DETERMINATION OF HARMFUL INSECT SPECIES IN ZIVZIK POMEGRANATE PRODUCTION AREAS OF SIIRT PROVINCE*

DETERMINACIÓN DE ESPECIES DE INSECTOS NOCIVOS EN LAS ÁREAS DE PRODUCCIÓN DE GRANADAS ZIVZIK DE LA PROVINCIA DE SIIRT

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ABSTRACT

Zivzik pomegranate is an important source of income for producers in Siirt province. There are many harmful insect species that cause loss of yield and quality in pomegranate. This study was carried out to determine the pest insect species in Zivzik pomegranate production areas in Siirt province and its districts in 2018 and 2019. The study was conducted total in 38 orchards in 12 villages in 3 districts (Central, Şirvan and Pervari). To determine the insect species, samples were collected with pheromone trap, shoot cutting, visual inspection, Japanese umbrella and cultivation methods. As a result of the studies, a total of 24 harmful insect species belonging to 7 orders and 19 families were identified. Among these species, Carob moth (*Ectomyelois ceratoniae* (Zeller, 1839)), Pomegranate aphid (*Aphis punicae Passerini,* 1863) and *Chrysobothris affinis* (Fabricius, 1794) were found to be important species. dried fruit beetle (*Carpophilus spp*.) fruit fly (*Drosophila melanogaster* Meigen, 1830), Ash whitefly (*Siphoninus phillyreae* (Haliday, 1835)), leopard moth borer (*Zeuzera pyrina* Linnaeus, 1761) and *Tenuipalpus granati* Sayed, 1946 were determined as secondary pests. Furthermore, *Chrysobothris affinis* (Fabricius, 1794) detected in this study is the first record for the pomegranate fauna of Turkey.

Keywords: *Aphis punicae; Ectomyelois ceratoniae*; Harmful insect; Pomegranate.

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RESUMEN

La granada Zivzik es una importante fuente de ingresos para los productores de la provincia de Siirt. Hay muchas especies de insectos dañinos que causan pérdida de rendimiento y calidad en la granada. Este estudio se llevó a cabo para determinar las especies de insectos plaga en las áreas de producción de granadas de Zivzik en la provincia de Siirt y sus distritos en 2018 y 2019. El estudio se realizó en total en 38 huertos en 12 aldeas en 3 distritos (Central, Şirvan y Pervari). Para determinar las especies de insectos se colectaron muestras con trampa de feromonas, corte de brotes, inspección visual, sombrilla japonesa y métodos de cultivo. Como resultado de los estudios se identificaron un total de 24 especies de insectos nocivos pertenecientes a 7 órdenes y 19 familias. Entre estas especies, se encontró que la polilla del algarrobo (*Ectomyelois ceratoniae* (Zeller, 1839)), el pulgón de la granada (*Aphis punicae* Passerini, 1863) y *Chrysobothris affinis* (Fabricius, 1794) son especies importantes. el escarabajo de los frutos secos (*Carpophilus* spp.), la mosca de la fruta (*Drosophila melanogaster* Meigen, 1830), la mosca blanca del fresno (*Siphoninus phillyreae* (Haliday, 1835)), la polilla leopardo (*Zeuzera pyrina Linnaeus*, 1761) y *Tenuipalpus granati* Sayed, 1946 se determinaron como secundarias. plagas Además, *Chrysobothris affinis* (Fabricius, 1794) detectada en este estudio es el primer registro para la fauna de granada de Turquía.

Keywords: *Aphis punicae; Ectomyelois ceratoniae;* Insecto nocivo; Granada.

INTRODUCTION

The homeland of the pomegranate (*Punica granatum L.*) is the Middle East and the Caucasus. It is one of the most ancient fruit species cultivated for thousands of years (Mozaffarian et al., 2007). Pomegranate is a fruit of tropical and subtropical climates, which can be grown in a limited way in hot and equable climates (Pavhane et al. 2022)

Pomegranate is a very useful fruit for human health and has properties such as antimicrobial, antiparasitic, antiviral and anticarcinogenic (Ranjha et al., 2021). In addition to the use of pomegranate as fresh or fruit juice (Rifna, E. J., and Dwivedi, M., 2021), tannin, pectin, vinegar, citric acid, dye and ink raw materials, oil, animal feed and various pharmaceutical raw materials are obtained from its various parts. For this reason, it is expected that the importance, consumption and production area of pomegranate fruit will increase in the future. Some studies have wanted to draw attention to beneficial effects on human health (Malik et al., 2005; Wang et al., 2011; Vilahur et al., 2013).

According to 2018 FAO data, a total of 23 874 678 tons of pomegranate is produced in the world. Pomegranate cultivation is realized in many parts of the world, including India, Iran, China and Turkey. While the total amount of pomegranate production was 127,760 tons/year in 2008, it increased to 537,847 tons/year in 2018, in Turkey (TÜİK, 2020). In the global context, pomegranate production is mainly carried out in regular plantations in the Mediterranean region (61%), Aegean region (21%) and southeastern anatolia region (9%). In these regions, the number of orchards and the amount of production is increasing rapidly. In other regions, it is grown as a border tree or a single tree. On the basis of provinces in Turkey, the highest pomegranate production is carried out in the provinces of Antalya, Mersin and Muğla, respectively. On the other hand, Siirt province ranks 11th in Turkey and 4th in the Southeast Region with a total pomegranate production of 6,788 tone.

Pomegranate cultivation is performed in all cities of the Southeastern Anatolia Region. Important local varieties such as zivzik pomegranate, Hijaz pomegranate, Mule head, Tigris pomegranate, Bori, Şekerek, Mayhoş, Gunpowder, Urfa pomegranate, Karaköprü pomegranate, Seyfi pomegranate, Katina pomegranate, Derik pomegranate and Oğuzeli pomegranate are grown in this region. (Şimşek and Yücel, 2015).

Zivzik pomegranate got it is named from the Zivzik (Dişlinar) village of Şirvan district, where it grows. It is a fruit with abundant juicy, unique flavor, highly preferred by consumers in the domestic market, long storage life and a source of healing.

The one Zivzik pomegranate fruit weighs between 200 and 800 g on average, the fruit grains are the size of chickpeas, the seeds are small and soft (Anonymous, 2020).

As with many fruit varieties, many harmful insect species cause yield and quality losses in pomegranate orchards. To successfully prevent these losses, it is possible to primarily detect the pests and apply an appropriate control method in a timely.

Considering the studies on insect species harmful in the pomegranate in different parts of the world; Cocuzza et al. (2016) stated that *Aphis punicae Passerini*, 1863, *Aphis gossypii Glover,* 1877, *Planococcus* spp., *Zeuzera pyrina Linnaeus*, 1761, *Ectomyelois ceratoniae* (Zeller, 1839), *Deudorix livia* (Klug, 1834) and *Cryptoblabes gnidiella* (Millière, 1867) as harmful arthropod species in pomegranate fields in the Circum-Mediterranean region. On the other hand, *Siphoninus phillyreae* (Haliday, 1835) whitefly species has been reported to cause severe outbreaks on pomegranate in Greece and India (Balika et al., 1999; Tsagkarakis, 2012). It has been stated that the most harmful aphids (Aphididae) on pomegranate worldwide are *Aphis punicae* and *Aphis gossypii* (Cocuzza et al., 2016). Furthermore, it was determined that *Planococcus citri Risso,* 1813 (Pseudococcidae) adversely affected the commercial quality of pomegranate fruits in Spain and other important pomegranate production areas of the Mediterranean basin (Bartual et al., 2012; Kahramanoğlu and Usanmaz 2013). In another different study, *Deudorix isocrates* (Fabricius, 1793) (Lepidoptera, Lycaenidae) was recognized as one of the most harmful species for pomegranate in India (Bagle, 2009). Besides, various studies have reported the Mediterranean fruit fly *Ceratitis capitata* (Wiedemann, 1824) (Tephritidae), which can cause serious damage to the pomegranate from time to time and can become an important pest under certain conditions (Holland et al., 2009; Braham, 2015). In addition by Andreadis et al., (2016) Coleopteran species *Amphicerus bimaculatus* (Olivier, 1790) had been reported in a newly planted pomegranate orchard.

In Turkey, many studies have been reported on the detection of pomegranate pests and their natural enemies, population development and control of some important species (Mart and Altın, 1992; Öztop et al., 2002; Anonymous, 2005; Öztürk et al., 2005; Yıldırım and Başpınar, 2011; Mamay et al., 2016). These studies were carried out in the provinces of Aydın, Denizli, and İzmir in the Aegean region (Yıldırım and Başpınar, 2011; Başpınar et al., 2013; Turanlı and Yoldaş, 2016), in the provinces of Adana, Mersin, Osmaniye and Gaziantep in the Eastern Mediterranean region (Öztürk et al., 2005: Bayhan et al., 2005) and in Antalya province (Öztop et al., 2002; Öztop et al., 2010) in the Southeastern Anatolia region, mostly in the province of Şanlıurfa (Mart and Altın 1992; Mart and Kılınçer, 1993; Mamay et al., 2014; Mamay, 2016; Mamamy et al., 2016; Mamay 2018) and in the

Adıyaman and Siirt province (Gülmez et al. 2022).

It is important in terms of making a general inventory in the province of Siirt, which has different eco-geographical characteristics, since researches on the detection of harmful fauna in pomegranate fields, both at domestic and abroad, are very few and have been carried out in small areas. Zivzik pomegranate cultivation areas have quite different ecological characteristics within themselves. Considering this aspect, this study aims to reveal the possibility of detecting different species, as well as the fauna of insect species in the pomegranate ecosystem in general, and the harmful species that have the potential to cause yield losses in the product. In this study, brief information about harmful insect and important species determined as a result of surveys and observations made in Zivzik pomegranate growing areas in Siirt province and its districts in 2018-2019 is given and discussed with previous studies.

MATERIAL AND METHOD

The main material of this study was the Zivzik pomegranate orchards in Siirt province and the harmful insects in these orchards. Moreover, different according to species insect traps, insect collection materials, laboratory equipment and other materials were created.

This study was conducted total in 38 orchards in Siirt Province, Central, Şirvan and Pervari districts in 2018 and 2019 (Table 1). To determine the harmful species in pomegranate orchards, the root collar, stem, branch, shoot, leaf, flower and fruit of the pomegranates were examined visually and the necessary the samples were collected. For this purpose, 2–4 orchards were selected in each village to represent the villages where pomegranate cultivation is carried out in each district. Samples were taken every 2–3 weeks in spring and summer and once a month in autumn and winter. Samples of harmful insect species in pomegranate orchards were performed according to the methods below.

Table 1. The locations where the study was conducted in 2018 and 2019.

PROVINCE	DISTRICT	VILLAGE	THE NUMBER OF ORCHARDS
SIIRT	Central	Yerlibahçe	8
		Gökçebağ	2
		Kezer	1
		Yığınlı	2
	Şirvan	Prinçli	4
		Kapılı	4
		Sarıdana	2
		Dişlinar (Zivzik)	4
	Pervari	Narsuyu	2
		Güleçler	3
		Ayvalıbağ	4
		Kilis (Palamutbağ)	2
		TOTAL	38

2.1. Determination of harmful insects in the Zivzik pomegranate production area of Siirt.

2.1.1. Visual inspection method

The root collar, trunk, branches, leaves, buds, flowers and fruits of the pomegranate trees were carefully examined by walking around each tree for 2–3 min, from 4 different aspects of 10–15 trees randomly selected to represent the orchard in the sampling orchard. Harmful adult individuals seen were collected manually or with a mouth aspirator. On the other hand, pre-adult individuals were taken to the culture boxes with the help of forceps and brought to the laboratory with their food and then cultured (Anonymous, 2017).

2.1.2. Branch counting method

We species that feed on the shoots and branches of pomegranate trees were collected with this method. Adult species were killed directly in kill bottles and placed in envelopes with their label information. to pre-adult species were cut with the help of pruning shears with the plant organs they were found in. Then all samples were brought to the laboratory, and the collection of adult species was made. The individuals in the pre-adult period, were cultured at room conditions in the laboratory, and they were ensured to be adults. Emerging adults were recorded.

2.1.3. Impact method

This method was used to detect more mobile pest species. According to the number of trees in the sampled orchards, one branch from four directions of randomly selected trees (10–20 trees) to represent the orchard, it was ensured that the mobile harmful species fall into the Steiner funnel by hitting them once with the help of a stick (Steiner, 1962). Then these insects were by killed and brought to the laboratory for labeling (Anonymous, 2017).

2.1.4. Trap method

The trap method was used for the purpose capture the adults of *Ectomyelois ceratoniae* (Zeller, 1839), *Cryptoblabes gnidiella* (Millière, 1867) and *Zeuzera pyrina Linnaeus*, 1761. The pheromone traps purchased (Verim Group) were hanged in an orchard in each district. The traps are hung 1.5–2 m above the ground on the south branch of a tree in the middle of the garden, representing the orchards. The traps were checked at 1-2-week intervals and the captured adults were counted. The sexually attractive pheromones were renewed every 4–6 weeks, on the other hand, the sticky plate was changed as it became dirty (Anonymous, 2017).

2.1.5. Determination of intra-tissue pests

Intra-tissue pests have been observed in pomegranate stems and branches that feed on the tissue and cause the trees to dry completely within a few years. These observations were made especially during critical periods (November-February). First, a general observation that was made in the surveyed orchards to determine the pests in the tissue. The trunk and branches of the trees that are drying out or under stress were visually examined, and samples were taken from the trunk, branches and shoots of

the trees that were suspected or showed symptoms of damage. Approximately 1 m of branch samples were taken from each infested tree. Then, the infected branch samples were cut into 20 cm pieces and their ends were paraffinized and cultured in transparent boxes in the laboratory under room conditions. The emerging adults were checked at weekly intervals, and emerging harmful species were recorded.

RESULTS AND DISCUSSION

A total of 24 harmful insect species belonging to 7 orders, and 19 families were identified as a result of this research in the Zivzik pomegranate production areas of Central, Şirvan and Pervari districts of Siirt province in 2018 and 2019 (Table 2). Among these species, *Ectomyelois ceratoniae, Aphis punicae* and *Chrysobothris affinis* were found to be important and common species in pomegranate stems and branches. On the other hand, *Carpophilus* spp. *Drosophila melanogaster, Siphoninus phillyreae, Zeuzera pyrina* and *Tenuipalpus granati* species were determined as secondary pests. Besides, it is thought that some species of other pests are rarely found in the pomegranate, or they come to the pomegranate trees for protection in certain periods (Table 2).

Considering the studies on pomegranate orchards in different regions of Turkey; Öztürk et al. (2005), in a study conducted in the Eastern Mediterranean region pomegranate orchards, 28 harmful species belonging to 18 families were determined and *Aphis punicae, Siphoninus phillyreae, Planococcus citri, Zeuzera pyrina* and *Carpophilus spp*. reported that they are common species in the region. Moreover, *Z. pyrina* (Lepidoptera: Cossidae), *Amphicerus bimaculatus* (Olivier, 1790) and *Apate monachus* (Fabricius, 1775), (Coleoptera: Bostrychidae), a total of 3 pest species have been reported in another study (Öztop et al., 2010). In a similar study 42 insect species were obtained from the orders of Orthoptera (1), Thysanoptera (9), Hemiptera (18), Coleoptera (8) Lepidoptera (4) and Diptera (2) (Gülmez et al. 2022).

Table 2. List of harmful species detected in Zivzik pomegranate production areas, Siirt Turkey.

ORDER	FAMILY	INSECT SPECIES
LEPIDOPTERA	Pyralidae	**Ectomyelois ceratoniae (Zeller, 1839)*
		Cryptoblabes gnidiella (Millière, 1867)
	Cossidae	*Zeuzera pyrina Linnaeus, 1761*
HEMIPTERA	Aphididae	**Aphis punicae Passerini, 1863*
	Aleyrodidae	**Siphoninus phillyreae (Haliday, 1835)*
	Cicadellidae	*Empoasca decipiens Paoli, 1930*
		Asymmetrasca decedens (Paoli, 1932)
	Cicadidae	*Klapperichicen viridissima (Walker, 1858)*
		Lyristes plebejus (Scopoli, 1763)
	Issidae	*Agalmatium bilobum (Fieber, 1877)*
	Lygaeidae	*Spilostehus pandurus (Scopoli, 1763)*
	Pentatomidae	*Dolycoris baccarum (Linnaeus, 1758)*
		Acrosternum heegeri Fieber, 1861
COLEOPTERA	Nitidulidae	**Carpophilus spp.*
	Buprestidae	*Capnodis tenebrionis (Linnaeus, 1761)*
		**Chrysobothris affinis (Fabricius, 1794)*

ORDER	FAMILY	INSECT SPECIES
COLEOPTERA	Scarabaeidae	*Melolontha sp.*
	Bostrychidae	*Bostrychus spp.*
	Curculonidae	*Apion sp.*
DERMAPTERA	Forficulidae	*Forficula auricularia Linnaeus, 1758*
DIPTERA	Drosophilidae	**Drosophila melanogaster Meigen, 1830*
TYSANOPTERA	Thripidae	*Thrips sp.*
ACARINA	Tenuipalpidae	*Tenuipalpus granati Sayed, 1946*
	Eriophyidae	*Aceria granati (Canestrini & Massalongi, 1894)*

* Important pests detected in pomegranate

The observation results and control recommendations for common and economically important pests are given below. The results about the species with economic importance were examined in the light of the literature.

***Ectomyelois ceratoniae* (Zeller, 1839)**

Ectomyelois ceratoniae was determined in all pomegranate orchards observed in Siirt province in both 2018 and 2019. It was observed that adult flight continued from the last week of April until the last week of October in the traps hung in the orchards where the population was monitored. In mid-August, symptoms of damage have been observed in the pomegranates since the period when the pomegranate fruits started to fall. At the beginning of September, mature larvae were found in pomegranate fruits. Also, the mature larvae were found in the fruits left in the orchard after harvest in November and December. Among the harmful species, it was determined that it is the most common harmful species in pomegranate orchards. When the *E. ceratoniae* directly damages the fruit, it causes significant quality and yield loss. We observed that the pest does more damage in trees that are planted frequently, pruned well, and in trees with low air circulation and in orchards that leave rotten and pest-contaminated fruits on the tree or in the orchards during the harvest period.

It has been reported that the *E. ceratoniae* is one of the most important pests of pomegranate in many countries, especially in Turkey (Tokmakoğlu et al., 1967; Mansour, 1984; Al-Izzi et al., 1987; Arutyunyan, 1990; Mart and Altın, 1992; Öztop et al., 2002; Öztürk et al., 2005; Yıldırım and Başpınar, 2011; Turanlı and Yoldaş, 2016; Mammay et al., 2014). It was determined that the *E. ceratoniae* is the main pest of the Zivzik pomegranate and it is common and intense in all pomegranate orchards in Siirt province.

Ectomyelois ceratoniae is a polyphagous pest. The hosts include carob, pomegranate, persimmon, loquat, citrus fruits, walnuts, apples, pears, almonds, chestnuts, hazelnuts, grapes and olives (Avidov and Gothilf, 1960; Tokmakoğlu et al., 1967; Balachowsky, 1972; Anonymous, 1995; Özkan et al., 1997; Öztürk et al., 2005; Mamay et al., 2014). The carob moth causes pomegranate fruits to rot and their market value to decrease (Tokmakoğlu et al., 1967; Mart, 1992; Anonymous, 1995; Özkan et al., 1997; Mamay et al., 2014. Anonymous, 2017). The pest passes the winter in the larval stage on the

tree or on fallen fruits, under the bark and cracks. The first adult emergence of the carob moth occurs between April and June. In July, lay their eggs on the fruit crown (calyx) and usually one by one at the beginning of the veraison period. The larvae that emerge from the eggs are first fed on the fruit crown of the pomegranate, then enter the fruit and feed on the grains. (Mart, 1992; Mart and Kılınçer, 1993). It was observed in the study that the outer shell of pomegranate fruits exposed to larval damage first turns brown, crusted and then the whole fruit rots.

***Aphis punicae* (Passerini, 1863)**

Aphis punicae was recorded in all sampled orchards in Central, Pervari and Şirvan districts in both 2018 and 2019. In both years, the pest started to appear in the last week of April, when the flower buds began to be determined on the pomegranate trees. The population density reached its highest level in May, when the trees were in full bloom. The pest was seen in pomegranate orchards until mid-July. The pomegranate aphids were detected in 78.94% of the orchards controlled in 2018. It was observed that in 31.57% of pomegranate aphid orchards, it exceeded the economic damage threshold (10 infected shoots/trees). Predator species were also found to be very intense in late May and early June, when pomegranate aphids were intense. Especially in this period, adult, larva and pupal stages of different species belonging to the Coccinellidae family, and predatory species belonging to the Chrysopidae, Anthocoridae and Miridae families were observed to be high.

As in 2019, the density of *A. punicae* was very low in the orchards that were observed, and it was detected in 26.31% of the orchards. We observed that *A. punicae* did not exceed the economic damage threshold (10 infested shoots/trees) in any orchard sampled in 2019. Due to the heavy rainfall in Siirt in May and June 2019, the density of pomegranate aphids was observed to be very low. The pomegranate aphid populations were found at low levels in parallel with the increase in natural enemy populations from June, the increase in air temperature from July and the decrease in shoot yield. It was determined that there was a linear relationship between *A. punicae* density and shoot yield, and a negative relationship between an increasing number of natural enemies and temperature values. *Aphis punicae* is a common pest, especially in years when there is no rain in the pomegranate orchards of Siirt province.

Generally, there are previous studies on the detection, biology, density and control of *A. punicae* (Jothi and Tandon, 1993; Bayhan et al., 2005; Abd-Ella, 2015). The *Aphis punicae* feeds in colonies under the leafs of pomegranate trees, on the tips of shoots, on flowers and fruits. (Toros et al., 2002). This pest begins to appear in the first flowering period in mid-April, and population density reaches its highest level in May and June, during the full flowering period of the pomegranate. From the middle of July, it was determined that the density of the *A. punicae* gradually decreased after the last flowering period (Mamay, 2016). It was observed that pests cause problems in orchards with frequent planting, poor pruning and high humidity. It was determined that the pomegranate aphid, which is seen from the beginning of flowering in the spring, creates a high population especially in May-June. The pomegranate aphid feeds by absorbing plant sap on young leaves, shoots, flowers and fruits, secreting sweetish substances during feeding and creating intense fumagine. It causes poor development of the plant, flower drop, deteriorates the product quality due to the fumagine it creates, and decreases the market value, by preventing photosynthesis in intense populations (Mart and Altın, 1992; Öztürk et al., 2005).

***Chrysobothris affinis* (Fabricius, 1794)**

Chrysobothris affinis mostly enters the trunk and branches of pomegranate trees in poorly maintained and water-stressed orchards, destroying the cambium and causing the trees to dry out. It was seen that the common and abundant in the pomegranate orchards in Yerlibahçe, Gökçebağ, Yığınlı, and Kezer, which are connected to the central district of Siirt, both 2018 and 2019. In the early spring and autumn, branch samples taken from the branches and trunks of the infected trees were taken into the culture containers and the adult emergence was observed in the laboratory. The adult emergence from the pomegranate branch and stem samples contaminated with *C. affinis* larvae in the laboratory started as of May 10, 2018, and the adult emergence has increased since mid-June. Adult emergence reached the highest point in the last week of June. The highest average adult emergence was found in the branch samples taken in 2018 (9.50 adults/1m branch) in the orchards in Gökçebağ village, and the least adult emergence was determined in the branch samples (1.00 units/1m branch) taken from the orchards in Şirinli village of Şirvan.

We observed that *C. affinis* was more concentrated in the gardens that were expropriated and remained within the scope of the Ilısu dam project in the central district of Siirt. Also, we determined that this pest is very intense because the necessary irrigation and maintenance procedures are not carried out in these orchards, which are located in the dam basin and on the edge of the Botan river. It was found that 40%-50% of the trees in some orchards are infested with this pest insect. Tree trunks and branches infested with *C. affinis* should be removed from the orchards by the first week of May at the latest. In previous studies in our country, no literature was found about the detection of *C. affinis* in pomegranate orchards.

***Siphoninus phillyreae* (Haliday, 1835)**

Siphoninus phillyreae was detected in some orchards in Siirt Central (Gökçbağ, Kezer), Şirvan (Pirinçli) and Pervari (Güleç) districts in both 2018 and 2019. Although it is not a very common pest, it was determined at low densities in July and August in orchards that are not well pruned. The pomegranate whitefly feeds on the leaves of the pomegranate and directly damages the plant, causing shrinkage, yellowing, deformity and shedding of the pomegranate leaves. It also secretes a sweetish substance (fumagine) during feeding, and as a result, it prevents the plant photosynthesis and respiration. It causes growth retardation in the plant and decreases the quality and market value of the product (Öztürk et al., 2017).

Siphoninus phillyreae is among the hosts of pomegranate, pear, hawthorn, peach and apple and is a polyphagous pest. It spends the winter in adult form. Adults that spend the winter can be seen in pomegranate orchards as in April when leaves begin to form on pomegranates, whereas adults of the first generation are seen from June (Satar et al., 1999). Adults lay their eggs on the underside of young leaves in a semicircle or in groups (Satar et al., 1999; Ulusoy, 2001). This pest stay stable on the leaves during the larva and pupa stages and cause damage by absorbing the plant sap (Öztürk et al., 2017).

***Zeuzera pyrina* Linnaeus, 1761**

The pest was recorded in only one orchard in the Pirinçli village of Şirvan district in 2018 in the orchards observed in the province of Siirt. The pest was found at low intensity. Adults emerged in May. The Zeuzera pyrina is a polyphagous pest and its main hosts are pomegranate, apple, pear, cherry, plum, walnut, olives, and poplar. The pest is more of a problem in neglected orchards and weak pomegranate trees that are left under stress (Nizamlıoğlu, 1963; Öztürk et al., 2017; Ulu et al., 2001). The pest spends the winter in the larval stage in the galleries opened on the trunk and branches of the trees. The adults are seen in nature between the end of May and September, and the population density reaches the highest level in August. Adults leave their eggs under the shells, cracks and galleries, one by one or in groups. (Ulu et al., 2001). Larvae feed by opening the galleries on shoots, branches and trunks. Occurring dense sap flow from the larval entrance holes. Larvae cause damage by opening galleries in the trunks of saplings and trees. In old trees, it causes damage by opening the galleries in the branches. Damaged plant branches and shoots weaken over time and dry or break (Öztürk et al., 2017).

***Carpophilus* spp.**

In the study, it was found that when the fruits started to ripen from September in both years, they formed a density in the fruits damaged as a result of the carob moth or physiological cracking. It was observed that they create density, especially in cracked and damaged fruits poured under pomegranate trees.

Adults of *Carpophilus* spp are usually black in color, and in some species they are brown. This species spends the winter as an adult among fruit and vegetable residues, under leaves and wood chips in humid environments, or as adults and pupae in warehouses (Anonymous, 1995; Özkan et al., 1997). Adults that emerge from April are harmful by feeding on many products. Since pomegranate fruits are not yet formed in this period, is not happening harm in pomegranate fruits. It was observed that sourdough insects feed on pomegranate fruits injured naturally or for any reason (hail wound, twig rubbing, bird damage, etc.), and they cause intense souring and rot in the pomegranates with the effect of rotten fungi during feeding. Pomegranate fruits damaged in this way to lose market value.

***Drosophila melanogaster* Meigen, 1830**

Drosophila melanogaster in the observed orchards, the fruits were observed starting from September when they started to ripen. It was observed that they form density in fruits cracked on or under the tree for various reasons and that have been damaged by the *E. ceratoniae*. It was determined that they are more intense in October (harvest period). It was found that thousands of adults emerge and reproduce very quickly in contaminated fruits cultured in the laboratory. Therefore, the removal of rotten or damaged fruits in orchards is important in terms of reducing the density of *D. melanogaster*. It is necessary to collect the fruits that fall under the pomegranate trees regularly from the middle of August and remove them from the orchards. When this process occurs, the density of both *Carpophilus* spp, *D. melanogaster* and *E. ceratoniae* decreases.

Klapperichicen viridissima (Walker, 1858)

Klapperichicen viridissima was not seen much in pomegranate fields before, and adult and nymph liners have been detected in the pomegranate orchards of Yerlibahçe and Gökçebağ in Siirt Merkez district, and in the Pirinçli village of Şirvan. It was detected intensively, especially in the Pirinçli village of Şirvan, at the beginning of July. *Klapperichicen viridissima* nymph shells were detected on trunks and branches of pomegranate trees near vines. In the census made on 20 trees, an average of 3.6 nymph shells/tree (0–22 nymph shells/tree) was determined in the study. Anbaroğlu (1967), in his study in Gaziantep province, states that grape cicada nymphs become adults after being in the soil for 5 years, there are 10–50 nymphs in a vine, depending on the density of the infested area, and the rate of survival of the nymphs that hatch in eggs is very low.

RESULTS

The Zivzik pomegranate is an important source of income for pomegranate producers in Siirt. It is the agricultural product with the highest economic return after Siirt pistachio, due to it that finds buyers both in the region and in other regions. As a result of this study, many harmful insect species were identified in the production areas of Zivzik pomegranate in Siirt province. The prevalence and densities of these species is variability according to years and region.

We can say that the natural balance is preserved because there is no or very little use of chemical pesticides in the pomegranate production areas in Siirt. Especially in May and June, natural enemy species were determined very intensely. We consider it extremely important that the state support given to pomegranate producers in Siirt province for organic pomegranate production continues to increase.

This work showed that the presence of the carob moth is the main pest and in some years, it causes loss of yield and quality due to direct damage to the fruit in some orchards. We think that it would be appropriate to study and apply mass trapping and anti-mating techniques for the control of carob moth to preserve the natural balance existing in Siirt. In this sense, there is a need to expand environmentally friendly practices in the province. Moreover, It is extremely important to use the right pesticides (specific, free of residue and resistance problems, environmentally friendly, harmless to beneficial organisms or least harmful, etc.) at the right time, instead of unconscious pesticide applications in pomegranate production areas. We believe that it will be very beneficial to make efforts to protect environmental health and natural balance. To solve the entomological problems that may arise in the Zivzik pomegranate orchards in the future, priority should be given to “Integrated Pest Management” and “Organic Agriculture” and these programs should be supported.

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