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New invasive species in Turkey: Zaprionus indianus (Gupta) (Diptera: Drosophilidae)

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ABSTRACT
Zaprionus indianus (Gupta) (Diptera: Drosophilidae), an invasive species, was reported for the first time from Eastern Mediterranean region in Turkey, in 2017-2018. It was found on Trabzon persimmon, blackberry, fig, cherry, mulberry, peach and plum.

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Türkiye'de yeni istilacı tür: Zaprionus indianus (Gupta) (Diptera: Drosophilidae)

ÖZET
İstilacı bir tür olan *Zaprionus indianus* (Gupta) (Diptera: Drosophilidae), Türkiye'de ilk kez Doğu Akdeniz bölgesinde, 2017-2018 yıllarında Trabzon hurması, böğürtlen, incir, kiraz, dut, şeftali ve erik üzerinde tespit edilmiştir.

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INTRODUCTION

The genus *Zaprionus* is widespread in the African region (Tsacas et al., 1981). The most common two species of the genus are *Zaprionus indianus* Gupta, 1970 and *Zaprionus tuberculatus* Malloch, 1932 which are known as African fig fly and Vinegar fly or Pomace fly, respectively. They are distributed into the Palearctic and the Afrotropical regions (Chassagnard and Tsacas, 1993). So far, *Z. tuberculatus* is the only known species of this genus for the Turkish fauna reported by Patlar et al. (2012). This species is known as a secondary pest. Contrary to the *Z. tuberculatus*, *Z. indianus* is known as a primer pest on more than 80 fruit crops that include fig, apple, cherry etc. (Yassin and David, 2010). It can cause a serious damage in many fruit crops. This species was first collected and described in India by Gupta (1970). The origin of the species is considered to be tropical Africa (Chassagnard and Kraaijveld, 1991; Yassin and David 2010). However, it has expanded its distribution and spread rapidly throughout Central and South America (Vilela, 1999; Tidon et al., 2003; David et al., 2006; van der Linde et al., 2006). It was also reported from several European countries. According to Vilela 1999; it caused up to 50% yield loss in Brazilian fig orchards.

The genus *Zaprionus* is characterized by two longitudinal silvery-white stripes dorsally which are sandwiched black stripes laterally through their thorax. The body almost 3 mm in length. Their color is brown and eyes are red (Yassin and David, 2010).

In this note, we report the presence of *Z. indianus* on several fruit trees in Turkey. In this paper, distribution and host plants of the species of *Z. indianus* are given. Thus, this study contributes to Turkish Drosophilidae fauna.

MATERIAL and METHODS

Firstly, *Z. indianus* was determined on rotten cherry fruits and various fruit orchards during a survey of cherry pests in Eastern Mediterranean region (Adana, Hatay, Kahramanmaraş, Mersin, Osmaniye, Niğde) in Turkey. Infested fruits were collected and placed in plastic boxes for emergence of adult flies (Figure 1). Samples were also taken from apple cider vinegar traps hung by the producer in the orchards. Then, flies from traps and those emerged in the containers were placed in 70% ethyl alcohol for further identification. Identification of the genus *Zaprionus* was made Dr. Amir YASSIN (CNRS researcher, Institut de Systématique, Evolution, Biodiversité/ France). All samples were deposited in the Nedim Uygun Biological Control Laboratory in Plant Protection Department of Agriculture Faculty, Çukurova University, Adana, Turkey.

Figure 1. *Zaprionus indianus* (Gupta); a) adult emergence from infested fruits in laboratory culture, b) fruit damage and adult flies on peach

RESULTS and DISCUSSION

Adults of *Z. indianus* were discovered while monitoring cherry pests. *Z. indianus* adults were found in infested fruits and in apple vinegar traps placed in persimmon, blackberry, fig, cherry, mulberry, peach, and plum in 2017-2018. We found *Z. indianus* for the first time in Turkish fruits orchards.

Zaprionus indianus Gupta, 1970 (Figure 2)

Material examined: Adana, Merkez, *Diospyros kaki* (Ebenaceae), 10.IX.2017, 7♀♀, 6♂♂; Adana, Saimbeyli, *Morus nigra* (Moraceae), 24.VII.2018, 11♀♀, 9♂♂; Hatay, Antakya, Merkez, *Ficus carica* (Moraceae), 27.VII.2018, 18♀♀, 15♂♂; Hatay, Defne, *Rubus fruticosus* (Rosaceae), 22.VII.2018, 16♀♀, 8♂♂; Hatay, Defne, *Ficus carica* (Moraceae), 22.VII.2018, 21♀♀, 22♂♂; Mersin, Değnek, *Prunus avium* (Rosaceae), 13.VII.2018, 4♀♀, 3♂♂; Mersin, Kızılbağ, *Prunus persica* (Rosaceae), 13.VII.2018, 7♀♀, 5♂♂; Osmaniye, Merkez, *Rubus fruticosus* (Rosaceae), 01.VIII.2018, 25♀♀, 21♂♂; Osmaniye, Merkez, *Prunus domestica* (Rosaceae), 01.VIII.2018, 19♀♀, 21♂♂.

Figure 2. *Zaprionus indianus* (Gupta); female dorsal view (a) lateral view and ovipositor (b), male lateral view (c) and fore femur with very long dark spines (d)

Host: *Malus domestica* Borkh., *Prunus persica* L., *Prunus avium* L., *Pyrus communis* L., *Rubus idaeus* L., *Rubus* sp. (Rosaceae), *Psidium guajava* L. (Myrtaceae), *Carica papaya* L. (Caricaceae), *Mangifera indica* L. (Anacardiaceae), *Opuntia cordobensis* Speg, *Opuntia ficus indica* Miller, *Opuntia quimilo* K. Schum (Cactaceae), *Diospyros* sp. (Ebenaceae), *Ficus carica* L. (Moraceae), *Vitis vinifera* L. (Vitaceae) (Lavagnino et al., 2008; Joshi et al., 2014).

Distribution: Africa, India, Saudi Arabia, Brazil, Uruguay, South America, Central and North

America, Argentina, France, Spain (Vilela, 1999; De Toni et al., 2001; Soto et al., 2006; Van der Linde et al., 2006; Carles-Tolrá, 2009; Kremmer et al., 2017).

Remarks: This pest began to be seen in traps from July to September 2017 within the study area and has been detected in fruits on the trees. *Z. indianus* is an important and aggressive pest, causing fruit damage and yield losses. Its damage was detected in the study areas but it has been reported by researchers that the fly is mainly considered a secondary pest, infesting damaged fruits (Van der Linde et al., 2006). This is the first record of *Z. indianus* in Turkey.

CONCLUSIONS

The fig fly, *Z. indianus* is a pest of African origin. But, it is now widely distributed in the USA and North in Canada (Joshi et al., 2014; Markow et al., 2014). In Europe there is very little documentation of presence of *Z. indianus*. According to Kremmer et al., (2017), the records from Austria (1985), Italy (1988) and Malta (1985) can be found in TaxoDros Database (http://www.taxodros.uzh.ch/), and also there is one description from Spain (Carles- Tolrá, 2009). This is the first record of *Z. indianus* in Turkey and was found in large numbers. This fly can adapt to a wide variety of climates, and it has been reported that if it can successfully overwinter it may also spread rapidly (Karan et al., 2000). *Z. indianus* usually prefers a warm climate although adaptation to cooler climates has been documented previously (Da Mata et al., 2010), indicating plasticity in tolerance to environmental conditions and an ability to survive in temperate regions. According to our observations, *Z. indianus* is an aggressive and major pest of fruit plantations of the study area due to the damage it causes to the fruits. However, the researchers have been reported that this pest has been considered a primary pest only in fig and unlike *Drosophila suzukii*, *Z. indianus* is not known to infest undamaged, unripe fruits, but if it can use ripening fruit already attacked by *D. suzukii*, there is the potential for increased damage to harvested fruit (Van der Linde et al., 2006; Renkema et al., 2013). Observation studies will be continued on fruit plantations to understand whether or not it is a major pest and future observations for *D. suzukii* should include *Z. indianus*. Also, studies on the impact of this pest, geographical distribution and infestation of other commercial and natural fruit species should be considered a priority.

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