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**NEW RECORD FOR SPOTTED WING DROSOPHILA, *Drosophila suzukii*  
(MATSUMURA, 1931) (DIPTERA: DROSOPHILIDAE)  
IN KARAMAN, CENTRAL ANATOLIA**

**SUMMARY**

Spotted wing drosophila, *Drosophila suzukii* (Matsumura, 1931) (Diptera: Drosophilidae) is a polyphagous, invasive pest of many fruit crops. Although its native to East Asia, the pest has rapidly spread its range in many parts of the Americas and Europe since the first record in 2008. *Drosophila suzukii* was first recorded on strawberry crops in Erzurum, Eastern Turkey in 2014. This study was conducted in order to establish the presence of *D. suzukii* on cherry in Karaman. For this purpose, six apple cider vinegar traps were placed in three cherry orchards during period April 30<sup>th</sup> to June 25<sup>th</sup> 2017 and *D. suzukii* was confirmed in all surveyed locations. Totally, 39 *D. suzukii* adults (24♀ and 15♂) were captured in the traps during the monitoring period on cherry orchards. This paper presents a new record of the occurrence of *D. suzukii* in Karaman (Ermenek), Central Anatolia on cherry. Also this is the first report of the presence of *D. suzukii* in cherry grown in Turkey.

**Keywords:** Central Anatolia, cherry, *Drosophila suzukii*, invasive pest, spotted wing drosophila, Turkey

**INTRODUCTION**

*Drosophila suzukii* (Matsumura), also known as Spotted Wing Drosophila in the United States, and Cherry Drosophila in Japan, is an invasive, highly polyphagous and a devastating pest that originates from East Asia (Kanzava, 1935; Walsh et al., 2011). It was first described by Matsumura in Japan in 1931. The first record outside of Asia was in Hawaii in 1980 (Hauser, 2011), then in California in 2008 *D. suzukii* was found for the first time (Hauser, 2009). In Europe, it was first reported in Spain and Italy in 2008 (Grassi et al., 2011; Raspi et al., 2011; Calabria et al., 2010; Cini et al., 2012). Since then, the geographical distribution of *D. suzukii* has spread rapidly and many other European countries made their first record (Figure 1).

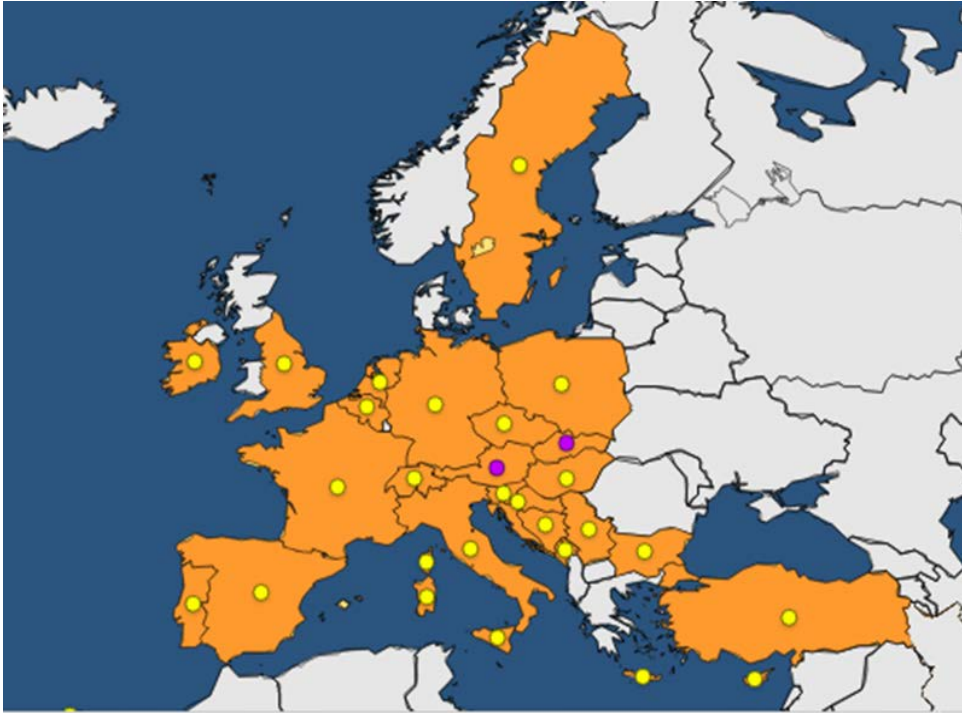
Adults of *D. suzukii* are small flies approximately 2.25–4.0 mm long (females are usually slightly larger than males), with red eyes, yellowish brown thorax and dark brown abdomen with black transverse stripes. Males display a black spot on the outer edge of each wing and two sex combs on the first and

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Notes: The authors declare that they have no conflicts of interest. Authorship Form signed online.

second segments of their front legs, females possess a large serrated ovipositor, clear wings without spots and lack sex combs on legs (Hauser, 2011; Walsh et al., 2011; Cini et al., 2012; EPPO, 2013). Even though males and females of *D. suzukii* can be easily detected by these distinguishing features of the two sexes, similar characters are present in some other closely related *Drosophila* species, such as *Drosophila subpulchrella*, *Drosophila pulchrella*, *Drosophila immacularis* and *Drosophila immigrans* (Hauser, 2011; Cini et al., 2012; EPPO, 2013 Asplen et al., 2015).



**Figure 1.** Distribution map of *Drosophila suzukii* in Europe (EPPO, 2017). France (NPPO of France, 2010), Slovenia (Seljak, 2011), Switzerland (NPPO of Switzerland, 2011), Belgium (NPPO of Belgium, 2011), Croatia (Milek et al., 2011), Austria (NPPO of Austria, 2012), Netherlands (NPPO of Netherlands, 2012), Portugal (NPPO of Portugal, 2012), Germany (Vogt et al., 2012), United Kingdom (EPPO, 2012), Hungary (Kiss et al., 2013), Slovak Republic (NPPO of Slovak Republic, 2014), Czech Republic (NPPO of the Czech Republic, 2014), Greece (Máca, 2014), Poland (NPPO of Poland, 2014), Bulgaria (NPPO of Bulgaria, 2014), Bosnia and Herzegovina (Ostojić et al., 2014), Serbia (Toševski et al., 2014), Ireland (NPPO of Ireland, 2015), Romania (Chireceanu et al., 2015), Montenegro (Radonjić and Hrnčić, 2015), Sweden (NPPO of Sweden, 2016), Turkey (Orhan et al., 2016) and the last record was from Cyprus (NPPO of Cyprus, 2017). (Legend: ● Present, ● Transient).

Spotted Wing Drosophila is a member of the subgenus *Sophophora* (Diptera: Drosophilidae) (Asplen et al., 2015). Drosophilidae consists of approximately 4,200 species, but they are generally not considered as pests because they are primary consumers of microorganisms, yeasts, and bacteria associated with the early stages of plant decay (Deprá et al., 2014; dos Santos et al., 2017). Unlike the vast majority of *Drosophila* species, which oviposit in decaying or rotting fruit, *D. suzukii* females are able to lay eggs in undamaged, ripening fruit by its serrated ovipositor (Gargani et al., 2013; Mazzi et al., 2017). The oviposition wounds and internal larval feeding as well as the secondary pathogens make infested fruit unmarketable (Goodhue et al., 2011; Walsh et al., 2011). The pest has included on A2 list as a quarantine pest by the European Plant Protection Organization (EPPO, 2013).

This invasive pest observed most often on cherries, peaches, plums, persimmons, strawberries, grapes, apricots, blackberries, blueberries, figs, hardy kiwis, nectarines, pears, pluots, raspberries, apples, oranges, tomatoes and also been found on wild and ornamental plants by several authors (Hauser et al., 2011; Lee et al., 2011; Walsh et al., 2011). This economically important pest led to \$500 million in annual losses in Western US production areas without adequate control measures (Goodhue et al., 2011).

The goal of this study was to check the presence of the spotted wing drosophila, *D. suzukii* on cherries in Karaman province. This paper provides the first report on the occurrence of *D. suzukii* in central Anatolia. Also this is the first report of the presence of *D. suzukii* in cherry grown in Turkey.

## MATERIAL AND METHODS

### Monitoring and Trapping of *Drosophila suzukii*

The monitoring of *D. suzukii* was conducted from the end of April (when the fruits were green) to the end of June (until the harvest) in 2017, in three cherry orchards which located in Ermenek, about 120 km south-west of Karaman (Central Anatolia). The cherry cultivars traditionally bred here are "0900 Ziraat".

In order to detect the *D. suzukii*, two apple cider vinegar traps were placed on cherry trees in each orchard, a total of six traps. The location of the Orchard 1, Orchard 2 and Orchard 3 were 36°37'34"N 33°1'9"E, 36°36'7"N 32°56'2"E, 36°37'42"N 33°1'31"E, respectively. Each trap consisted of a 500 ml durable plastic bottles, baited with 100 ml of apple cider vinegar, with five holes 5 mm in diameter on the top sides, to allow the entry of the attracted flies (Figure 2) (Grassi et al., 2011; Gargani et al., 2013; Baser et al., 2015). Traps were hung at a height of 1.5-2 m on the south-eastern side of tree canopy (Grassi et al., 2011; Labanowska and Piotrowski, 2015; Radonjić and Hrnčić, 2015). Traps were replaced weekly with new ones and exposed traps were moved to laboratory where collected insects were preserved in 70% ethanol for further analysis (Grassi et al., 2011; Baser et al., 2015).



**Figure 2.** Apple cider vinegar trap on cherry tree

### Identification of *Drosophila suzukii*

Morphological identification of the *D. suzukii* was done by using a stereomicroscope Olympus SZ61 following the Hauser (2011) and EPPO (2013) diagnostic protocol for *D. suzukii*. The males were distinguished by a conspicuous black spot on the outer edge of each wing and by the two sex combs on each of their front legs. Females were identified by large serrated ovipositor with many dark sclerotized teeth (Hauser, 2011; Deprá et al., 2014; Lue et al., 2017).

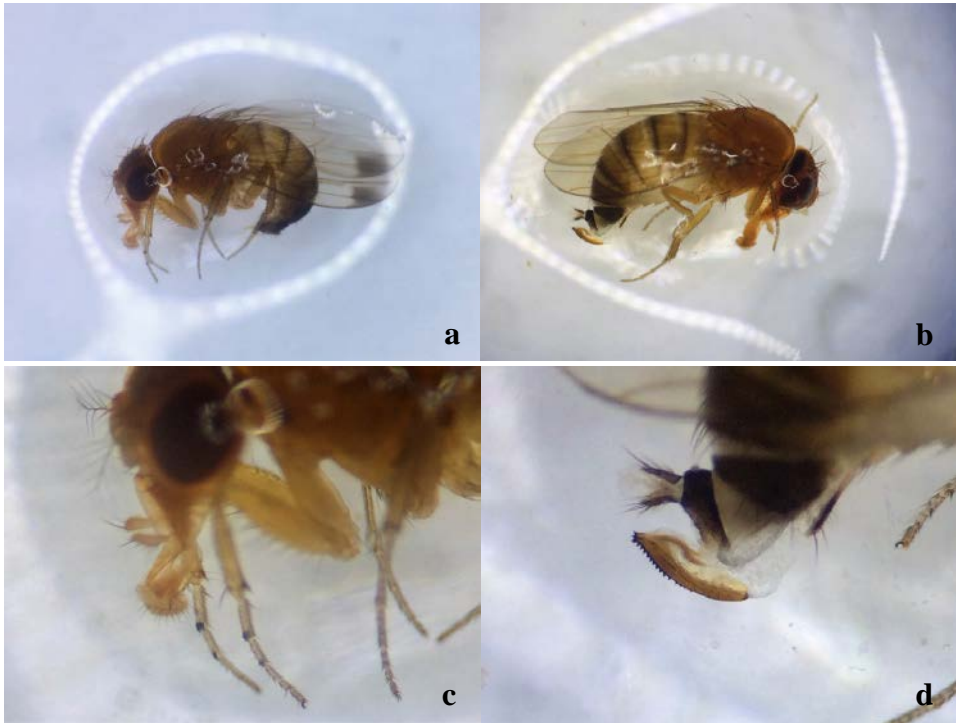
## RESULTS AND DISCUSSION

The adults of *D. suzukii* monitoring was carried out at six traps in three locations in 2017. The presence of *D. suzukii* was confirmed in all inspected locations. Results associated with the trap counts from the three locations are presented in Table 1. Data in Table 1 show that a total of 39 *D. suzukii* adults (24♀ and 15♂) were captured in the traps during the monitoring period on cherry orchards in Ermenek. Females were captured at first and outnumbered males in all locations. Traps also captured other flies, thrips, earwigs and houseflies. Usually, the proportion of other insects in traps was very high than *D. suzukii*.

**Table 1.** Occurrence of *D. suzukii* adults captured by apple cider vinegar traps in cherry orchards in 2017

Orchards No	Collection date							
	07.05.17	14.05.17	21.05.17	28.05.17	04.06.17	11.06.17	18.06.17	25.06.17
1	1♀	-	1♀	1♀	-	1♀ 3♂	1♀	-
2	-	1♀	-	-	-	1♀ 3♂	2♀ 1♂	2♀ 1♂
3	-	-	-	-	4♀	3♂	4♀ 2♂	5♀ 2♂

In morphological sense, specimens of *D. suzukii* do not differ from the specimens of this species which previously recorded in other parts of Europe. Adults are 2-3 mm in length with red eyes and a pale brown to yellowish-brown thorax and abdomen. Males possessed a black spot on the outer edge of each wing (Figure 3a) and two sex combs on the first and second segments of their front legs (Figure 3c). Females slightly larger than males (Figure 3b) and possessed a distinctly serrated ovipositor (Figure 3d) which allows them to lay eggs under the skin of a healthy, ripening fruits. The wings of females were clear without spots and there were no sex combs on their feet. This morphological characters make easy the identification of *D. suzukii* and distinguish it from other *Drosophila* species.



**Figure 3.** General view of *D. suzukii* a) male, b) female, c) sex combs on the first and second segments of male front legs, d) serrated ovipositor of female

*Drosophila suzukii* was detected for the first time in Erzurum, Turkey on strawberry crops by Orhan et al. in 2014. Just three years after the first detection, we found the pest on cherry crops in Ermenek (Figure 4). Although there are approximately 1000 km between Erzurum and Ermenek, the definition of the pest in Ermenek should not be surprising. Because the pest spread 1400 km/year either passively or actively through infested fruits (Calabria et al., 2010). With this study, we presents a new record of the occurrence of *D. suzukii* in Ermenek

(Karaman), Central Anatolia on cherry and this is the first report of the presence of *D. suzukii* in cherry grown in Turkey.

*Drosophila suzukii* prefers a temperate climate (Walsh et al., 2011), like that of the many parts of fruit growing areas of Turkey. Therefore, spreading of the *D. suzukii* may lead to important economic costs in the absence of necessary measures.

This polyphagous pest threatened the fruit production and led to severe crop losses in its newly invaded areas in many parts of the world (Hauser, 2011; Lee et al., 2011; Walsh et al., 2011; Cini et al., 2012; Deprá et al., 2014). The adults of *D. suzukii* are very mobile so the pest has rapidly spread its geographic range in a very short time and became one of the most devastating pests, particularly on cherry and berry fruits and also on vineyards especially in the temperate regions (Saguez et al., 2013; Radonjić and Hrnčić, 2015).



**Figure 4.** Map of Turkey showing the localities where *D. suzukii* was first reported on strawberry and cherry

## CONCLUSIONS

This study is the first report on the occurrence of *D. suzukii* in cherry orchards in Ermenek (Karaman), Turkey. There are large cherry growing areas not only in Central Anatolia, but also in other regions of Turkey. In view of the rapid spread of the pest and potential for economic damage, further studies of *D. suzukii* biology, population dynamics and monitoring of the distribution should be done, especially in fruit growing areas with temperate climates in Turkey. Also, farmers should be informed about this new invasive pest.

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