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New pests on greenhouse vegetables in Antalya Province, Turkey

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Abstract: *New pests on greenhouse vegetables in Antalya Province, Turkey.* The Antalya region leads greenhouse vegetable production in Turkey, with a total of 3,266,230 t from an area of 25,855 ha. Tomato is the most grown crop, followed by cucumber and pepper. The tomato leafminer *Tuta absoluta* was detected in greenhouses in Turkey several years ago. Recently, some other new pests have begun to appear. These are the mirid species *Creontiades pallidus*, which has been causing damage especially in pepper greenhouses since 2012, and mealybug species from the genus *Phenacoccus*, which were recorded on crops from 2012 to 2014. Greenhouse tomatoes are also seriously harmed by the cecidomyiid *Lasioptera* sp. This insect has been previously recorded as a pest only in Greece, and has been known to exist in the Antalya region since 2013.

Key words: Antalya, *Creontiades pallidus*, *Lasioptera*, *Phenacoccus*

INTRODUCTION

Of total Turkish fresh vegetable production, greenhouse vegetable production accounts for a significant share, due to favorable climate conditions. Approximately 6.4 million t of vegetables are produced each year, from a greenhouse area of 64,759 ha. The Antalya region takes first place in greenhouse vegetable production, with a total of 3,266,230 t produced in a total greenhouse area of 25,855 ha, which is 43% of the total greenhouse vegetable production area in Turkey [TURKSTAT 2015].

Turkey, ranked fourth in the world in terms of tomato production [FAO 2014], produced about 12.5 million t of tomato in 2015, of which nearly 3.4 million t were grown in greenhouses. The Antalya region, with 16,986 ha of tomato greenhouse area and a tomato production volume of 2 million t, takes the leading position in greenhouse tomato production in Turkey. The next most significant crops after tomato are cucumber and pepper [TURKSTAT 2015].

In Antalya province, where intensive greenhouse vegetable production is practiced, reports have suggested that cotton whitefly *Bemisia tabaci* Genn., Western flower thrips *Frankliniella occidentalis* Pergande, aphids *Aphis gossypii* Glover, *Myzus persicae* Sulzer, and spider mites *Tetranychus cinnabarinus* Boisd. are the main insect pests, and if necessary precautions were not taken the damage caused by them would rapidly exceed economic loss thresholds [Tunç and Göçmen 1994, Bulut and Göçmen 2000, Keçeci et al. 2007]. Besides, it is reported that the tomato leafminer *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae), which has appeared in Turkey in 2009, has spread rapidly in

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all regions where tomato is grown, and caused significant production losses of up to 100% [Öztemiz 2012].

In this paper we present some new insect pests that have appeared in greenhouses in Antalya province. They were detected by our routine field surveys between 2012 and 2015. The new pests recorded are *Creontiades pallidus, Lasioptera* sp. and *Phenacoccus* spp.

NEW PESTS RECORDED IN ANTALYA PROVINCE

Creontiades pallidus (Rambur) (Heteroptera: Miridae)

Creontiades pallidus, also known as the cotton shedder bug, is a pest whose population has significantly increased in cotton production areas in recent years [Efil and İlkan 2003]. The species was first recorded in pepper greenhouses in 2012 in our field studies, and it caused significant losses in pepper crops. Similarly, *C. pallidus* was first detected in two pepper greenhouses where biological control is practiced, in Almeria, Spain in 2000––2001, and was found to have caused significant losses in pepper fruits [Urbaneja et al. 2001].

Creontiades pallidus is about 8 mm long, generally of yellowish green color. There are black spots on its body. The antenna of nymphs is long and has clearly marked red and pale bands. Eggs are laid into the plant tissue and can be detected only by the operculum, which can be seen from outside [OEPP/EPPO 2004]. On the sorgum plant, the egg incubation period has been found to be 5–7 days. There were five nymphal instars and the total nymphal period was 8–14 days [Ratnadass et al. 1994]. Males live for 11 days and females for 13 days. A female lays 45–250 eggs [Sharma and Nwanze 1997]. It is a common pest in many open-air crops, e.g. cotton. Significant damage can occur in fruit when prey is scarce and the population is high [Blom et al. 2009].

Creontiades pallidus is an omnivorous species [Allouche et al. 2007]. It essentially feeds on plants (it is a phytozoophage); however, reduction in the rate of damage to plants occurs when other food is available in the environment. For example, feeding traces on pepper fruits have been shown to decrease by 84% when *Ephestia* eggs are present, 72% when tobacco whiteflies are present and 40% when red spiders are available [Allouche et al. 2007]. Again, it is reported that *C. pallidus* may cause economic damage, such as feeding and ovipositing damage, to pepper fruits when there are no prey in the environment [Blom 2008].

In conducting the study, we found that *C. pallidus* occurred in pepper greenhouses where biological control is practiced. Biological control applications, which gained momentum after the tomato leafminer *T. absoluta* entered Turkey in 2010–2011, have been most intensively practiced in greenhouse pepper growing in Antalya province (Fig. 1). The pests are thought to have emerged in parallel to the controlled chemical spraying in greenhouses where biological control is conducted and to the reduced number of sprayings. In fact, Allouche et al. [2007] reported that *C. pallidus* was an example of a classical secondary pest whose importance had increased as a result of reduced pesticide usage.

FIGURE 1. *Creontiades pallidus* feeding damage on pepper

***Phenacoccus* spp. (Hemiptera: Pseudococcidae)**

Another pest which has begun to appear in greenhouse pepper production in Antalya province is *Phenacoccus* spp. This pest has only been found in biological control greenhouses. Kaydan et al. [2014] identified three invasive species of mealybug that had entered Turkey and spread rapidly in recent years: *P. solenopsis* (Tinsley), *P. solani* (Ferris) and *P. madeirensis* (Green).

The mealybug was detected in greenhouse vegetable production in Antalya in the early part of the 2012–2013 pepper production season in Kumluca district (Western Antalya) during our field study (Fig. 2). The pest was not found in any

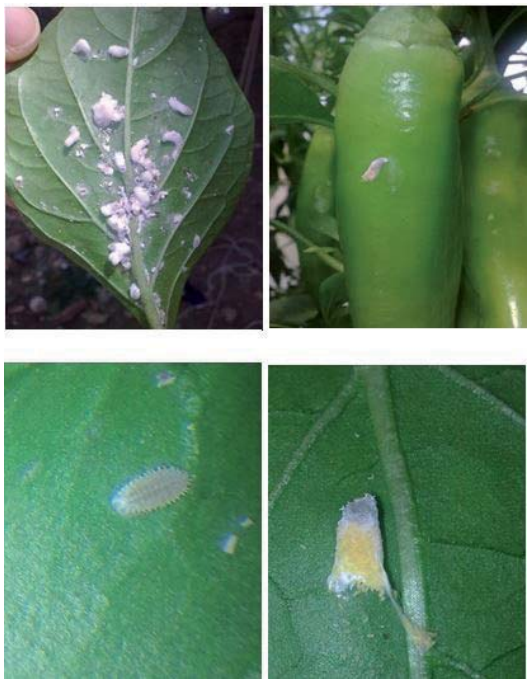

FIGURE 2. *Phenacoccus* mealybugs on pepper leaf

other area during the same production season (2012–2013). In our study, the pest was also detected in the 2013–2014 and 2014–2015 seasons, but was not encountered during the 2015–2016 season.

According to a previous study conducted in Antalya, mealybug samples were determined to be *P. madeirensis* [Kaydan et al. 2012].

Lasioptera sp. (Diptera: Cecidomyiidae)

Lasioptera sp. was first detected and identified in the tomato production areas of Mersin province (Eastern Mediterranean) in Turkey in 2012 [Buyukozturk 2014]. The pest was first discovered in the greenhouse tomato production areas of Antalya province through our study in early 2013. *Lasioptera* sp. is a pest that was first recorded worldwide in tomato production areas of Greece [Perdikis et al. 2011] and was identified in Turkey afterwards. Although the pest was diagnosed at genus level, it has not yet been identified at species level [Perdikis et al. 2011, Buyukozturk 2014].

Lasioptera spp. are small black insects with wings are covered by dark colored scales. The larvae have no legs, have a length of 3 mm, and take on an orange color when they reach the final period [Perdikis et al. 2011, Buyukozturk 2014]. After hatching from eggs, larvae live inside the stem of the plant. By feeding in the core of the stem, larvae cause deterioration and bores in the plant tissue. Once galleries have been mined, it is possible to see 4–20 larvae inside [Perdikis et al. 2011, Buyukozturk 2014, Buyukozturk et al. 2016]. Due to the damage caused particularly in parts of the stem where leaf stems are pinched off, these parts are seen from the outside as stains 5–6 cm in length with brownish black color [Perdikis et al. 2011, Buyukozturk 2014]. Unless they are controlled, the stem is damaged starting from the infection point, transmission of water and nutrients is blocked, the plant weakens at these points, and this causes the plant to break off [Perdikis et al. 2011, Buyukozturk 2014]. The damage reduces the fruit quality and market value. Besides, it is possible to observe fungal mycelium on the damaged tissue [Perdikis et al. 2011].

Species of the genus *Lasioptera* are known to have a mutualistic relationship with fungi [Yukawa and Rohfritsch 2005]. Females collect the fungal conidia through a special structure called *mycangia* at the ends of the abdomen, and lay them together with their eggs in the stem of the host plant. At later stages, the fungus assists the hatching larva in entering the stem and progressing within the plant [Rohfritsch 1997, 2008, Thomas and Goolsby 2015]. It is reported that the fungus is a nutritional source for the larva, and also protects the larva against parasites and enables the young adult to emerge easily [Rohfritsch 1992, 2008]. As the fungus helps the larva to make galleries within the stem, at the same time it enables the first-stage larva to reach the parenchyma cells [Rohfritsch 1992]. Since the first stage larvae have many thornlike and long hairs (Fig. 3), they can carry the fungal conidia as adult females and help the fungus to spread [Rohfritsch 1992].

Since the larvae of the pest feed in the stem, its diagnosis and control are quite difficult [Perdikis et al. 2011]. The damage symptoms of the pest, for which no

FIGURE 3. *Lasioptera* and damage to tomato

effective control method has yet been determined [Buyukozturk et al. 2016], might be confused with a fungal disease factor. It is suggested that it can be controlled by decreasing the proportional humidity inside the greenhouse and leaving a long stalk when pinching off leaf stems [Buyukozturk et al. 2016].

CONCLUSIONS

The mirid *Creontiades pallidus*, the pseudococcid *Phenacoccus* spp. and the cecidomyiid *Lasioptera* sp. constitute a potential threat to vegetable production areas in Turkey and in the Antalya region in particular. Two of them, the mirid and pseudococcid, were observed by us only in glasshouses with biological control. *Creontiades pallidus* is already known to infest cotton and sunflower [Efil and İlkan 2003, Kaya and Sertkaya 2014]. It is likely that both *C. pallidus* and *Phenacoccus* spp. have become primary pests on pepper due to the reduced use of insecticides in glasshouses in which beneficial biological agents are released. Obviously, further studies are needed, including identification to species level, investigations on the spreading, hosts and biology of the pests, as well as control methods for these newly occurring pests in Antalya province.

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Streszczenie: *Nowe szkodnki warzyw szklarniowych w Turcji, w rejonie Antalya.* W Turcji liderem produkcji warzyw szklarniowych jest region Antalya, gdzie produkuje się łącznie 3 266 230 mln t warzyw na 25 855 ha. W regionie tym najczęściej uprawiany jest pomidor, a następnie ogórek i papryka. Kilka lat temu w szklarniach, w Turcji wykryto motyla minującego liście pomidorów, *Tuta absoluta*. W chwili obecnej pojawiają się nowe szkodniki. Są nimi rejestrowany od 2012 roku *Creontiades pallidus* (Miridae), który przede wszystkim uszkadza paprykę, a także wełnowiec z rodzaju *Phenacoccus*, którego obecność stwierdzono w latach 2012–2014. Pomidory szklarniowe są także poważnie uszkadzane przez szkodnika pryszczarka *Lasioptera* sp. Obecność tego owada wcześniej notowano jedynie w Grecji. O jego występowaniu w regionie Antalya wiadomo od 2013 roku.