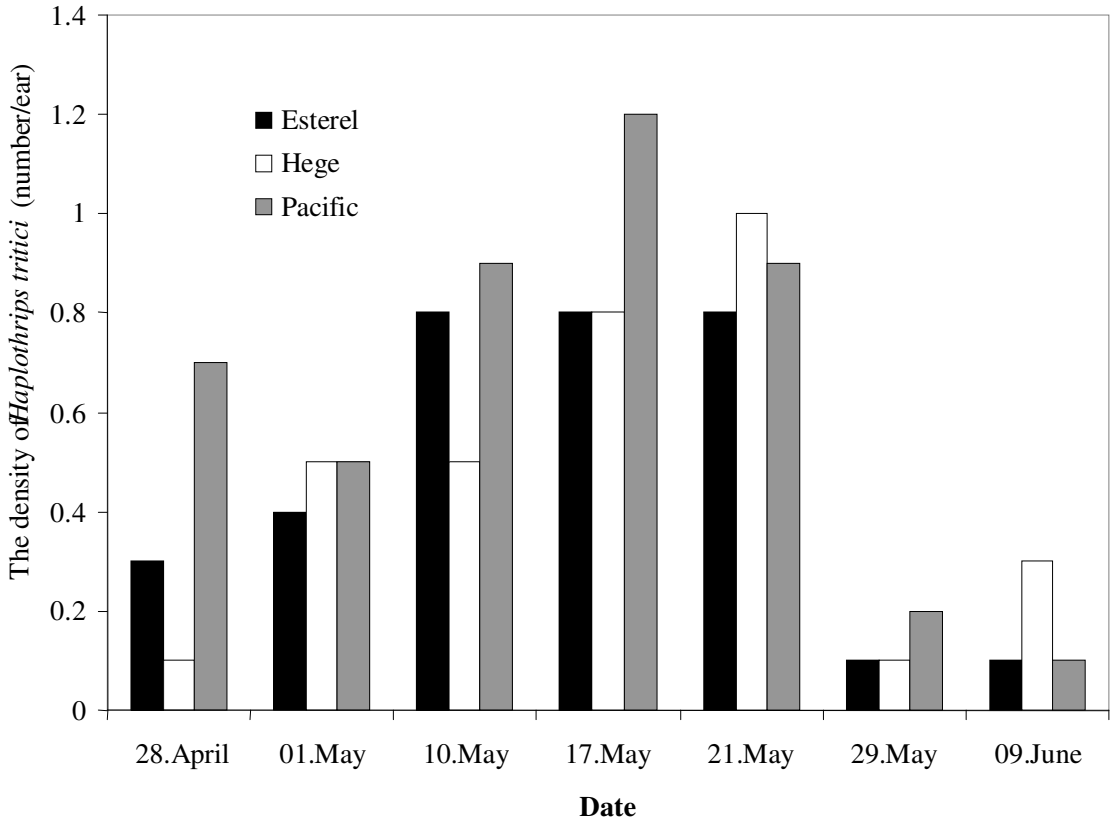

Figure 7. Population densities of *H. tritici* on the barley cultivars, Esterel, Hege and Pacific, (per ear) in 2003.

second year, an increase in the populations on the other bread wheat varieties (Sham 4 and Yüreğir 89) occurred with the second larval stage (29th May). The thrips population densities on the durum wheat varieties, Balcali 85, Firat 93 and Harran 95, were not as high as in the first year. Nevertheless, high population densities on Balcali 85 and Firat 93, in particular, (in the last week of May) occurred in the second larval stage. In both years, the populations on the barley varieties remained at low levels. Taratorina (1984) found that pest [wheat thrips, grain thrips (*Limothrips cerealium*) and aphids] abundance was considerably lower on barley than on wheat in all the years of the study.

Zhichkina and Kaplin (2001) reported that the peak for adult *H. tritici* occurred in June during the studies in the Samara region of Russia from 1996 to 1999. According to Latifian (2003) the thrips population density was at a high level during stem growth and the flowering and earing stages. The kinds of host cereals, changing weather conditions, soil tillage, sowing dates and natural enemies may have played an important role in thrips population densities in our study and the earlier-mentioned studies. Chugunov (1988) also reported that the timing of the control measures is closely connected to the economic thresholds and determining yield losses caused by individual pests, so these should also be carefully considered. According to Kamenchenko (1988), the control of the larvae should be carried out at grain formation, but control of the adults is important under outbreak conditions. Bielza and Lacasa (1998) found that for average production and prices, the economic damage threshold was 17 larvae per spike. The density of natural enemies and economic damage threshold should be considered for suppressing populations of *H. tritici* in cereal fields.

ACKNOWLEDGEMENTS

I am very grateful to Prof. Dr. Irfan Tunç, of the Akdeniz University, Agricultural Faculty, Plant Protection Department, PK 510 Antalya/Turkey, for thrips identification and Prof. Dr. Mustafa Çölkesen, of the Kahramanmaraş Sütçü Imam University, Agricultural Faculty, Field Crops Department, Avşar Campus 46100, Kahramanmaraş/Turkey for the cereal cultivars. Also, my thanks go to the bachelor students Cemil Bengin and Bişar Dağ for their assistance in counting and collecting the spike specimens.

REFERENCES

Anonymous (2002). Wheat thrips, INRA. The date of research: 10.11.2010. http://www.inra.fr/hyppz/RAVAGEUR/6haptri.htm.

Bielza P, Lacasa A (1998). Calculation of the economic damage threshold of wheat thrips *Haplothrips tritici* (Kurdjumov). Bol. San. Veg. Plagas, 24(2): 239-250.

Bielza P, Torres-Vila LM, Lacasa A (1996). Injuriousness of *Haplothrips tritici* Kurdjumov, 1913 (Thysanoptera: Phlaeothripidae) on wheat in central Spain. Folia Entomol. Hung, 57: 13-18.

Bournier A, Bernaux P (1971). *Haplothrips tritici* Kurdj. and *Limothrips cerealium* Hal. agents of the spotting of hard wheats. Ann. Zool. Ecol. Anim., 3(2): 247-259.

Chugunov AI (1988). Agrotechnical timing of tasks in plant protection. Zash. Rast. (Moskva). 10: 51-52.

Kamenchenko SE (1988). Assessment of the injuriousness of phytophages of spring wheat and prospects for using it in an intensive technology under irrigation conditions. Sib. Vestn. S-kh Nauki, (1): 33-37.

Latifian M (2003). A study of the phonology (related to host growth) and population fluctuation of important wheat pests. Iran. J. Agric. Sci., 34(4): 995-1001.

Lodos N (1984). Türkiye Entomolojisi III Genel, Uygulamalı ve Faunistik. Ege Üniversitesi, Ziraat Fakültesi Yayınları, No: 456. Ege Üniversitesi Basımevi, Bornova-İzmir, p. 150.

Minaei K, Mound LA (2008). The Thysanoptera Haplothripini (Insecta: Phlaeothripidae) of Iran. J. Nat. Hist., 42 (41–42) 2617–2658.

Shcherbakova SA (2008). Resistance of winter wheat cultivars to the wheat thrips. Zashch. Karan. Rast., 6: 41-42.

Taratorina GF (1984). Methods of soil cultivation and the insect fauna of cereal crops. Zash. Rast., 9: 43.

Tunç İ (1975). Central Anatolia Wheat thrips species that damage detection and Haplothrips Kurdjtritici.'s Research on biokolojisi, Anka ra University, Faculty of Agriculture, Ent. Course. PhD thesis.

Tunç İ (1978). Important thrips attacking wheat in central Anatolia. Report,-CENTO-Scientific-Programme. 1976, Recd., pp. 51-52.

Tunç İ, zur Strassen R (1984). Thysanoptera of Ankara Provience. Ankara University, Agricultural Faculty Publications. No: 919, Ankara. p. 37.

Tunç İ (1992). Studies on the Thysanoptera of Antalya V. Phlaoeothripidae, Uzel with an overall account, Turk. J. Entomol., 16(3): 135-146.

Veselinov D (1976). The appropriate timing of treatment against *Haplothrips tritici*. Rastit. Zasht., 24(3): 25-28.

Zhichkina LN, Kaplin VG (2001). The biology and ecology of and damage to plants by *Haplothrips tritici* Kurd. (Thysanoptera) in the forest-steppe of the middle Volga area. Entomol. Obozr, 80(4): 830-842.