academicJournals

Vol. 8(19), pp. 2189-2194, 23 May, 2013
DOI: 10.5897/AJAR11.1317
ISSN 1991-637X ©2013 Academic Journals
http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

*Full Length Research Paper*

# Monitoring population density and fluctuations of *Xyleborus dispar* and *Xyleborinus saxesenii* (Coleoptera: Scolytıdae) with red winged sticky traps in hazelnut orchards

**Islam Saruhan[1]* and Hüseyin Akyol[2]**

[1]Department of Plant Protection, Faculty of Agriculture, Ondokuz Mayis University, Samsun, Turkey.
[2]Bleak Sea Agricultural Research Institute Samsun, Turkey.

Accepted 15 May, 2013

**Bark and ambrosia beetles (Coleoptera: Curculionidae:Scolytinae) include many important pest species of forest and fruit trees. They usually prefer the physiologically stressed trees for colonization but also it is known that they attack healthy trees. Bark and ambrosia beetles are consisted of two main ecological groups, bark beetles grow in bark and ambrosia beetles in sapwood. Especially ambrosia beetles are very detrimental in Turkish hazelnut orchards. This study was carried out between 2005 and 2007 to monitor populations of *Xyleborus dispar* and *Xyleborinus saxesenii* (Col.: Scolytidae), causing considerable damages in hazelnut (*Corylus avellana* L.) orchards in Ordu and Samsun Provinces. The populations of the bark beetles were monitored using sticky traps with red wings that are registered and used to capture these pests. Ethyl alcohol (96%) was used as the attractant in the traps. The results of the three-year study indicated that both pest species emerged in different times in Ordu and Samsun. *X. dispar* emerged in large numbers in springs (March - May) as overwintered adults; however, *X. saxesenii* emerged in large numbers in summers (June - August). Population density is usually the *X. dispar* was found to be more. *X. dispar* on 05.15.2007 (398 adult/trap), X. *saxesenii* on.09.01.2005 (383 adult/trap) the highest catch was recorded in Samsun province.**

**Key words:** Hazelnut, monitoring population, *Xyleborus dispar*, *Xyleborinus saxesenii*, red winged sticky traps.

## INTRODUCTION

Hazelnut is one of the most important agricultural products of Turkey; it is cultivated over approximately 550 thousand hectares (84% of global production area), producing 500 thousand tonnes (69% of global production), of which approximately 300 thousand tones are exported (Yavuz, 2007).

Approximately 150 insect species have been detected in hazelnut orchards. However, only 10 to 15 of these species result in economic losses, varying between years and the region of hazelnut (Işık et al., 1987). According to various studies conduced in Turkey, Hazelnut weevil (*Balaninus nucum* L.) is the most significant hazelnut pest (Işık et al., 1987; Ecevit et al., 1995; Tuncer and Ecevit 1996 a, b; Saruhan and Tuncer, 2001; Tuncer et al., 2002). Bark beetles (*Scolytidae*) comprise another pest group of hazelnut (Ak et al., 2005a, b, c). These pests are a risk for stone or pome fruits, kiwi and forests, and have recently been shown to harm hazelnut orchards. Serious

*Corresponding author. E-mail: isaruhan@omu.edu.tr. Tel: +90-362-3121919 / 1133. Fax: +90-362-4576034.

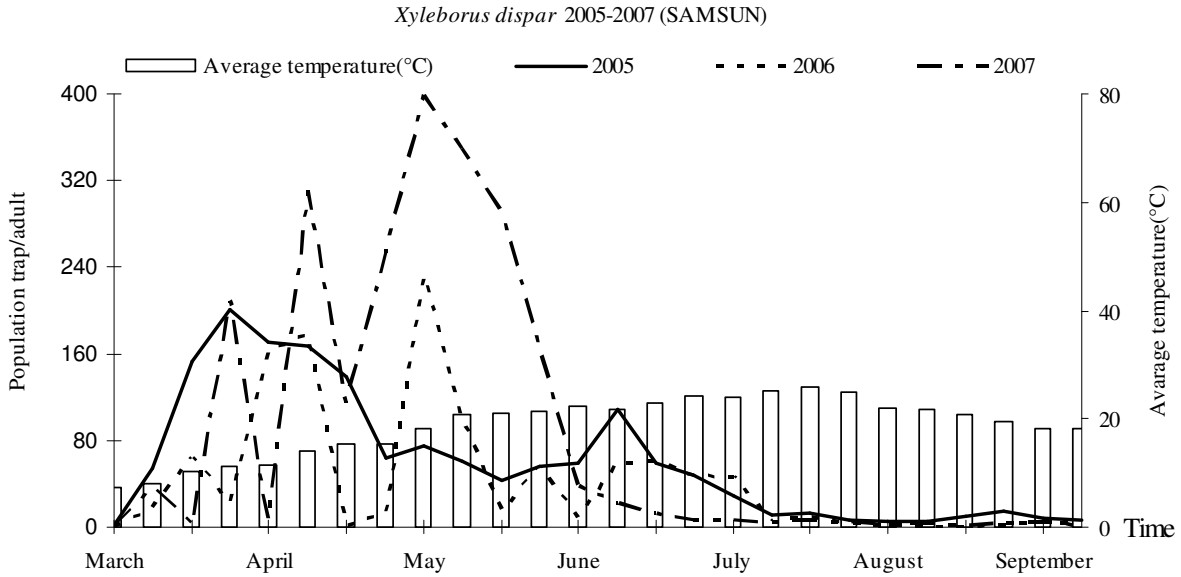


**Figure 1.** Population density and fluctuation of *X. dispar* in Samsun province (2005-2007).

damage of these species were observed on hazelnut plants in low and middle altitude of region in last years (Mani et al., 1990; Raulder, 2003; Kaya, 2004; Ak et al., 2006b, 2010). While other pests directly or indirectly affect the quality and yield in hazelnut orchards, bark beetles (*Scolytidae*) cause product losses by draining young or old hazelnut branches. Additionally, as these pests spend most of their lives in the woody tissue of their host, they are extremely difficult to eradicate. Therefore, chemical control must be supported by cultural and biological control.

Controlling bark beetles depends on the emergence time of the adult females. Therefore, Red Winged Sticky Traps (ethyl alcohol baited) are used to detect their emergence and achieve mass capture.

Population monitoring of pest species is of great importance in determining the emergence time of adult individuals in order to control them. Population monitoring enabled the determination of emergence times and population fluctuations of pest species in hazelnut orchards.

Due to the high population of pests in hazelnut orchards and the importance of determining the emergence time of adults in controlling them, this study examined population fluctuation of *X. dispar* and *X. saxesenii*. Both species are important in terms of both presence and density in hazelnut orchards in Turkey. They were monitored at different locations in two provinces (Samsun and Ordu) for three years and the emergence time of adults was determined.

## MATERIALS AND METHODS

The main materials of the study consist of hazelnut orchards, *Scolytidae* (bark beetles) species (*X. dispar* and *X. saxesenii*), Red Winged Sticky Traps and 96% ethyl alcohol as the attractant.

The trap used in the study consists of four red-colored sticky plates as a wing and a 1-liter plastic bottle hung just below them. Each wing of the sticky trap has an area of 148.9 $cm^2$ (14.6 cm height and 10.2 cm width). The total area of the sticky part of the trap is 0.12 $m^2$. The plastic bottle has four holes to enable the alcohol to evaporate.

Population monitoring of *X. dispar* and *X. saxesenii* used red-winged sticky traps licensed for use against bark beetles, which were located in hazelnut orchards of Samsun (Terme) and Ordu (Central) provinces between 2005 and 2007. Three traps were hang at each location used in the study. Traps were placed 1.5 m above the ground and spaced 20 m from each other. Population fluctuations of *X. dispar* and *X. saxesenii* were monitored in Samsun province (41° 12' 37" N - 36° 59' 32" W) and Ordu province (40° 58' 48" N - 37° 55' 44" W) in 2005 to 2007 (Figures 1 to 4). The numbers of trapped *X. dispar* and *X. saxesenii* were monitored weekly between March and October; traps were cleaned after each count and this process continued throughout the year. In the first year, traps were hang in Samsun location on 03.15.2005, and removed on 10.25.2005. In Ordu location, they were hang on 03.31.2005 and removed on 10.20.2005. In the second year, they were hang in Samsun location on 03.15.2006 and gathered on 10.26.2006, and in Ordu location they were hang on 03.16.2006 and gathered on 10.27.2006. In the last year of the study, the traps were hang in Samsun location on 03.21.2007 and gathered on 11.01.2007. In Ordu location, they were hung on 03.23.2007 and gathered on 10.15.2007.

## RESULTS

### Population density and fluctuation of *X. dispar* in Samsun Province (2005-2007)

The first *X. dispar* individuals were trapped during the last week of March (03.25.2005) in Samsun in 2005. The highest catch was recorded in the third week of April

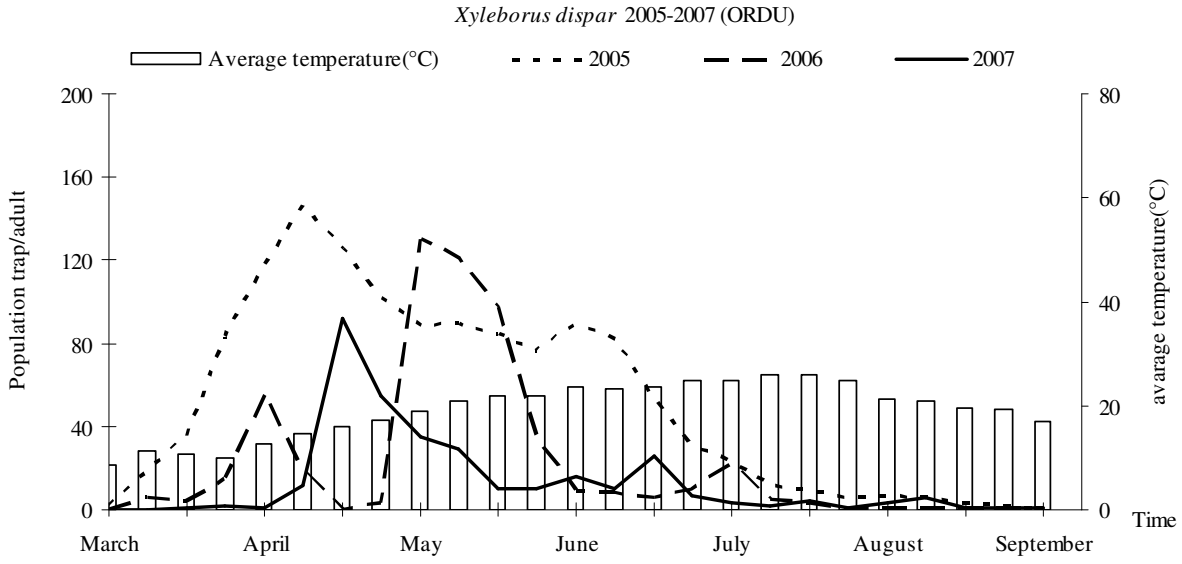


**Figure 2.** Population density and fluctuation of *X. dispar* in ordu province (2005-2007).

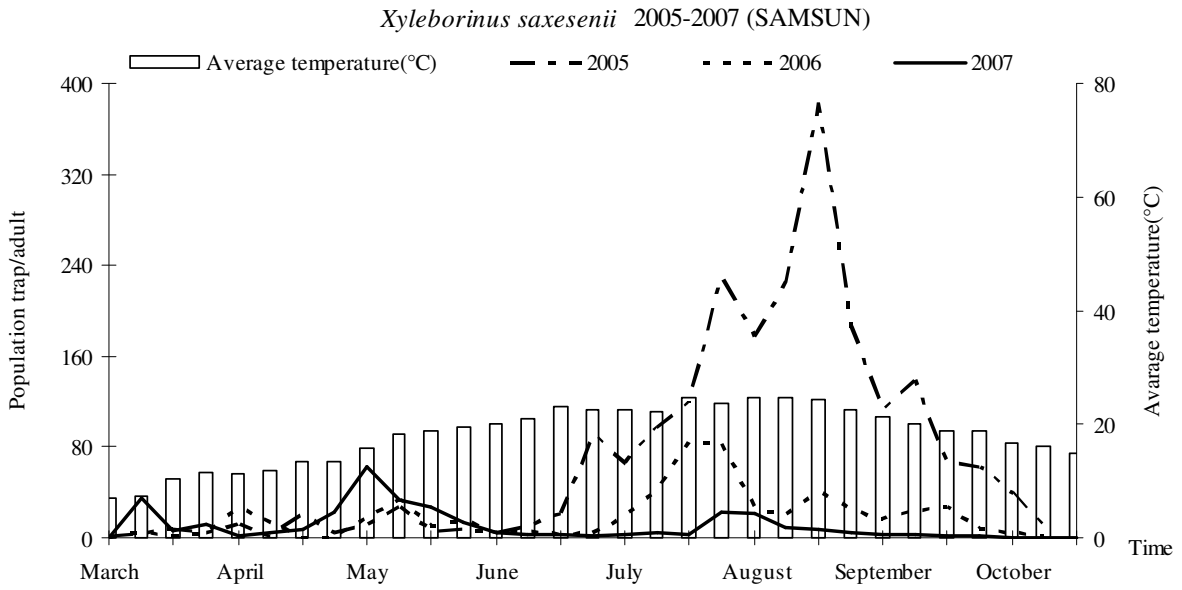


**Figure 3.** Population density and fluctuation of *X. saxesenii* in Samsun province (2005-2007).

(04.20.2005) (201 adult/trap). The number of individuals caught in traps decreased from this date, but an increase was observed again at the end of June and the beginning of July. The last adult individuals were trapped on 10.25.2005. In 2006, similarly to the previous year, the first catch was observed in the third week of March (03.21.2006). High numbers of individuals were trapped during May and June. The highest catch was recorded on 05.18.2006 (232 adult/trap). Catches declined from 07.13.2006 and the last catch was observed on 10.26.2006. In 2007, the first catch occurred in the last week of March (03.27.2007). High catches were observed during April. The highest catch was recorded on 05.15.2007 (398 adult/trap). Catches declined from 06.12.2007 and the last catch was recorded on 10.02.2007. High catches were observed during April. The highest catch was recorded on 15.05.2007 (398 adult/trap) (Figure 1). Data from Samsun Province for the three study years reveals that pests generally begin to emerge by the end of March, depending on the season, and reach their highest density emergence in April. Therefore, biological control for the pest should be

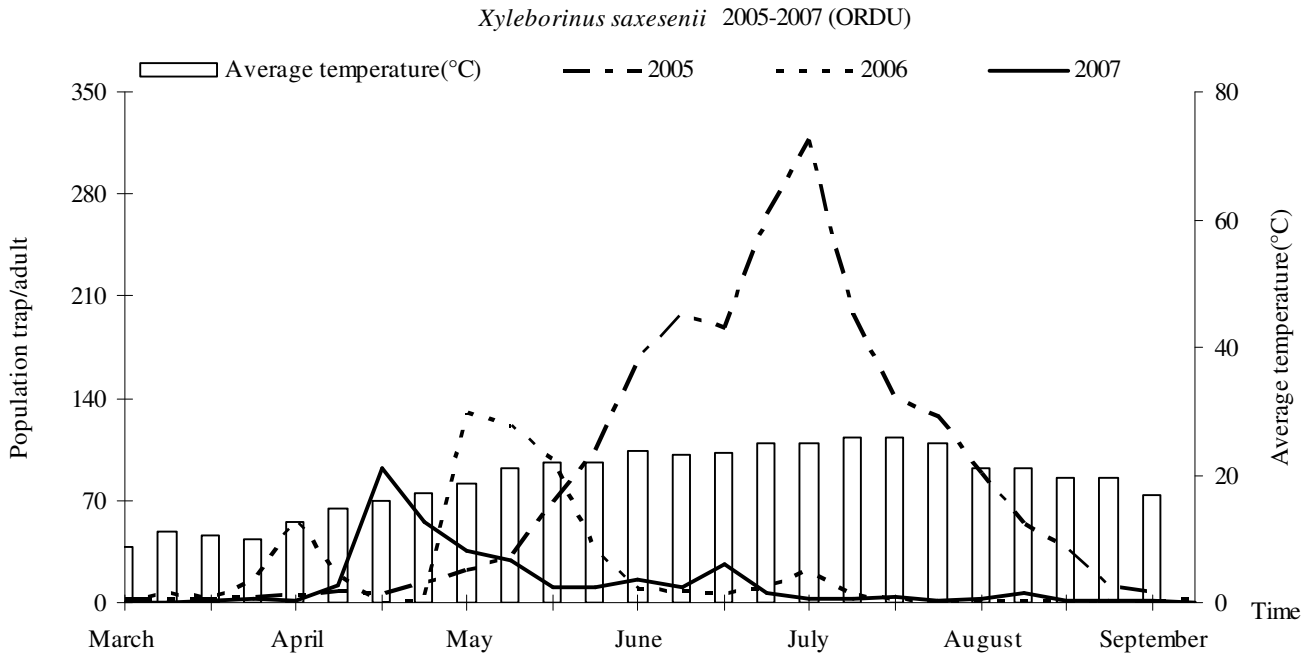


**Figure 4.** Population density and fluctuation of *X. saxesenii* in Ordu Province (2005-2007).

commenced at the end of March and chemical control in the first week of April.

### Population density and fluctuation of *X. dispar* in Ordu Province (2005-2007)

The pattern for *X. dispar* trapped in Ordu showed similarity to that of Samsun. The first catch at Ordu occurred in the first week of April (04.08.2005) and high catches were observed in March and April. The highest catch was recorded on 05.20.2005 (146 adult/trap). Catches of *X. dispar* at Ordu decreased from 07.9.2005 and the last catch was recorded on 10.07.2005. Seasonal differences were observed the following year, 2006, with earlier catches than in 2005. The first catch was observed on 03.23.2006 and high catches were recorded in April and May 2006, as in the previous year. The highest catch of 2006 was recorded on 05.29.2006 (130 adult/trap). From 07.04.2006, catches decreased and the last catch was observed on 10.27.2006. In Ordu during 2007, *X. dispar* was first trapped on 04.04.2007 and high catches were observed between 05.08.2007 and 07.12.2007. The highest catch was recorded on 05.16.2007 (92 adult/trap). The number of individuals trapped decreased from 07.20.2007 and ended on 10.05.2007 (Figure 2). The data indicate that the emergence of *X. dispar* depends on seasonal factors and that traps should begin to be used one week later than those at the Samsun site, and that chemical control should be started by the first week of April, as in Samsun province site. Both provinces showed a population decline at the beginning of May and an increase at the beginning of June. Therefore, commencing chemical pest control by the first week of June is of great importance in controlling populations.

### Population density and fluctuation of *X. saxesenii* in Samsun Province (2005-2007)

As with *X. dispar*, individuals of *X. saxesenii* were first recorded in traps in the last week of March and lasted until the last week of September in Samsun. The highest catches of *X. saxesenii* in Samsun generally occurred in July and August in each of the three study years. The highest catch during 2005 was recorded on 09.01.2005 (383 adult/trap); in 2006 it was detected on 07.26.2006 and 08.02.2006 (83 adult/trap), and in 2007 on 05.15.2007 (63 adult /trap). Even though the emergence of *X. saxesenii* in the summer season was detected in the first week of May 2007 and the first week of June during 2005 and 2006, the dense emergence of *X. saxesenii* in summer season was determined as being between the end of June and beginning of August. In 2007, adult emergence in May- June might result from the low population and high temperature since May (Figure 3). According to the data acquired, management of *X. saxesenii* should commence at the beginning of July in Samsun province, unlike *X. dispar.*

### Population density and fluctuation of *X. saxesenii* in Ordu Province (2005-2007)

In 2005, catches of *X. saxesenii* in Ordu were recorded

between 03.31.2005 and 10.20.2005. The highest catch was recorded on 08.05.2005 (317 adult/trap). And also high catches were observed in the dates between 07.29.2005 and 08.19.2005. In 2006, catches were recorded between 03.16.2006 and 10.27.2006. High catches were recorded between 07.20.2006 and 09.22.2006. The highest catch was recorded on 08.04.2006 (98 adult/trap). In 2007, the first and last catches were recorded on 03.23.2007 and 10.15.2007, respectively. The highest caught was seen on 07.20.2007 (58 adult/trap), and the time period with high catches was between 07.06.2007 and 07.27.2007 (Figure 4).

## DISCUSSION

In both locations in all three study years, the emergence of adult *X. dispar* was determined to be between March and June, depending on temperature. The emergences during these periods were found to be non-continuous and occurred as a result of nestling of adult in different periods.

Adult *X. saxesenii* were determined to emerge densely in the summer period between the end of June and August at both locations. Additionally, adult individuals nestling in the spring period were found in traps.

According to population monitoring over the three years in Samsun and Ordu provinces, adult individuals of both pests species emerged at different periods. The population progress of *X. dispar and X. saxesenii* were similar to each other at both locations.

As a result of population monitoring in Samsun and Ordu provinces, the dense emergence of adult *X. dispar* was found to occur in spring and adult *X. saxesenii* emerged in summer. Apart from these dense emergences, each species was found to make instantaneous (non-continuous) emergences. These findings support those reported by Ak (2004) and Ak et al. (2005a, b, c, 2006a).

It was found that *X. dispar* had higher population densities than *X. saxesenii* in both locations during 2006 and 2007 but not 2005.

Population monitoring of *X. dispar* showed that adult emergence increased during the spring season when the temperature was approximately 18 to 20°C. Similarly, a study by Kaya (2004) of mixed fruit trees (apple, pear, plum, peach etc.) found that, from 1997 to 1999, the first emergence of adult *X. dispar* was on May 8$^{th}$, April 26$^{th}$, and May 6$^{th}$, respectively. Schultz et al. (2002), using ethyl alcohol baited Lindgren and Japanese traps, reported that the first emergence of adult *Xyleborus crassiusculus* was at the end of March and the beginning of April. Mani et al. (1990), using ethanol traps, stated that *X. dispar* was caught in spring when the temperature was 20°C and that catches lasted for 3 to 4 weeks. In a study using ethyl alcohol funnel traps in fruit orchards in Canada (Creston), White (1992) reported that *X. dispar* emerged at the end of March and beginning of April and had two peaks in April and June. Ciglar and Boric (1998) stated that 98% ethyl alcohol diluted 1:1 with water could be used as baiter in winged traps; *X. dispar* emerged in spring when the temperature was 20°C and the emergence lasted from the last week of April to mid June. The results of population monitoring of *X. saxesenii* showed the emergence of adults in the spring season when the temperate reached 18 to 20°C, as in *X. dispar,* and the dense emergence was detected in June- August. Similarly, a study by Markalas and Kalapanida (1997) examined flight models of some *Scolytidae* using an ethyl alcohol baited slot tarp in an oak forest in Greece between 1992 to 1993; it was reported that *X. dispar* emerged in high numbers between March and June, and *X. saxesenii* from the end of April to the end of August. In a study of flight dynamics using alcohol traps, Raulder (2003) found that *X. saxesenii* and *X. dispar* began to fly in spring (end of March or the first week of April) when the daily temperature was 18°C and above, lasting until autumn; and that the period of dense flight occurred at the end of April to mid June. A survey of *Scolytidae* in Oregon forest (Cramer, 2005) observed the first emergence of *X. saxesenii* in mid February when the temperature reached 18°C and lasted until the end of autumn, with the period of highest emergence being from the beginning to the end of June.

*X. dispar* was found to have higher population density than *X. saxesenii* and the emergence of its nestled adults was observed in spring (March - April - May). This result highlights the importance of determining the appropriate period to commence the control of especially *X. dispar.* In this period, the control (mechanical, biotechnical and chemical) of nestled adults can give effective results. During the summer period, *X. dispar* showed low emergence from the end of June to mid August. *X.* saxesenii was found to emerge in low density in spring, depending on temperature, with dense emergence observed in the summer season (June - August). Therefore, control of this species should be conducted during this period.

### REFERENCES

Ak K (2004). Giresun, Ordu ve Samsun İllerinde Fındık Bahçelerinde Zarar Yapan Yazıcıböcek (Coleoptera: Scolytidae)Türlerinin Tespiti ve Kitlesel Yakalama Yöntemi Üzerinde Araştırmalar. Selçuk Üniversitesi Fen Bilimleri Enstitüsü (Basılmamış) Doktora tezi, Konya. P. 92.

AK K, Uysal M, Tuncer C (2005a). Giresun, Ordu ve Samsun illerinde fındık bahçelerinde zarar yapan yazıcıböcek (Coleoptera: Scolytidae) türleri, kısa biyolojileri ve bulunuş oranları. Ondokuz Mayıs Üniversitesi Ziraat Fakültesi Dergisi. 20(2):37-44.

AK K, Uysal M, Tuncer C (2005b). Giresun, Ordu ve Samsun illerinde fındık bahçelerinde zarar yapan yazıcıböceklerin (Coleoptera: Scolytidae) zarar seviyeleri. Gaziosmanpaşa Üniversitesi Ziraat Fakültesi Dergisi. 22(1):9-14.

AK K, Uysal M, Tuncer C, Akyol H (2005c). Orta ve Doğu Karadeniz Bölgesinde fındıklarda zararlı önemli yazıcıböcek (Colepotera: Scolytidae) türleri ve çözüm önerileri. Selçuk Üniversitesi Ziraat Fakültesi Dergisi. 19(37):37-39.

AK K, Uysal M, Tuncer C (2006a). Yazıcı Böceklerin Samsun ili fındık

bahçelerindeki populasyon değişimi ve kitle yakalama yöntemi üzerinde araştırmalar. Selçuk Üniversitesi Ziraat Fakültesi Dergisi. 20(39):15-22.
AK K, Uysal M, Tuncer C (2006b). "Karadeniz Bölgesinde kivilerde zararlı yazıcıböcek (Coleoptera: Scolytidae) türleri ve mücadelesi, 365-370". Gaziosmanpaşa Üniversitesi, Ziraat Fakültesi, II. Ulusal Kivi ve Üzümsü Meyveler Sempozyumu (14-16 Eylül 2006, Tokat) Bildirileri. P. 380.
AK K, Güçlü Ş, Tuncer C (2010). Kivide yeni bir meyve zararlısı: *Lymantor coryli* (Perris, 1853) (Coleoptera: Scolytidae). Türkiye Ento. Dergisi. 34(3):391-397.
Ciglar I, Boric B (1998). Bark beetle (Scolytidae) in Croation orchards. Acta Hortic. 525:299-305.
Cramer EE (2005). A survey of three key specıes of Ambrosıa Beetles (Coleoptera: Curculionidae: Scolytinae: *Monarthrum scutellare*, *Xyleborus dispar*, *Xyleborinus saxesenii*) in Oregon's Wıllamette Walley Nursery Industry. A Project, Oregon State University, Bioresource research and University Honors College. P. 27.
Ecevit O, Tuncer C, Hatat G (1995). Karadeniz Bölgesi bitki sağlığı problemleri ve çözüm yolları. O. M. Ü., Ziraat Fakültesi Dergisi. 10(3):191-206.
Işık M, Ecevit O, Kurt MA, Yücetin T (1987). Doğu Karadeniz Bölgesi fındık bahçelerinde Entegre Savaş olanakları üzerinde araştırmalar. Ondokuz Mayıs Üniversitesi Yayınları. No: 20, Samsun. P. 95.
Kaya M (2004). Bursa ilinde değişik meyve ağaçlarında *Xyleborus dispar* (F.) (Coleoptera: Scolytidae)'ın ergin populasyon değişimi üzerinde araştırmalar. Yüzüncü Yıl Üniversitesi, Zir. Fak., Tarım Bilimleri Dergisi. 14(2):113-117s.
Mani E, Remund U, Schwaller F (1990). Der Ungleiche Holzbohrer, *Xyleboryus dispar* F. (Coleoptera: Scolytidae) im Obst und Weinbau. Landwirtschaft Schweiz Band. 3(3):105-112.
Markalas S, Kalapanida M (1997). Flight pattern of some Scolytidae attracted to flight barier traps baited with ethanol in an oak in Greece. Anz. Schadlingskde., Pflanzenschutz, Umweltschutz. 70:55-57.
Raulder H (2003). Observation on the flight dynamics of Bark Beetle (*Xyleboruus saxeseni* and *Xyleboruus dispar*). Gesunde Pflanzen. 55(3):53-61.
Saruhan İ, Tuncer C (2001). "Population densities and seasonal fluctiations of Hazelnut pests in Samsun, Turkey. 419-429". Proc. V. Int. Congress on Hazelnut. Acta. Hortic. P. 556.
Schultz PB, Dills MS, Whitaker CS (2002). Managing Asian Ambrosia Beetle in Virginia. Sna Res. Conf. 47:167-169.
Tuncer C, Ecevit O (1996a). "Fındık Zararlıları ile mücadelede entegre model tasarımı, 40-53". Fındık ve Diğer Sert Kabuklu Meyveler Sempozyumu (10-11 Ocak 1996, Samsun) Bildirileri. P. 419s.
Tuncer C, Ecevit O (1996b). "Samsun ili fındık üretim alanlarındaki zararlılarla savaşım faaliyetlerinin mevcut durumu üzerinde bir araştırma, 286-292". Fındık ve Diğer Sert Kabuklu Meyveler Sempozyumu (10-11 Ocak 1996, Samsun) Bildirileri P. 419s.
Tuncer C, Saruhan İ, Akça İ (2002). Karadeniz Bölgesi fındık üretim alanlarındaki önemli zararlılar. Eko-kalite. Samsun Ticaret Borsası Yayın organı yıl:2, Sayı 2:43-54.
White KJ (1992). Scolytid pests in fruit tree orchards. Simon Fraser University. Master Thesis. P. 52.
Yavuz GG (2007). Fındık. Tarımsal Ekonomi Araştırma Enstitüsü-BAKIŞ. Sayı: 9, Nüsha: 8