

## Insects on lavender in Isparta province, Turkey

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### Abstract

Since ancient times, people have been interested in perfumed and spicy plants and used them in many areas such as cosmetics, flavors, foodstuffs and dyes. The effects of plant extracts and essential oils derived from these plants on plant diseases and pests have been studied in detail for many years. The lavender is becoming one of the most important aromatic plants in Isparta province and there has recently been an increase in lavender plantations. However, there is limited or no any study on pests of lavender in Turkey. This study aimed at identifying insect that attack to lavender plants. The surveys were performed in two locations of Isparta province in Turkey between 2015-2016. The Insects on lavender plants were sampled by three different methods (sweep net, pitfall and direct plant sampling). The collected insects' samples were brought to the laboratory in the plastic containers. Once morphologically identified, the insects were sent to the authorities for species identification.

As a result, some insects belonging to different orders (Orthoptera, Hemiptera, Coleoptera, Diptera, Lepidoptera, Hymenoptera) were determined. *Poecilimon glandifer* Karabağ (Orthoptera: Tettigoniidae), *Cercopis vulnerata* Rossi (Hemiptera: Cercopidae), *Lepyronia coleoprata* (L.), *Neophilaenus lineatus* (L.), *Philaenus spumarius* (L.), *Philaenus spumarius* (L.) (Hemiptera: Aphrophoridae), *Atrococcus achillae* (Kiritchenko) (Hemiptera: Pseudococcidae) were found to be the most common pest species in sampled lavender palants.

**Keywords:** Aromatic plants, *Lavandula angustifolia*, Insect

### Introduction

Since ancient times, perfumed and spicy plants have been used in many areas such as cosmetics, flavors, foodstuffs and dyes. In the early 20th century, before the development of the chemical industry, more than 40% of all drugs were originated from herbal plants (Bayram et al., 2010). Because of the side effects of synthetic chemicals, interest in medicinal and aromatic plants has been increased in recent years. Effects of extracts and essential oils derived from these plants on plant diseases and pests were studied in detail (Mansour et al., 1986; Regnault-Roger and Hamraoui, 1994; Regnault-Roger and Hamraoui, 1995; Regnault-Roger, 1997; Shaaya et al., 1997;

Thorsell et al., 1998; Karakoç et al., 2006; Kara et al., 2014; Kurşuncu Şahin and Karaca, 2019; Şanlı et al., 2020).

The origin of lavender is known from the Mediterranean basin, especially rocky and calcareous areas. It also grows in North Africa, Europe and Western India. Lavender was cultivated by the ancient Greeks and Romans in England. The name of the plant comes from the Latin verb "lavare", meaning "to wash" or "to bathe" (Anonymous, 2009). Lavender plant is one of the most common aromatic plants used in pharmacy and cosmetic area. Recently, it is becoming an important herbal plant for Isparta province and cultivation area of lavender are increasing day by day. According to Turkish Statistical Institute

### Cite this article as:

Metin, F., Zeybekoğlu, U, Karaca, I. (2020). Insects on lavender in Isparta province, Turkey. Int. J. Agric. Environ. Food Sci., 4(4), 425-431  
DOI: <https://doi.org/10.31015/jaefs.2020.4.5>

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Received: 02 August 2020 Accepted: 05 November 2020 Published Online: 28 November 2020

Year: 2020 Volume: 4 Issue: 4 (December) Pages: 425-431

Available online at : <http://www.jaefs.com> - <http://dergipark.gov.tr/jaefs>

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(TUIK)'s data in 2019, lavender production was about 1462 tons in Turkey and Isparta province provides 93% of Turkey's total lavender production (Başaran, 2017). The aim of this study is to identify harmful and beneficial insects on lavender plant in Isparta province, Turkey.

### Materials and Methods

Field surveys were performed in 2015-2016 in all lavender cultivation areas in Isparta province, Turkey. Three sampling methods, sweep net, pitfall trap and direct plant sampling, designed to sample insects on lavender plants. All sampled insects were brought to the laboratory with plastic containers and sent to the authorities for species identification. Insect samples belonging to Cercopidae, Aphrophoridae and Cicadellidae families of Hemiptera were identified by Prof.

Dr. Ünal ZEYBEKOĞLU (Second author of this manuscript). The other insect samples, Pseudococcidae family by Prof. Dr. Bora KAYDAN (Çukurova Üniversitesi, İmamoğlu Vocational School, Adana, Turkey) and Tettigoniidae family of Orthoptera by Prof. Dr. Battal ÇIPLAK (Akdeniz University, Science and Arts Faculty, Biology Department, Antalya, Turkey) were identified. Insect specimens were deposited in Entomological Museum of Isparta, Turkey (EMIT) at the Plant Protection Department of the Agricultural Faculty, Isparta Applied Sciences University, Isparta, Turkey.

### Results and Discussion

Insects collected from lavender plants grown in Isparta province in 2015 and 2016 are given at Table 1.

Table 1. Insects collected from lavender plants grown in Isparta province

Species	Family	Order
<b>Pests</b>		
<i>Cercopis vulnerata</i> Rossi, 1807	Cercopidae	Hemiptera
<i>Lepyronia coleoprata</i> (L.)	Aphrophoridae	Hemiptera
<i>Neophilaenus lineatus</i> (L.)	Aphrophoridae	Hemiptera
<i>Philaenus spumarius</i> (L.)	Aphrophoridae	Hemiptera
<i>Cechenotettix martini</i> (Lethierry, 1883)	Cicadellidae	Hemiptera
<i>Platymetopius major</i> (Kirschbaum, 1868)	Cicadellidae	Hemiptera
<i>Atrococcus achilleae</i> (Kiritchenko, 1936)	Pseudococcidae	Hemiptera
<i>Eurydema ornatum</i> (Linnaeus, 1758)	Pentatomidae	Hemiptera
<i>Dolichorus baccarum</i> (Linnaeus, 1758)	Pentatomidae	Hemiptera
<i>Nezara viridula</i> (Linnaeus, 1758)	Pentatomidae	Hemiptera
<i>Pyrrhocoris apterus</i> (Linnaeus, 1758)	Pyrrhocoridae	Hemiptera
<i>Lygaeus equestris</i> (Linnaeus, 1758)	Lygaeidae	Hemiptera
<i>Poecilimon glandifer</i> Karabağ, 1950	Tettigoniidae	Orthoptera
<b>Natural Enemies</b>		
<i>Coccinella septempunctata</i>	Coccinellidae	Coleoptera
<i>Hyppodamia variegata</i>	Coccinellidae	Coleoptera
<i>Anisochrysa carnea</i>	Chrysopidae	Neuroptera
<i>Eupeodes ochrostoma</i> (Zetterstedt)	Syrphidae	Diptera

### *Cercopis vulnerata* Rossi, 1807

Length of adults are 8.2-10.5 mm. Head, thorax and abdomen of the adults are black. Front wings have red bands. Legs are black.

This species is distributed in some parts of Europe and Asia and found in Japan, ABD, Canada, Albania, Austria, Czech Republic, England, France, Germany, Greece, Hungaria, Italy, The Netherlands, Norway, Poland, Romania, Spain, Switzerland and Yugoslavia (Lodos and Kalkandelen, 1981).

Host plants: *Beta vulgaris*, *Fragaria vesca*, *Pyrus communis*, *Malus domestica*, *Medicago sativa*, *Ribes rubrum*, *Prunus avium*, *Prunus domestica*, *Corylus avellana*, *Rubus caesius*, *Humulus lupulus*, *Salix alba* and some weeds (Hill, 1987).

This species was found in lavender areas during April and May.

### *Lepyronia coleoprata*

Adults are 3-5 mm in length, wings are light brown and have bold brownish, black spots. Scutellum is brown. Legs are dark brown.

This species is distributed in Afghanistan, Algeria, Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Uruguay, Iraq, Italy, Mongolia, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Switzerland, Swiss, Syria, Turkey, Yugoslavia (Lodos and Kalkandelen, 1981).

Host plants: *Medicago sativa*, *Populus tremula*, *Salix alba*, *Rubus caesius*, *Juglans regia*, *Acarus calamus*, *Galium aparine*, *Cirsium arvense*, *Rumex acetosella* and *Lepidium draba* (Lodos and Kalkandelen, 1981).

This species was collected in this study during summer.

***Neophilaenus lineatus* (Linnaeus, 1758)**

Adults are 5-7 mm in length. Front wings have pale brownish spots. Scutellum is dark. Legs are light brown.

This species is distributed in Albania, Algeria, Austria, Belgium, Bulgaria, Czech Republic, Denmark, England, Finland, France, Germany, Hungary, Italy, Ireland, Mongolia, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Switzerland, Swiss, Tunisia, Turkey, Yugoslavia (Lodos and Kalkandelen, 1981).

Host plants: *Luzula sylvatica*, *Eriophorum vaginatum*, *Scirpus cespitosus*, *Carex nigra*, *C. rostrata*, *Poa nemoralis*, *Phalaris arundinacea*, *Calamagrostis canescens*, *C. villosa* and *Nardus stricta* (Novotny, 1995). *Juncus squarrosus* (Brooks and Whittaker, 1999). Some weeds, woody plants and pasture plants are also hosts of this species (Biedermann, 2003).

This species was found in lavender areas of Isparta between June and July.

***Philaenus spumarius***

Adults are 5.8-6.7 mm in length. Its body has more than 20 different colors. Generally, it is yellowish, brownish and blackish. The pronotum is black and legs are light brown.

This species is distributed in Afghanistan, Algeria, Austria, Belgium, China, Cyprus, Greece, Czech Republic, Denmark, England, Finland, Hungary, Italy, Iraq, Ireland, Mongolia, Japan, Morocco, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Switzerland, Swiss, Syria, Tunisia, Turkey, Yugoslavia (Lodos and Kalkandelen, 1981). It was also reported to be common and harmful all over the world (Whittaker, 1968; Raatikainen, 1971).

Host plants: Halkka et al. (1976) reported that there were more than 150 hosts of this species in Finland. *Anaphalis margaritacea*, *Medicago sariva* (Hofman and McEvoy, 1985), *Agrostis capillaris*, *Ammi visnaga*, *Argyrolobium biebersteinii*, *Avena barbata*, *Bromus hordeaceus*, *Calendula officinalis*, *Caucalis platycarpos*, *Cichorium inthybus*, *Clematis vitalba*, *Echium vulgare*, *Euonymus japonicas*, *Galega officinalis*, *Hordeum bulbosum*, *Hordeum murinum*, *Iris germanica*, *Melilotus officinalis*, *Populus nigra*, *Psoralea bituminosa*, *Salix babylonica*, *Taraxacum officinale* (Toper Kaygın and Elçi, 2017).

This species was found in July.

***Cechenotettix martini***

Adults are 4.2-5.4 mm in length. There are light and dark brown spots on the body. Scutellum is dark. Center and both sides of pronotum has brown spots. Legs are black.

This species is distributed in France (Della Giustina et al., 1989), Algeria, Morocco, Belgium, Portugal and Spain (Nast, 1987).

Host plants: *Lavandula x intermedia* *Trifolium hybridens*, *T. repens*, *Senecio vulgaris*, *Vinca rosea* (Valenta et al., 1961), *L. angustifolia* (Lis-Balchin, 2002). It was reported that this species was a vector of Stolbur disease in *Lavandula hybrida* (Moreau and Leclant, 1973; Boudon-Padieu and Cousin, 1999)

This species was found in July. This is the first record for Turkish fauna.

***Platymetopius major***

Adults are 5.11-5.62 mm in length and head is narrow than

pronotum (Zeybekoğlu, 1991).

Distribution: Algeria, Armenia, Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Iran, Italy, Jordan, The Netherlands, Poland, Siberia, Slovakia, Sweden, Turkey (Dlabola, 1967; Lodos and Kalkandelen, 1988; Zeybekoğlu, 1991; Bosco and Arzone, 1997).

Host plants: *Acer japonicum*, *A. palmatum*, *A. campestre* (Walczak et al., 2012).

This species was found in June and July.

***Atrococcus achilleae***

Females are elongate, 2.1-3.5 mm in length and light gray color and its body covered by wax secretion. Ovisac is not clear.

This species is distributed in Armenia, Kazakhstan, Moldova, Mongolia, North Korea, Ukraine (Ben-Dov, 1994), Bulgaria (Gavrilov, 2010), China (Tang, 1992), Hungary, Russia (Danzig, 1998), Italy (Longo vd., 1995), Slovenia (Seljak, 2010), Swedish (Gertsson, 2001), Turkey (Kaydan et al., 2007) Turkey and Bulgaria, (Kaydan et al., 2015).

Host plants: *Amaranthaceae*, *Asteraceae*, *Caryophyllaceae*, *Crassulaceae*, *Cyperaceae*, *Dipsacaceae*, *Euphorbiaceae*, *Fabaceae*, *Lamiaceae*, *Liliaceae*, *Papaveraceae*, *Plantaginaceae*, *Plumbaginaceae*, *Ranunculaceae*, *Rosaceae*, *Scrophulariaceae* (Ben-Dov, 1994; Danzig, 1998; Kaydan vd., 2004).

This species was found during the year and its population was higher from the end of June till middle of September.

***Eurydema ornatum***

Adults are 7-8 mm in length. Body is gray, shiny red and it has black line on the body. Sometimes color of the adults is changed from red to yellow or green.

This species is distributed in Palearctic Region, especially Europe and Mediterranean (Lodos, 1982), the Netherlands (Aukema, 1993) and Turkey (Özgen et al., 2005a)

Host plants: *Brassica oleracea*, *Calluna vulgaris*, *Echium vulgare*, *Erodium cicutarium*, *Gladiolus italicus*, *Raphanus raphanistrum*, *Ornithogalum sigmoideum*, *Salvia verticillata*, *Stipa bromoides*, *Salvia viridis*, *Rumex crispus*, *Hypericum perforatum*, *Melilotus officinalis*, *Picris strigosa*, *Sigesbeckia orientalis*, *Lavatera bryoniifolia*, *Malva neglecta*, *Sinapsis arvensis*, *Sideritis taurica*, *Verbascum sp.*, *Vicia lutea* (Dursun and Fent, 2011).

This species was found during summer.

***Dolicorus baccarum***

Adults are 10-12 mm in length and brown color. Corners of scutellum are whitish yellow.

This species is distributed in Europe, Korea, China, Japan (Lodos et al., 1998) and Turkey (Fent and Aktac, 1999; Özgen et al., 2005a)

Host plants: wheat, pistachio, apricot, cherry and olive (Özgen et al., 2005a,b).

This species was found in August, September and October.

***Nezara viridula***

It is generally green but edge of the head, pronotum and connexivum are yellowish. Body is flat and broad (Lodos, 1986). Antenna are yellow with 5 segments. Scutellum is triangular. Female adults are 14.6 mm and male adults are 13.6 mm long.

This species is cosmopolitan and common all over the world (Önder et al., 2006). *N. viridula* is distributed widely in the tropics, subtropics, and temperate zones of the world (Yukawa et al., 2007).

Host plants: *N. viridula* is a polyphagous species. Kiritani et al., reported that *N. viridula* has 145 host plant species. Corn, sorghum, soybean, castorbean, wildcrucifer, melilotus, thornapple, sunflower, lucerne, groundcherry, clover and soybean are hosts of *N. viridula* (Velasco and Walter, 1992)

This species was found in the lavender areas of Isparta province during spring, summer and autumn.

#### ***Pyrhocris apterus***

It has black head and antenna, red pronotum and black scutellum (Awad and Önder, 1997). Adults are 10-12 mm long.

This species is distributed in Afganistan, Albania, Algeria, Austria, Balear Islands, Belgium, Bulgaria, Caucasus, Asia, Rusia, Corsica, Costa Rica, Cyprus, Czechoslovakia, Danmark, England, France, Germany, Greece, Hungary, Iran, Iraq, Israel, Italy, Kashmir, Mongolia, Morocco, Finland, Poland, Portugal, Romania, Sardinia, Siberia, Spain, Sweden, Switzerland, Syria, Tacikistan, Tunusia, Turkey, USA and Yugoslavia (Awad and Önder, 1997).

Host plants: The main host plant of *P. apterus* is mallow but it can also be seen on okra and other Malvaceae (Lodos, 1986). Kaya and Kovancı (2004) reported that this species was seen around raspberry growing areas in Bursa province of Turkey.

This species was found in Isparta during spring and summer months.

#### ***Lygaeus equestris***

These bugs can reach about 11 to 12 millimetres in length. They have a characteristic red-black pattern, fully developed wings and long, powerful legs.

Host plants: *Astragalus spruneri* Boiss, *Cardaria draba*, *Centaurea sp.*, *Chenopodium sp.*, *Convolvulus sp.*, *Elaeagnus orientalis* (L.), *Fragaria spp.*, *Pistachio vera* (L.), *Platanus sp.*, *Populus sp.*, *Prunus armeniaca* (L.), *Prunus domestica* (L.), *Pyrus communis* (L.), *P. malus* (L.), *Rosa sp.*, *Rubus sp.*, *Rumex sp.*, *Salix sp.*, *Sinapis sp.*, *Spinacia oleracea* (L.), *Tamarix sp.*, *Verbascum sp.*, *Vicia sp.* *Vitis vinifera* (L.) (Lodos et al., 1999; Yanık and Yücel, 2001; Özsaraç and Kıyak, 2001; Gençer et al., 2004).

This species is distributed in Albania, Austria, Belgium, Bosnia, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Macedonia, Montenegro, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland (Péricart, 2001), Holo-palearctic and Pakistan and India (Linnavuori, 2007; 2011) and Turkey (Lodos et al., 1999; Ulusoy et al., 1999; Özsaraç and Kıyak, 2001; Gençer et al., 2004; Kaya and Kovancı, 2004; Zobar and Kivan, 2005; Önder et al., 2006; Demirözer and Karaca, 2011).

This species was found during summer.

#### ***Poecilimon glandifer***

Adults are 5-9 mm long. Females are bigger than males and ovipositor is green. Adults have green and black bands on pronotum and legs are greenish. Antenna are as long as body

length.

Host plants: fruit trees, grass and pastures and some ornamentals (İren, 1973).

It is reported that this species is endemic for Turkey and distributed inland (Mol et al., 2016).

This species was found during May and June. Growers apply pesticides on lavender only for this pest.

#### **Conclusion**

Our research demonstrated that 13 pest and 4 natural enemy insect species collected from lavender plants of Isparta province. This study is the first record for *Cechenotettix martini* in Turkish fauna. Among these species, *Poecilimon glandifer* was the only important pest determined in the study.

#### **Compliance with Ethical Standards**

##### **Conflict of interest**

The authors declare that for this article they have no actual, potential or perceived the conflict of interests.

##### **Author contribution**

The contribution of the authors is equal. All the authors read and approved the final manuscript. All the authors verify that the Text, Figures, and Tables are original and that they have not been published before.

##### **Ethical approval**

Not applicable.

##### **Funding**

This study was supported by üleyman Demirel University, Scientific Research Projects Coordination Unit (project number 4456-YL1-15).

##### **Data availability**

Not applicable.

##### **Consent for publication**

Not applicable.

##### **Acknowledgements**

The authors thank to Süleyman Demirel University, Scientific Research Projects Coordination Unit for the financial support of this study with project number 4456-YL1-15.

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