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FIRST RECORD OF THE INVASIVE SIPHONATROPHIA CUPRESSI (SWAIN) (APHIDIDAE  APHIDINI  APHIDINA) IN THE IBERIAN PENINSULA

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Siphonatrophia cupressi Swain, 1918 has been caught for first time in the Iberian Peninsula in the Arboretum and Botanical Garden of Lleida. Small colonies with apterous and alate individuals were recorded on Cupressus macrocarpa Hartw. The aphid was mainly associated to the as native parasitoid Lysiphlebus testaceipes Cresson, which enhances the role of this parasitoid in potentially preventing outbreaks of the new immigrant aphid species.

KEY WORDS: Siphonatrophia cupressi, Cupressus macrocarpa, aphid, alien species, Lysiphlebus testaceipes, parasitoids.

INTRODUCTION

The genus Siphonatrophia Swain, 1918 (Aphidinae: Aphidini: Aphidina) includes two species: Siphonatrophia (s.) cupressi (Swain, 1918) which is a nearctic species living on Cupressaceae in North and Central America and Siphonatrophia (Lacusaphis) aetherelaca Zhang & Zhang, 2002 living on unidentiﬁed Cruciferaceae in China (REMAUDIÈRE & MUÑOZ VIVEROS, 1991). Siphonatrophia cupressi lives on tips of scale leaves of Cupressaceae (Cupressus arizonica Greene, C. guadalupensis S. Watson, Cupressus macrocarpa Hartw., Juniperus scopulorum Sarg., Juniperus virginiana L. and Widdringtonia sp. in Canada, USA, Mexico and Central America (Honduras, Costa Rica) (REMAUDIÈRE & MUÑOZ VIVEROS, 1991; Rabasse et al., 2005; Villalobos Muller et al., 2010; Footitt & Richards, 1993; Footitt et al., 2012; SANO & Yoshitomi, 2012).

The species was recorded for first time in Europe in South France (Mougins, Alpes Maritimes) and Northern Italy (Pozzuolo del Friuli, Friuli-Venezia Giulia) (Rabasse et al., 2005) and its expansion in Italy (Lombardia, Toscana and Sicilia) has been conﬁrmed (BELLA & SQUARCINI, 2009). The aphid has also been recorded in Japan (SANO & Yoshitomi, 2012).

We report here, the first record in the Iberian Peninsula of the species S. cupressi and we describe the aphid morphs recorded and natural enemies associated with the species, especially parasitoids and hyperparasitoids.

RESULTS AND DISCUSSION

Catches were made in the Arboretum and Botanical Garden Pius Font i Quer de Lleida (Catalonia, Spain, 41°37’38.82”N and 0°36’01.76”E), a recently created botanical garden of 7 ha and more than 500 species of plants, mainly trees and shrubs (http://arboretum.parcteleida.es). Samples of aphids were collected in spring and summer of 2012 and 2013; spring, summer and autumn of 2014, and winter of 2015. When present, mummies were also collected. These mummies and the remnant aphids not used for identification were reared on 500 ml plastic cages, covered with mesh for aeration and maintained at 25°C until parasitoids or hyperparasitoids emerged.

Aphids were identiﬁed as belonging to the species S. cupressi. Only apterous and alate viviparous females were found. Identiﬁcations were made following keys of BLACKMAN & EASTOP (2014) and the description of Swain (1918) and RABASSE et al. (2005). The slides (reference L843) are mainly deposited in the aphidological collection of the University of Leon and some other in the laboratory of Entomology of the University of Lleida (UdL).

The apterous viviparous females (Fig. 1, 1, 2) are small aphids (1.0 to 1.7 mm), pale blue-green when alive, colorous with the leaves of host and strongly domed dorsally and ﬂattened against leaf ventrally (Fig. 1, 1), with antennae of 5 or 6 antennal segments, processus terminalis similar in length to the basal part of the last joint segment (Fig. II, 1); rostrum reaching the middle coxae with its apical segment short (Fig. II, 3); abdomen dorsum membranous (Fig. I, 2), siphunculi pore-like on a small and slightly raised cone (Fig. II, 4) and cauda conspicuous with more of 10 setae (Fig. II, 5). The alate viviparous females are similar to the apterae but comparatively slender; with antennal segment with 3 to 8 small secondary sensoria (Fig. II, 2) and forewing with the medially vein once (Fig. II, 7) or twice branched (Fig. II, 6).

The aphid was ﬁrstly recorded in May 2012 but very few individuals could be collected, although we collected some mummies. No more individuals were observed that year. Similar situation occurred in 2013. In 2014, the aphid was ﬁrstly recorded by the end of March and its abundance was higher than those of 2012 and 2013. So, small colonies were recorded in summer, autumn and winter 2014-2015.

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SHORT NOTE
The aphid formed small colonies with scattered individuals dispersed on the tip of leaves of *C. macrocarpa* on about 15 trees planted in 2009 in the Lleida’s Botanical Garden. It was not recorded on other species of Cupressaceae present in the Lleida’s Arboretum: *Cupressus sempervirens* L., *Juniperus communis* L., *J. oxycedrus* L., *J. phoenicea* Farg., *J. sabina* Farg., *J. virginiana* L.) and species of *Chamaecyparis* and *Thuja*.

The first record of *S. cupressi* in the Iberian Peninsula is an indicator of the expansion of this species in Western Europe because it has been previously only reported in France and Italy (RABASSE et al., 2005; BELLA & SQUARCINI, 2009). In Italy, where specimens of *S. cupressi* were already caught with a 12.2 m high suction trap during 1999-2002, colonies of the aphid have been reported on *C. sempervirens*, x *Cupressocyparis leylandii* (Dallim. & A.B. Jacks.) Dallim. & A.B. Jacks. and *Juniperus chinensis* L. The occurrence of *S. cupressi* on *C. macrocarpa* and not on other Cupressaceae in Lleida, suggests a recent invasion of this aphid in the Iberian Peninsula.

*Siphonatrophia cupressi* is a monoecious holocyclic species with oviparae apterous and males alate or apterous that can occur in October-November (PALMER, 1952). In Europe, in Italy (Toscana) and France (Alpes-Martitimes) this species is found frequently from May to November-December with presence of apterae and alatae and may be associated with ants (BELLA & SQUARCINI, 2009). Our findings show that in Lleida, the aphid can be found earlier and first individuals are already on tips of branches by the end of March. Similarly to that reported in Italy and unlike what happens in France, where have been recorded oviparous (but not males), no sexual morphs could be recorded in Lleida. The record of alive adults and nymphs in February 2015 clearly outlines that *S. cupressi* develops parthenogenetically, the same that happens in southwestern Japan where the aphid has also been recorded and reported as an introduced species in this country (SANÓ & YOSHITOMI, 2012).

No damages on the infested trees were observed, because the density of the aphids was low. However, data recorded show that an increase of the density has occurred from the first detection in 2012, and this suggests that the surveillance of the aphid is needed. Heavy infestations may produce discoloration of branch tips and aesthetic damages to the ornamental trees attacked. This alien aphid species is restricted at the moment to parks, gardens and city areas in which these trees have been planted but given the globalization and the use of the Cupressaceae in gardening (LOPEZ LILLO & SANCHEZ DE LORENZO CÁCERES, 2001) it is very probably that *S. cupressi* could be introduced to other countries in Europe and Northern Africa in the next years.

The detection of aphid alien species in botanical gardens, as it has been the recently case of *Neophyllaphis podocarpi* Takahashi (PÉREZ HIDALGO et al., 2015), indicates that these types of ecosystems, with a high diversification of vegetation and its origins, are important focus for the arrival and potential establishment of alien aphid species. On the other hand, the periodical surveillance of these ecosystems and the early detection could be a procedure for recognizing recent new potential problems and to identify the actions to prevent the spread of the alien species to other ecosystems.

Parasitoids were identified by P. Starý (Institute of Entomology, Czech Republic) and a voucher is in his personal collection and in the laboratory of Entomology of UdL, other vouchers were supplied to the Institute of Zoology, Belgrade for possible DNA analyses. Hyperparasitoids were identified following the Antoni Ribes’ keys, available at the webpage http://www.ponent.atrace.org/fauna/ins. Two parasitoid species emerged from *S. cupressi*: *Ephedrus persicae* Froggatt and *Lysippelebus testaceipes* (Cresson). Whereas *E. persicae* was only found in May 2012, *L. testaceipes* was the prevalent species there and the only one emerged in 2013 and 2014 (Table 1). A high proportion of mummies collected at the middle of December 2014 resulted in hyperparasitoids belonging to the species *Asaphes suspensus* (Nees), *Asaphes vulgaris* Walker and *Pachyneuron aphidis* (Bouché) (Table 1). No predators could be recorded to prey on aphids.

*Ephedrus persicae* and *L. testaceipes* are common aphid

![Fig. 1 – *Siphonatrophia cupressi*, apterous viviparous female, in nature (1) and habitus in (2). The red arrow shows the position of the siphunculus.](image)
Fig. II – *Siphonatrophia cupressi*, apterous viviparous female antennae (1, 3, 4, 5), alate viviparous female (2, 6, 7); antennae without pigment (1, 2), apical rostral segment (3), siphunculi (4), cauda (5), and two different fore wings (6, 7).

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parasitoids in NE Iberian Peninsula (Lumbierres et al., 2005; Pons & Lumbierres, 2013) and its parasitism on S. cupressi seems to be a host adaptation of these parasitoids to this new aphid immigrant. Lysiphlebus testaceipes was able to parasitize the aphid from spring to the end of autumn and the new association can be classified as becoming established in the area. The rapid association of L. testaceipes to new aphid invaders points out the role of this as native species in Spain and in the Mediterranean (Starý et al., 2004; Lumbierres et al., 2005; Mitrovic et al., 2013) in potentially preventing outbreaks of the new immigrants aphid species, as has recently been reported in the case of Aphis illinoisensis Shimer (Havelka et al., 2013).

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