



Araştırma Makalesi/Research Article

Coleoptera Species Determined in Almond Orchards in Mugla and Manisa Provinces of Turkey and Species Feed on Almond

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Abstract

This study has been carried out in Datça, Fethiye, Seydikemer and Akhisar, Kula localities of Turkey during the years 2014-2016. In this study, 127 insect genus/species belonging to 25 different families of Coleoptera order were determined. *Anthonomus amygdali*, and *A. pyri* feed on buds and flowers, *Polydrusus quadriticollis*, *P. ponticus* species feed on leaves, especially by consuming the edges of the leaves. *Clytra novempunctata*, *Labidostomis longimana*, *L. rufa*, *Smaragdina limbata* mainly feed on new shoots and leaves. *Cerambyx carinatus*, *C. welensii*, *Prionus coriarius* feed on wood tissues. *Tatianaerhynchites aequatus* and *Rhynchites smyrnensis* are mostly found on the fruit and feed on fruit on which they feed, and cause glue on fruit surface. It has been determined that *Tropinota hirta* and *Oxythyrea cinctella* feed on flowers and pollen. It was observed that *Bostrichus capucinus* and *Scobicia chevrieri* feed on wood tissues, *Teratolytta dives* and *Eolydus atripes* feed on leaves while *Orsodacne variabilis* feeds on flower, anther, filament and ovary organs.

This study determined for the first time that *B. capucinus*, *S. chevrieri*, *C. carinatus*, *C. welensii*, *P. coriarius*, *C. novempunctata*, *C. numidicus*, *Scolytus intricatus*, *Scolytus kirschii*, *T. dives*, *E. atripes* and *O. variabilis* species feed on almond orchards. Apart from these species, all of the identified species were detected only and did not show any biological activity.

Keywords: Almond, Coleoptera, Cerambycidae, Chrysomelidae, Coccinellidae, Curculionidae

Muğla ve Manisa İlleri Badem Bahçelerinde Saptanan Coleoptera Takımına Ait Türler ve Bademde Beslenen Türler

Öz

Bu çalışma, Datça, Fethiye, Seydikemer ve Akhisar, Kula ilçelerinde 2014-2016 yılları arasında gerçekleştirilmiştir. Çalışma sırasında Coleoptera takımına bağlı 25 adet familyaya ait 127 adet cins/tür tespit edilmiştir. *Anthonomus amygdali* ve *A. pyri* tomurcuklar ile çiçek içinde beslenmekte olup, *Polydrusus quadriticollis*, *P. ponticus* türleri ise yapraklarda özellikle yaprak kenarlarını tüketerek beslenmektedir. *Clytra novempunctata*, *Labidostomis longimana*, *L. rufa*, *Smaragdina limbata* özellikle yeni sürgün ve yapraklardan beslenmektedir. *Cerambyx carinatus*, *C. welensii*, *Prionus coriarius* türleri odun doku içinde beslenmektedir. *Tatianaerhynchites aequatus*, *Rhynchites smyrnensis* çoğunlukla meyve üzerinde bulunmakta ve meyve üstünden beslenmektedir ve beslendiği yerde meyvede zamk çıkıntısının olmasına neden olur. *Tropinota hirta* ve *Oxythyrea cinctella* çiçek ve polenler ile beslendiği tespit edilmiştir. *Bostrichus capucinus* ve *Scobicia chevrieri* odun dokusu içinde beslendiği, *Teratolytta dives*, *Eolydus atripes* yapraklardan beslendiği görülmüştür. *Orsodacne variabilis* çiçeklerden, erkek organ, sapçık, ovaryum ile beslenmektedir.

B. capucinus, *S. chevrieri*, *C. carinatus*, *C. welensii*, *P. coriarius*, *C. novempunctata*, *C. numidicus*, *Scolytus intricatus*, *Scolytus kirschii*, *T. dives*, *E. atripes* ve *O. variabilis* türlerinin badem alanlarında beslediği ilk defa bu çalışma ile belirlenmiştir. Bu türler dışında belirlenen türlerin tamamı sadece tespit edilmiş ve herhangi bir biyolojik aktivite gösterdiği görülmemiştir.

Anahtar Kelimeler: Badem, Coleoptera, Cerambycidae, Chrysomelidae, Coccinellidae, Curculionidae.

Introduction

Almond (*Prunus dulcis* Miller) is a tree in the Rosaceae family, native to Central and Western Asia. It was originally cultivated in Turkey, Iran, Syria and Palestine. Almond was taken from these countries to Greece, North Africa, Italy and Spain, and then to North America (Bolu and Özgen, 2010; Yavuz, 2011). Almonds are mostly consumed dried fruits and also preferred as fresh fruit in the green period. Field studies were carried out in Manisa and Mugla provinces where Almond



production is the highest in the Aegean region.

There are many data available about the Coleoptera fauna of Turkey. It has been reported that a number of Coleopteran species attack almond trees and has some beneficial species (Benhadi-Marin et al., 2011; Bolu et al., 2005; Bolu et al., 2006; Bolu and Özgen, 2007; Bolu and Legalov, 2008; Bolu and Özgen, 2009; Bolu and Özgen, 2010; Bolu, 2016; Gök et al., 2005; Lodos, 1981; Lodos et al., 2003; Maçan, 1986; Maral et al., 2014; Monaco, 1967; Önuçar and Zümreoğlu, 1985; Şahin et al., 2016; Şen and Gök, 2009; Russo et al., 1994; Yanık, 2013; Yücel and Şahin, 2015; Zalom et al., 2012).

The data on Coleoptera species found in almond growing areas in the Aegean region are incomplete. In the present study, different Coleoptera species from the almond trees were identified and recorded. Data on the damage of the potential pest and feeding species on almond trees were also observed.

Materials and Methods

This study was carried out in the almond orchards of Akhisar, Kula (Manisa) and Datça, Fethiye, Seydikemer (Muğla) between 2014 and 2016. Coleoptera species were collected from the almond trees by hand or with an aspirator, from the almond trees. Also Frappage (beating) method (hitting the 20 tree branches, 5 strokes per tree, and the falling individuals on a 40*40 cm sized cloth were collected) and visual observation methods were used in the collection of samples. During the studies, species feeding different parts of almond trees brought to the laboratory with plant parts to observe feeding status. Insect samples brought to the laboratory were allowed to be an adult in a room containing 25°C temperature and 70% humidity.

Results and Discussion

Coleoptera species

As a results of the study, 127 insect genus/species belonging to 25 families were found. Among these insects, it has been seen that 29 species feeding different part of almond trees.

Table 1. Coleoptera species determined in almond orchards in Muğla and Manisa provinces

| Family | Species Name | Locations |
|--------------|--|---|
| Aderidae | <i>Aderus populneus</i> (Creutzer in Panzer, 1796) | Datça Fethiye Seydikemer Akhisar Kula |
| Apionidae | <i>Catapion seniculus</i> (Kirby, 1808) | Datça Akhisar Kula |
| | <i>Ceratapion gibbirostre</i> (Gyllenhal, 1813) | Seydikemer Kula |
| | <i>Oryxolaemus flavifemoratus</i> (Herbst, 1797) | Fethiye |
| | <i>Malvapion malvae</i> (Fabricius, 1775) | Datça Fethiye Seydikemer Akhisar |
| | <i>Protapion fulvipes</i> (Fourcroy, 1785) | Akhisar |
| | <i>Protapion interjectum</i> (Desbrochers, 1895) | Fethiye |
| Bostrichidae | ** <i>Bostrichus capucinus</i> (Linnaeus, 1758) | Datça |
| | ** <i>Scobicia chevrieri</i> (Villa & Villa 1835) | Datça |
| Cantharidae | <i>Boveycanthis</i> sp. Wittmer, 1969 | Seydikemer |
| | <i>Cantharis pulicaria</i> Fabricius, 1781 | Datça Seydikemer Akhisar Kula |
| | <i>Malthinus conspicuus</i> Kiesenwetter, 1852 | Akhisar |



Table 1 continued

| | | |
|---------------|--|---|
| Cantharidae | <i>Malthinus hulai</i> Švihla, 2009 | Datça Fethiye Seydikemer |
| | <i>Malthinus punctatus</i> (Fourcroy, 1785) | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Malthinus seriepunctatus</i> Kiesenwetter, 1851 | Akhisar |
| | <i>Rhagonycha chevrolati</i> Marseul, 1864 | Datça Fethiye Seydikemer Akhisar Kula |
| Cerambycidae | <i>Agapanthia lateralis</i> Ganglbauer, 1884 | Fethiye Seydikemer |
| | ** <i>Cerambyx carinatus</i> Kuster, 1846 | Datça Kula |
| | ** <i>Cerambyx welensii</i> (Kuster, 1846) | Datça |
| | ** <i>Prionus coriarius</i> (Linnaeus, 1758) | Datça |
| | <i>Trichoferus fasciculatus</i> (Faldermann, 1837) | Datça |
| | <i>Stictoleptura cordigera</i> (Fuessly, 1775) | Fethiye Seydikemer |
| | <i>Stictoleptura tonsa</i> Daniel K.&Daniel J., 1891 | Fethiye Seydikemer |
| | <i>Stenurella bifasciata</i> (Muller, 1776) | Fethiye Seydikemer |
| | <i>Vadonia</i> sp. Mulsant, 1863 | Fethiye Seydikemer |
| Cetoniidae | ** <i>Tropinota (Epicometis) hirta</i> (Poda, 1761) | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Valgus hemipterus</i> (Linnaeus, 1758) | Datça Seydikemer |
| | ** <i>Oxythyrea cinctella</i> (Schaum, 1841) | Datça Seydikemer |
| | <i>Potosia cuprea cuprina</i> (Motschulsky, 1849) | Datça |
| Chrysomelidae | ** <i>Calomicrus syriacus</i> (W. 1924) | Fethiye Seydikemer |
| | <i>Chaetocnema tibialis</i> (Illiger 1807) | Kula |
| | ** <i>Clytra novempunctata</i> Olivier, 1808 | Datça Seydikemer Kula |
| | <i>Cryptocephalus macellus</i> Suffrian, 1860 | Datça Akhisar Kula |
| | <i>Hermaphysa ruficollis</i> (Lucas, 1849) | Datça Fethiye Seydikemer Akhisar Kula |
| | ** <i>Labidostomis longimana</i> (Linnaeus, 1758) | Fethiye Seydikemer |
| | ** <i>Labidostomis rufa</i> (Waltl, 1838) | Datça Fethiye Seydikemer Akhisar Kula |



Table 1 continued

| | | |
|---------------|---|---|
| Chrysomelidae | <i>Longitarsus callidus</i> Warchalowski, 1967 | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Macrocoma rubripes</i> (Schaufuss, 1862) | Datça Fethiye Kula |
| | <i>Phyllotreta nigripes</i> (Fabricius 1775) | Datça Fethiye Seydikemer Akhisar Kula |
| | ** <i>Smaragdina limbata</i> (Stevens 1806) | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Bruchidius ater</i> (Marsham, 1802) | Datça Fethiye |
| | <i>Bruchidius biguttatus</i> (Olivier, 1795) | Datça |
| | <i>Bruchidius bimaculatus</i> (Olivier, 1795) | Seydikemer |
| | <i>Bruchidius cisti</i> (Fabricius, 1775) | Datça Fethiye Seydikemer |
| | <i>Bruchidius imbricornis</i> (Panzer, 1795) | Kula |
| | <i>Bruchidius lividimanus</i> (Gyllenhal, 1833) | Seydikemer |
| | <i>Bruchidius nudus</i> (Allard, 1868) | Seydikemer Kula |
| | <i>Bruchidius orchesioides</i> (Heyden, 1892) | Datça |
| | <i>Bruchidius picipes</i> (Germar, 1824) | Fethiye |
| | <i>Bruchidius pusillus</i> (Germar, 1824) | Fethiye Seydikemer |
| | <i>Bruchidius seminarius</i> (Linnaeus, 1767) | Fethiye Akhisar |
| | <i>Bruchidius terrenus</i> (Sharp) | Fethiye |
| | <i>Bruchidius varius</i> (Olivier, 1795) | Datça Kula |
| | <i>Bruchidius villosus</i> (Fabricius, 1792) | Datça |
| | <i>Bruchus atomarius</i> (Linnaeus, 1761) | Akhisar |
| | <i>Bruchus luteicornis</i> Illiger, 1794 | Kula |
| | <i>Bruchus rufimanus</i> Bohemann, 1833 | Seydikemer |
| | <i>Caryedon serratus</i> (Olivier, 1790) | Kula |
| | <i>Spermophagus sericeus</i> (Geoffroy, 1785) | Fethiye Akhisar Kula |
| Cleridae | * <i>Trichodes</i> sp. Herbst, 1792 | Datça |
| | * <i>Denops albofasciatus</i> (Charpentier, 1825) | Datça |
| | * <i>Gyponyx signifler</i> (Boheman, 1851) | Datça Fethiye Seydikemer Akhisar |
| | * <i>Clerus mutillarius</i> Fabricius, 1775 | Datça Seydikemer Akhisar |
| | * <i>Thanasimus formicarius</i> (Linnaeus, 1758) | Datça Fethiye Seydikemer Akhisar |



Table 1 continued

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|---------------|--|---|
| Coccinellidae | * <i>Adalia bipunctata</i> (Linnaeus, 1758) | Datça Fethiye Seydikemer Akhisar Kula |
| | * <i>Coccinella septempunctata</i> Linnaeus, 1758 | Datça Fethiye Seydikemer Akhisar Kula |
| | * <i>Chilocorus bipustulatus</i> (Linnaeus, 1758) | Datça Akhisar |
| | * <i>Hippodamia variegata</i> (Goeze, 1777) | Akhisar Kula |
| | * <i>Propylea quatuordecimpunctata</i> (Linnaeus, 1758) | Akhisar Kula |
| | * <i>Coccinula quatuordecimpunctata</i> (Linnaeus, 1758) | Seydikemer Akhisar Kula |
| | * <i>Oenopia conglobata</i> (Linnaeus, 1758) | Datça Fethiye Seydikemer Akhisar Kula |
| | * <i>Exochomus quadripustulatus</i> (Linnaeus, 1758) | Seydikemer Akhisar Kula |
| | * <i>Stethorus</i> sp. Weise, 1885 | Datça Fethiye Seydikemer Akhisar Kula |
| Curculionidae | ** <i>Anthonomus amygdali</i> Hustache, 1930 | Datça Fethiye Seydikemer Akhisar Kula |
| | ** <i>Anthonomus pyri</i> Kollar, 1837 | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Achradidius syriacus</i> (Boheman, 1842) | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Coeliodes ruber</i> (Marshall, 1802) | Fethiye |
| | ** <i>Crypturgus numidicus</i> Ferrari, 1867 | Akhisar |
| | <i>Curculio pellitus</i> (Boheman, 1843) | Akhisar |
| | <i>Hypera plantaginis</i> (De Geer 1775) | Akhisar |
| | ** <i>Hypolixus pica</i> (Fabricius, 1798) | Fethiye Seydikemer |
| | <i>Larinus latus</i> (Herbst, 1783) | Seydikemer Kula |
| | <i>Lixus algirus</i> (Linnaeus, 1758) | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Lixus ascanii</i> (Linnaeus, 1767) | Fethiye |



Table 1 continued

| | | |
|--|--|---|
| Curculionidae | <i>Lixus incanescens</i> Boheman, 1835 | Fethiye Seydikemer |
| | <i>Lixus vilis</i> (Rossi, 1790) | Fethiye Seydikemer |
| | ** <i>Polydrusus ponticus</i> Faust, 1888 | Datça Fethiye Seydikemer Akhisar Kula |
| | ** <i>Polydrusus quadriticollis</i> Desbrochers, 1902 | Datça Fethiye Seydikemer Akhisar Kula |
| | ** <i>Scolytus amygdali</i> Guerin, 1847 | Datça |
| | ** <i>Scolytus intricatus</i> (Ratzeburg, 1837) | Datça |
| | ** <i>Scolytus kirschii</i> Skalitzky, 1876 | Fethiye |
| | ** <i>Scolytus mali</i> (Bechstein, 1805) | Fethiye |
| | ** <i>Scolytus rugulosus</i> (Muller, 1818) | Datça Fethiye Seydikemer Akhisar Kula |
| | ** <i>Scolytus scolytus</i> (Fabricius, 1775) | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Smicronyx jungermanniae</i> (Reiche, 1797) | Akhisar Kula |
| | <i>Sitona crinitus</i> (Herbst, 1795) | Fethiye Seydikemer |
| | <i>Sitona humeralis</i> Stephens 1831 | Fethiye Seydikemer |
| | <i>Sitona puncticollis</i> Stephens, 1829 | Datça Fethiye Seydikemer Akhisar Kula |
| | <i>Tychius brevisculus</i> Desbrochers, 1873 | Akhisar |
| <i>Tychius cuprifer</i> (Panzer, 1799) | Akhisar | |
| <i>Tychius meliloti</i> Stephens, 1831 | Akhisar | |
| Dasytidae | <i>Danacea nigratarsis</i> (Küster, 1850) | Akhisar |
| Dermestidae | <i>Ctesias maculifasciata</i> (Reitter, 1899) | Kula |
| | <i>Anthrenus</i> sp. Muller, 1764 <i>pimpinellae</i> group | Datça |
| Elateridae | <i>Peripontius terminatus</i> (Erichson, 1842) | Fethiye Seydikemer Akhisar Kula |
| | <i>Drasterius bimaculatus</i> (Rossi, 1790) | Fethiye Akhisar |
| | <i>Quasimus minutissimus</i> (Germar, 1822) | Datça Seydikemer Akhisar |
| | <i>Cardiophorus stussineri</i> Buysson, 1913 | Datça Kula |
| | <i>Cardiophorus discicollis</i> (Herbst, 1806) | Fethiye |
| | <i>Cardiophorus vestigialis</i> Erichson, 1840 | Akhisar |



Table 1 continued

| | | |
|---------------|---|---|
| Elateridae | <i>Porthmidius drymogenes</i> Platia, 2010 | Datça Fethiye Seydikemer |
| Latridiidae | <i>Corticarina</i> sp. Reitter, 1880 | Datça |
| Malachiidae | <i>Malachius</i> spp. Fabricius, 1775 | Seydikemer Akhisar Kula |
| Meloidae | ** <i>Teratolytta dives</i> (Brulle, 1832) | Akhisar |
| | ** <i>Eolydus atripes</i> (Pic, 1905) | Akhisar |
| Mycteridae | <i>Mycterus tibialis</i> Kuster, 1850 | Fethiye Seydikemer |
| Oedemeridae | <i>Oedemera flavipes</i> (Fabricius, 1792) | Datça Fethiye Seydikemer Akhisar Kula |
| Orsodacnidae | ** <i>Orsodacne variabilis</i> Baly, 1877 | Fethiye Seydikemer |
| | <i>Orsodacne humeralis</i> Latreille, 1804 | Akhisar |
| Ptinidae | <i>Homophthalmus aquilus</i> Toskina, 2013 | Datça |
| | <i>Dryophilus pusillus</i> (Gyllenhal, 1808) | Datça Fethiye Seydikemer Akhisar Kula |
| Rhynchitidae | ** <i>Tatianaerhynchites aequatus</i> (L., 1767) | Seydikemer Kula |
| | ** <i>Rhynchites smyrnensis</i> (Desb. des Loges, 1869) | Fethiye Seydikemer Akhisar Kula |
| Sericidae | <i>Triodontella</i> sp. Reitter, 1919 | Datça Kula |
| Silvanidae | * <i>Silvanus bidentatus</i> (Fabricius, 1792) | Datça Kula |
| Staphylinidae | <i>Tachyporus nitidulus</i> (Fabricius, 1781) | Datça |
| Trogossitidae | * <i>Nemosoma elongatum</i> (Linnaeus, 1761) | Datça |

* predatory species, ** species feed on the leaf, shoots, branches, trunk or fruit of almond tree

Almond orchards are particularly planted in areas where forest plantations disrupted, and mostly in areas where chemical control has not been done except for the major pest species. For this reason, this study shows that insect fauna is rich compared to other fruit production areas. It can be said that almond orchards are visited by many insect species. 98 species belonging to 21 families identified in this study are included visiting insects. The fact that some species feed on different parts of almond trees should not mean that they are pests. The majority of species recorded as pest spend their entire biological period on or within the plant.

Species feeding on almond trees

During the study it was determined that some insect species feeding on shoots, leaves, flowers or fruits of almond trees. Some of the species considered as pest species. *Anthonomus amygdali* and *Anthonomus pyri* were feeding on buds, flowers and reproductive parts (stigma, style, ovary, and anther) in each area. The larvae of the species were visible during the bud and flowering periods of the trees between January and April. Whereas adults were seen on the leaves after the flower pollination completed. Bud and flower samples taken from each district were brought to the laboratory and *A. amygdali* adults emerged from the plant samples. Monaco (1967), stated that adult feed on leaves and shoots. And also, a small number of *A. pyri* adults were recorded from samples. *Hypolixus pica*, *Polydrusus quadricollis* and *P. ponticus* species were feeding on the leaves, especially by consuming leaf edges. Özbek (2014) stated that *H. pica* fed on the leaves of almond trees. Bolu (2016) reported



almond as host of *L. ascanii*. Similarly Lodos et al. (2003) described that almonds are among the hosts of *P. ponticus* and *P. quadriticollis*. However, these species do not exist in high populations in the orchards. *Crypturgus numidicus*, *Scolytus amygdali*, *S. intricatus*, *S. kirschii*, *S. mali*, *S. rugulosus*, *S. scolytus*, species were observed feeding in the cambium tissue that cause drying of both old and young trees. The larvae and the adult of these pests were obtained from the branches with glue currents, which were dry or almost dry trees in each district. *S. rugulosus* and *S. scolytus* species were determined as dominant species in each district. In particular, *S. rugulosus* can cause wilting of young trees of 5–7 years old, and trees of 30–40 years old. The adults of *Scolytus* species were observed on the branches of the trees in May. The symptoms of damage, such as glue flow or sawdust were seen in June.

From the Chrysomelidae family, *Clytra novempunctata*, *Labidostomis longiman*, *L. rufa*, *Smaragdina limbata* feeding mainly new shoots and leaves. However, these species do not reach high population levels in the orchards. *Calomicrus syriacus* was found only in Fethiye and Seydikemer. The observations made on branches and leaves, no biological stage was found except the adult stage. Adults consumes all leaves and cause 100% defoliation leaving the tree leafless. Gök et al. (2005) reported in their studies in Isparta that biological stages other than adult was not seen on the trees or leaves and 99% of the tree could be damaged leading to leafless tree. They also stated that these species could be an important almond pest in areas with Mediterranean climate. Şen and Gök (2009) reported in another study performed in Isparta province that *C. syriacus* was the most dominant pest species of almonds and cherries in the study area.

Cerambyx carinatus, *C. welensii*, *Prionus coriarius* species in the Cerambycidae family, found in every orchards and almost in every tree of 20–90 years age in Datça district. Branches or stems of the trees were broken or dried because of pests. Fresh sawdust from damaged trees was noted begin in April. *C. carinatus* and *C. welensii* species were the most found species in the samples brought to the laboratory and in the field. There was no damage in the newly planted or regularly maintained orchards.

Tatianaerhynchites aequatus and *Rhynchites (Epirhynchites) smyrnensis* from the Rhynchitidae family feeding surface of the fruit and it causes gumming on the fruit. They do not reach the population density that they need to be controlled.

Cetoniidae Family, *Tropinota (Epicometis) hirta* and *Oxythyrea cinctella* were recorded on and in the flowers. Especially *T. hirta* were found feeding on flowers in every orchard surveyed in the provinces of Akhisar, Kula, Seydikemer and Fethiye during the blooming season. Therefore, it is a significant pest to be considered. It is a pest that can be suppressed with biotechnical control method with blue basins filled with water. In the case of biotechnical control, population can be suppressed and damage cannot occur. On the other hand, in Datça, the blooming starts in February, so the pest do not cause harm and not seen in the orchards.

From Bostrichydae family, *Bostrichus capucinus* and *Scobicia chevrieri* open galleries by feeding in branches and trunk.

From the Meloidae family, it was noted that the *Teratolytta dives* and *Eolydus atripes* fed on the leaves. However, the population of both the species has not high population density. We cannot say these species are a pest or problem for almond orchards.

Orsodacne variabilis from the Orsodacnidae family was determined that feeding anther, filament and pollen. Medvedev (2015) reports that *Orsodacne humeralis* and *Orsodacne variabilis* species may be the same species.

Our study revealed that *B. capucinus*, *S. chevrieri*, *C. carinatus*, *C. welensii*, *P. coriarius*, *C. novempunctata*, *C. numidicus*, *L. algirus*, *L. vilis*, *S. intricatus*, *S. kirschii*, *T. dives*, *E. atripes* and *O. variabilis* were determined for the first time feeding almond trees in Turkey. But it cannot said that all species are pests.

Predatory species found in almond orchards

During the study, predatory species belonging to Cleridae, Coccinellidae, Trogossidae and Silvanidae families were determined. Insect samples were collected as adult or larva with its host.

Gyponyx signifer, *Clerus mutillarius*, *Thanasimus formicarius* and *Trichodes* sp. belonging to the Cleridae family were collected as adults from orchard and from branches damaged by *Scolytus* spp. and brought to the laboratory.



It was found that the *Silvanus bidentatus* larvae belonging to the family of Silvanidae and *Nemosoma elongatum* adult from Trogossitidae family visited and fed in the galleries of *S. rugulosus*, *S. scolytus*, *S. amygdali* under the bark in the trunk. The list of insect predators given by Karaman and Tezcan (2006), *Clerus mutillarius*, *Thanasimus formicarius*, *N. elongatum*, *S. bidentatus* are among the natural enemies of the bark beetles. Sarıkaya and Avcı (2009) reported that in the Western Mediterranean forest areas, *C. mutillarius*, *T. formicarius*, *N. cornutum* species are important predators of bark beetles, Yıldız (2012), determined that *C. mutillarius*, *T. formicarius*, *Trichodes* sp., *N. elongatum*, *S. bidentatus* were predators of bark beetles in Bartın and Karabük provinces of Turkey. Ibiş (2015) reported *T. formicarius*, among the predators of bark beetles at the forest areas of Izmir. Baydemir (2016) described *C. mutillarius*, *T. formicarius* as predators of Scolytinae species in the Balıkesir province. Lieutier et al. (2016), reported that *C. mutillarius*, *T. formicarius* and *S. unidentatus* species were predators of bark beetles in pine trees in the Mediterranean region.

In the field studies conducted in Datça, it was observed that *D. albofasciatus* adults were feeding on the adults of *Scolytus* spp. and *S. chevrieri* in the holes opened on the branches damaged by pest.

It is known that *D. albofasciatus* feeds on many wood boring insects and bark beetles. Wall (1994) reported that *D. albofasciatus* feeding species belonging to the Bostrichidae family in Southern Europe. Yayla et al. (1995) documented, that *Phloeotribus scarabaeoides* was the one of its prey in the olive fields of Antalya. Gerstmaier et al. (1999), mentioned that species feeding on trunk from Anobiidae and Bostrichidae families were hosts to the *D. albofasciatus*. Bostrichidae, Cerambycidae larvae (Horak and Nakladal, 2009) and *Synoxylon* sp. (Bostrichidae) (Micas, 2011) are the prey of the *D. albofasciatus*. Frapa and Rouse (2016) also reported that *D. albofasciatus* was predacious on *S. chevrieri*.

Coccinellidae species, *Adalia bipunctata*, *Coccinella septempunctata*, *Hippodamia variegata*, *Propylea quatuordecimpunctata*, *Coccinula quatuordecimpunctata*, *Oenopia conglobata*, *Exochomus quadripustulatus* were collected from shoots that were infested with aphids. *Stethorus* sp. were collected from the leaves with the Acari. At the same time Coccinellidae species eggs, larvae and pupa stages were also found on plant samples.

In Tukey, Coccinellidae species reported by Aslan and Uygün (2005), Güncan et al. (2010), Portakaldalı and Satar (2010), Yoldaş et al. (2011) and Yanık (2013) are the same species found in this study. In addition, Coccinellidae species determined by Almatni and Khalil (2008) study of the *Brachycaudus amygdalinus* in the almond fields in Syria were the same found in this study. *Chilocorus bipustulatus* was observed as adult in the orchards that were infected with *Parlatoria oleae*.

It would also be useful to conduct detailed studies on species with limited information on its biology. It is worthwhile to study the details of alternative control methods such as biotechnological control, trapping methods which will not affect the populations of beneficial insect species.

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