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Asymmetrasca decedens Paoli and *Zygina flammigera* Fourcroy (Hemiptera: Typhlocybinae), New Pests in Peach and Almond Orchards in Tunisia

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ABSTRACT

Serious damage caused by cicadellid insects have been observed for a few years in peach and almond orchards in Tunisia. A survey of leafhopper species in the region of Mornag, in the Tunisian North East, shows the presence of two major species feeding on these cultivated trees: *Asymmetrasca decedens* and *Zygina flammigera.* The first was previously reported in 2007 on grapevine in the Cap Bon region, but not as stone fruit pest, while the second species is new for the Tunisian fauna. Almond trees seem to be more attacked by cicadellid than peach (67% on almond and 33% on peach). *A. decedens* is more abundant than *Z. flammigera* (82.2 and 79.5% of *A. decedens* and 15.9 and 19.3% of *Z. flammigera* in peach and almond, respectively).

Keywords: Auchenorrhyncha, Cicadomorpha, identification, leafhopper, stone fruits

INTRODUCTION

Leafhoppers are plant sap-feeding insects; these pests occur in high density in most agricultural ecosystems, including greenhouses (Alsuhaibani and Aldawood 2005), grasslands (Hamilton and Whitcomb 2010) and fruit orchards (Bleicher *et al.* 2007; Dakhil *et al.* 2010). Many species are considered as indirect plant pests because they are vectors of plant diseases (Della Giustina 1989). Many cicadellid species show resistance to classic insecticides (Grassi *et al.* 2008).

Only few surveys have been carried out in Tunisian agricultural areas on Auchenorrhyncha (Linnaviori 1965; Najar *et al.* 1998; Boukhris-Bouhachem *et al.* 2007). To our knowledge, no work has been done on the identification of cicadellid in Tunisian peach and almond orchards. The purpose of this study was to identify major cicadellid insects causing damage on peach and almond trees in Mornag.

Among the diversified Cicadellidae family, the Typhlocybinae, which represents a very specialized group of minute insects, quite regular in shape and sizeable range, often brightly colored, and related with typical damage to plants (Grassi and Dal Ri 2006). In contrast to other Cicadellids which are phloem feeders, the small size of the Typhlocybins and their mouthparts restrain them to feeding on the intracellular liquids of the parenchymal cells. This limited use of the plant is associated with typical injuries, often mistaken with Thysanopteran or mite-feeding punctures, appearing as small areas of depigmented cell clusters. These areas can turn brown with necrosis and induce wider plant deformations (Pollard 1968, 1969).

Damage similar to what was previously described was observed recently in Tunisian stone fruit orchard, especially on peach and almond trees. The leaves show discolored spots that became increasingly necrotic. These symptoms can be confused with mite attacks (**Fig. 1A**).

The feeding activity induces alterations on plant tissues, especially on young, tender tissues on the top of branches, inducing curled and twisted leaves. When the infestation is particularly high, many new small leaves are produced (**Fig. 1C**). This feeding activity causes alterations on plant tissues. Damaged leaves may turn yellow starting from the margins (**Fig. 1B**) and definitively dry and die (**Fig. 1D**).

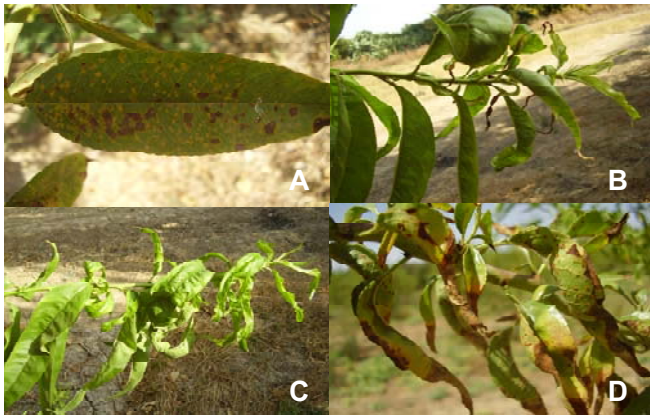

Fig. 1 Damage caused by cicadellid on almond (A, C) and peach (B, D) trees.

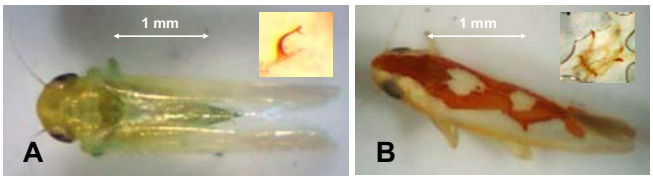

Fig. 2 The two cicadellid species attacking peach and almond trees with inset photos of the dorsal aspect of the male pygofer. (**A**) *Asymmetrasca decedens*; (**B**) *Zygina flammigera.*

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Short Communication

MATERIALS AND METHODS

Mornag, a severely impacted area with cicadellid damage, was chosen for field studies. Two techniques were used to investigate the leafhopper populations: sweep net and yellow sticky traps. One trap of 25 × 25 cm were placed in each culture (peach and almond) at 1.5 m height in the same farm. The tiny insects were collected in the net using a mouth aspirator and were killed with ethyl acetate vapour and eventually dried at room temperature until identification. Yellow traps were observed weekly and renewed monthly from March to October, and insects were unglued using a paint brush and white spirit, then stored in 70% ethanol until identification.

Morphological identification of the *Typhlocybinae* genus relies on the use of a few features, mainly color patterns, but can only be ensured by observation of the male genitalia, which have a characteristic shape (James *et al.* 2008; Demichelis *et al.* 2010). Hence, the apical part of the male abdomen was cut and placed for 12-24 h in 10% KOH solution, then rinsed with water and observed in glycerine under a stereomicroscope (Leica MZ 125) at 40 to 60X magnification. Identification was based on two keys of Faune de France (Ribaut 1952) and Della Giustina (1989).

Cicadellids trapped by yellow traps during 2009 were counted to estimate cicadellid diversity in peach and almond orchards. A χ^2 test was used to detect variance in cicadellid composition.

RESULTS AND DISCUSSION

The installation of yellow sticky traps during 2009 permitted the capture of 3347 cicadellids: 2251 on almond and 1166 on peach. 98.4% of cicadellids belonged to two principal species: *Asymmetrasca decedens* and *Zygina flammigera*. The other trapped species (1.6%) were not considered as peach and almond pests and are thus not cited here.

The size of the *A. decedens* adult is about 3-3.5 mm (females are bigger than males), with a typical dominant pale green color, more intense on the fore wings and on the legs (**Fig. 2A**). The distal portion of the corium, unlike *Empoasca vitis* (another green leafhopper very common in Tunisia), is slightly brown shaded (Viggiani et *al*. 1992; Boukhris-Bouhachem *et al.* 2007).

A. decedens is particularly present in Mediterranean countries such as Spain, France, Italy, Greece, Egypt, etc. It is a highly polyphagous species, which can feed on several cultivated and spontaneous trees (i.e. peach, almond, plum, apricot, cherry, apple, grapevine, *Citrus*, birch, *Salix* spp., *Ulmus* spp., *Populus alba*, among others), on many herbaceous crops (strawberry, beans, beet, egg-plants, tomatoes, potatoes, sweet pepper, alfalfa) and on weeds (*Amaranthus retroflexus*, *Chenopodium album*, *Solanum nigrum*, *Rubus* spp., etc.) (Freitas and Aguin-Pombo 2004; Grassi and Dal Ri 2006).

This species was considered as a peach pest in Italy in 1989 (Viggiani *et al*. 1992) and in Spain in 1994 (Alvarado *et al.* 1994). *A. decedens* has caused important damage on almond in Spain since 1997 (Jacas *et al*. 1997). In Tunisia, *A. decedens* was first observed in 1991 (Boukhris-Bouhachem *et al*. 2007) on grapevine in Cap Bon. In the current study we reported this species for the first time on stone fruit.

Concerning *Z. flammigera*, adults are characterized by their clear color and by the red wing coloration in a zig-zag shape (**Fig. 2B**). They measure between 2.9 (males) and 3.3 mm (females). This insect is responsible of severe symptoms as previously described (**Fig. 1A**), especially on almonds (Viggiani *et al*. 1992).

Z. flammigera was considered as a peach pest in Italy in 1992 (Viggiani *et al*. 1992), and in Spain in 2000 (Torres *et al.* 2000). In 1997 it was signalled as an almond pest in Spain (Torres *et al.* 1998). It is the first time that *Z. flammigera* is reported in Tunisia.

Results show that *A. decedens* is more frequent than *Z. flammigera* in peach and in almond (**Table 1**). However, there is no significant difference between the composition rate of *A. decedens* and *Z. flammigera* in peach and almond.

Table 1 Composition rate of *A. decedens* and *Z. flammigera* on peach and almond. Values of χ^2 are significant (*) when > to 3.84 (theoretical value).

	Asymmetrasca decedens	*Zygina flammigera*	χ^2 (between insect species)
Peach	82.2%	15.9%	31.63(*)
Almond	79.5%	19.3%	25.59(*)
χ^2 (between tree species)	0.025	0.279	-

In Spain, a study on almond cicadellid showed that 85.2% were *A. decedens*, 11.6% *Frutioidia bisignata* and only 2.5% *Z. flammigera* (Torres *et al.* 1998). In Italy, a study on 8776 cicadellids captured in peach showed that 97% were *A. decedens* and 3% were *Z. flammigera* (Viggiani *et al*. 2008).

CONCLUSION

Two Typhlocybin species were identified as serious threats to almond and peach production and may have economic importance as cited before in some Mediterranean countries. Typology of the damage was performed on peach and almond trees. Further bio-ecological studies should be conducted with deeper phonological analysis; investigation of the interaction with beneficial fauna is necessary to implement an adequate management program.

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