

Checklist of phytophagous insects on citrus from the Sternorrhyncha (Hemiptera) suborder in Mediterranean basin and the risk for introduction and harmfulness in Croatia

Fitofagni kukci iz podreda Sternorrhyncha (Hemiptera) na agrumima u Mediteranskom bazenu i rizik od unosa i uzrokovanja šteta u Hrvatskoj

Vjekoslav MARKOTIĆ¹ (✉), Renata BAŽOK², Tatjana MASTEN MILEK³, Mladen ŠIMALA¹, Maja PINTAR¹

¹ Croatian agency for agriculture and food – Centre for plant protection, Gorice 68b, 10000 Zagreb, Croatia

² University of Zagreb, Faculty of Agriculture, Department of Agricultural Zoology, Svetošimunska cesta 25, 10000 Zagreb, Croatia

³ Public Institution Green Ring, 151. samoborske brigade HV 1, 10430 Samobor, Croatia

✉ Corresponding author: vjekoslav.markotic@hapih.hr

Received: September 30, 2019; accepted: February 27, 2020

ABSTRACT

First aim of this review paper is to make the checklist of the most important phytophagous insects from the Sternorrhyncha (Hemiptera) suborder that may feed on plants from genus *Citrus*, *Fortunella* and *Poncirus*, present in the Mediterranean basin. Second aim is to compare the mentioned list with Croatian findings from relevant literature. Third aim is to separate and describe possible risk for introduction and harmfulness of the most harmful species in Croatia. In the literature review 46 species (17 aphids, 21 scale insects, 6 whiteflies and 2 psyllids) which may feed on citrus plants were found to be present in selected countries. Out of that number, 37 species (13 aphids, 18 scale insects and 6 whiteflies) are reported for Croatia. Based on their potential to cause damages, ability to spread and the vicinity of the countries in which they are found, following species if introduced could be potential threat for citrus growing areas in Croatia: *Toxoptera citricida* (Kirkaldy), *Aonidiella citrina* (Craw, 1890), *Parasaissetia nigra* (Nietner, 1861), *Trioza erytrae* (Del Guercio, 1918), *Aleurothrixus floccosus* (Maskell, 1896) and *Parabemisia myricae* (Kuwana, 1927).

Keywords: citrus, Croatia, introduction, phytophagous insects, Sternorrhyncha

SAŽETAK

Prvi cilj ovog preglednog rada je napraviti popis najvažnijih fitofagnih kukaca iz podreda Sternorrhyncha (Hemiptera) prisutnih u Mediteranskom bazenu kojima domaćini mogu biti biljne vrste iz rodova *Citrus*, *Fortunella* i *Poncirus*. Drugi cilj je usporediti navedeni popis s vrstama utvrđenim u Hrvatskoj temeljem dostupne relevantne literature. Treći cilj je izdvojiti i opisati najštetnije vrste za koje postoji rizik od unosa i uzrokovanja šteta u Hrvatskoj. Literaturnim pregledom u odabranim zemljama utvrđeno je 46 vrsta kukaca kojima domaćini mogu biti agrumi (17 lisnih uši, 21 štitastih uši, 6 štitastih moljaca i 2 lisne buhe). Od toga je 37 vrsta kukaca (13 lisnih uši, 18 štitastih uši i 6 štitastih moljaca) nađeno u Hrvatskoj. Na temelju njihovog potencijala uzrokovanja šteta, sposobnosti širenja i blizine zemalja u kojima su prisutni, nekoliko vrsta kukaca u slučaju unosa mogu predstavljati potencijalnu opasnost za uzgojna područja agruma u Hrvatskoj: *Toxoptera citricida* (Kirkaldy), *Aonidiella citrina* (Craw, 1890), *Parasaissetia nigra* (Nietner, 1861), *Trioza erytrae* (Del Guercio, 1918), *Aleurothrixus floccosus* (Maskell, 1896) i *Parabemisia myricae* (Kuwana, 1927).

Ključne riječi: agrumi, fitofagni kukci, Hrvatska, Sternorrhyncha, unos

INTRODUCTION

Citrus fauna has been in the focus of producer's interest from the beginning of their intensive growing. Therefore, citrus industry and entomologists have been collaborating for more than a century in study of their biology and finding means of their suppression and the results of such cooperation have greatly contributed to their control and suppression (Reuther et al., 1989). During its research on citrus insects in the Middle East in the first half of the 20th century, Bodenheimer (1951) had found that the fauna of the citrus trees is limited almost entirely to its pests and to the parasites or predators connected with them, but the citrus fauna of the world and especially within the Mediterranean area is still in full migration and expansion, aided enormously by human agency and commerce. However, the number of species on citrus will doubtless still increase considerably in the future, mainly on account of very occasional feeders of no economic importance and on account of new introductions (Bodenheimer, 1951).

In the first decade of 21st century it is evident considerable growth of introduction of new foreign species of phytophagous insects into Croatia and the new introduced insects have favorable preconditions for establishment particularly in the coastal part of Croatia which has Mediterranean climate and abundance of host plants suitable for foreign species of tropical origin (Matošević and Pajač Živković, 2013).

First aim of this review paper is to make the checklist of the most important phytophagous insects from the Sternorrhyncha (Hemiptera) suborder that may feed on plants from genus *Citrus*, *Fortunella* and *Poncirus*, present in the Mediterranean basin. Second aim is to compare the mentioned list with Croatian findings from relevant literature. Third aim is to separate and describe possible risk for introduction and harmfulness of the most harmful species in Croatia.

Materials and methods

The basis for making the checklist of phytophagous insects from the Sternorrhyncha suborder harmful to

citrus plants were web databases Scale Net (scale insects), Psyllist (jumping plant lice) and CAB International (Invasive Species Compendium), scientific and expert papers, catalogue reviews of species and thesis in the area of entomology. Apart from Croatia, the presence of phytophagous insects is also given for countries in the Mediterranean from which Croatia imports fresh fruits or fruit seedlings which are potential vectors of new species (Greece, Italy, Spain, Portugal, Turkey, Israel, Egypt and Tunisia) and countries with which Croatia shares inland border (Slovenia and Montenegro). For each species present in Mediterranean basin and Croatia, its scientific name and reference was given.

RESULTS

Aphids

There are around 4,500 species of aphids in the world (Blackman and Eastop, 1984; 1994; 2000). Fourteen aphid species are recorded on citrus: *Aphis craccivora* Koch, 1854, *Aphis gossypii* Glover, 1877, *Aphis nerii* Boyer de Fonscolombe, 1841, *Aphis spiraeicola* Patch, 1914, *Aulacorthum magnoliae* (Esig & Kuwana), *Aulacorthum solani* Kaltentbach, 1843, *Brachycaudus helichrysi* (Kaltentbach, 1843), *Brachyunguis harmalae* B. Das, 1918, *Macrosiphum euphorbiae* (Thomas, 1878), *Myzus persicae* Sulzer, 1776, *Sinomegoura citricola* van der Goot, *Toxoptera aurantii* (Boyer de Fonscolombe, 1841), *Toxoptera citricida* (Kirkaldy) and *Toxoptera odinae* (Van der Goot). Additionally, five other species have been recorded one or more times from citrus: *Aphis arbuti* Ferrari, 1872, *Aphis fabae* Scopoli, 1763, *Brachycaudus cardui* (Linnaeus, 1758), *Pterochloroides persicae* (Cholodkovsky, 1899) and *Rhopalosiphum maidis* (Fitch, 1856) (Blackman and Eastop, 2000). Data on distribution of mentioned species are given in Table 1. So far in Croatia have been determined 191 species of aphids on 192 different host plants (Gotlin Čuljak et al., 2012). Thirteen out of nineteen species which may feed on citrus plants (according to literature review) were found on different hosts in Croatia (Table 1).

Table 1. List of aphids that may feed on citrus plants recorded in the Mediterranean basin and Croatia

Species	Presence in citrus growing areas in the Mediterranean basin	Reference	Presence in Croatia	Reference
<i>Aphis craccivora</i> Koch, 1854 Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Akyürek et al., 2010; Swirski and Amitai, 1999; Allam and El-Kady, 1966; Weigand and Bishara, 1991; Mitrović et al., 2013; UK, CAB International, 1983; Kavallieratos et al., 2007; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Aphis gossypii</i> Glover, 1877 Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Akyürek et al., 2010; Swirski and Amitai, 1999; UK, CAB International, 1968; Halima-Kamel and Hamouda, 1993; Milevoj, 2002; Mitrović et al., 2013; Tsitsipis et al., 2007	+	Gotlin Čuljak et al., 2012
<i>Aphis nerii</i> Boyer de Fonscolombe, 1841 Aphididae	Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Swirski and Amitai, 1999; Grant Morse et al., 1996; Ben Halima, 2012; Mitrović et al., 2013; Tsitsipis et al., 2007; Cavalloro, 1986; Cambra et al., 2000; Costa and Starý, 1988	+	Gotlin Čuljak et al., 2012
* <i>Aphis spiraeicola</i> Patch, 1914 Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Greece, Italy, Spain, Portugal	Uygun et al., 1987; Swirski et al., 1991; UK, CAB International, 1969; Ben Halima, 2012; Modic and Urek, 2008; Katsoyannos et al., 1997; Melia, 1995; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Aphis fabae</i> Scopoli, 1763 Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Aslan and Uygun, 2005; Swirski and Amitai, 1999; Semeada et al., 2004; Halima-Kamel and Hamouda, 1993; Kos et al., 2008; Mitrović et al., 2013; Lykouressis and Tsitsipis, 1987; UK, CAB International, 1963; Mier Durante and Nieto Nafria, 1974; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Aphis arbuti</i> Ferrari, 1872 Aphididae	Turkey, Italy, Spain, Portugal	Görür et al., 2012; Barbagallo et al., 2011; Ghosh et al., 1994; Rodrigues et al., 2006	-	-
<i>Aulacorthum solani</i> Kalténbach, 1843 Aphididae	Turkey, Israel, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Görür et al., 2012; Swirski and Amitai, 1999; Boukhris-Bouhachem et al., 2007; UK, CAB International, 1985; Žikić et al., 2012; Tsitsipis et al., 2007; UK, CAB International, 1985; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Brachycaudus helichrysi</i> (Kaltenbach, 1843) Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Görür et al., 2012; Swirski and Amitai, 1999; Abdel-Salam et al., 1972; Ben Halima, 2012; Modic et al., 2009; Žikić et al., 2012; Kavallieratos et al., 2007; Bassi, 1994; Hermoso de Mendoza et al., 1986; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Brachycaudus cardui</i> (Linnaeus, 1758) Aphididae	Turkey, Israel, Tunisia, Slovenia, Montenegro, Italy, Spain, Portugal	Görür et al., 2012; Swirski and Amitai, 1999; Ben Halima, 2012; Modic et al., 2009; Žikić et al., 2012; Barbagallo et al., 2011; Tizado and Nunez Perez, 1998; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Brachyunguis harmalae</i> B. Das, 1918 Aphididae	Israel, Tunisia, Greece, Spain	Swirski and Amitai, 1999; Ben Halima, 2012; Tsitsipis et al., 2007; García Prieto et al., 2004	-	-

Table 1. Continued

Species	Presence in citrus growing areas in the Mediterranean basin	Reference	Presence in Croatia	Reference
<i>Macrosiphum euphorbiae</i> (Thomas, 1878) Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Görür et al., 2012; Swirski and Amitai, 1999; Elnagar et al., 1996; Halima-Kamel and Hamouda, 1993; Modic et al., 2009; Žikić et al., 2012; Tsitsipis et al., 2007; UK, CAB International, 1984; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Myzus persicae</i> Sulzer, 1776 Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	UK, CAB International, 1979; Swirski and Amitai, 1999; Grant Morse et al., 1996; Halima-Kamel and Hamouda, 1993; Kos et al., 2012; Žikić et al., 2012; Tsitsipis et al., 2007; UK, CAB International, 1979; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Pterochloroides persicae</i> (Cholodkovskii, 1899) Aphididae	Turkey, Israel, Egypt, Tunisia, Greece, Italy, Spain	Görür et al., 2012; Swirski and Amitai, 1999; Darwish et al., 1989; Ben Halima, 2012; Tsitsipis et al., 2007; Blackman and Eastop, 1984; Cabello et al., 1995	+	Gotlin Čuljak et al., 2012
<i>Rhopalosiphum maidis</i> (Fitch, 1856) Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Greece, Italy, Spain, Portugal	Görür et al., 2012; Swirski and Amitai, 1999; UK, CAB International, 1971; Ben Halima, 2012; Pajmon, 1997; Tsitsipis et al., 2007	+	Gotlin Čuljak et al., 2012
* <i>Toxoptera aurantii</i> (Boyer de Fonscolombe, 1841) Aphididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Görür et al., 2012; Swirski and Amitai, 1999; UK, CAB International, 1961; Ben Halima, 2012; Seljak, 2013; Žikić et al., 2012; Lykouressis and Tsitsipis, 1987; Liotta and Manzella, 1993; Melia, 1993; Rodrigues et al., 2006	+	Gotlin Čuljak et al., 2012
<i>Toxoptera citricida</i> (Kirkaldy) Aphididae	Tunisia, Spain, Portugal	Tsai, 1999; Ilharco et al., 2005	-	-
<i>Toxoptera odinae</i> (Van der Goot, 1917) Aphididae	Egypt	Aziza et al., 2014	-	-

* Found on citrus plants in Croatia

Scale insects

Approximately 16,000 species are described within the Sternorrhyncha suborder and 7,500 out of that number are scale insects (Gullan and Martin, 2003). According to Scale Net (2020), 433 scales are associated with Rutaceae family and 337 may appear on plants within the genus *Citrus*. Most of scale insects are polyphagous and they easily adapt to different conditions regarding food and climate. Pasive spread of scale insects in the world is very

intensive nowadays considering dynamic of marketing with fruit seedlings, fresh fruits and ornamental plants. In Croatia have been determined 111 species of scale insects (Masten Milek, 2007). In total, literature data on presence of 24 the most important scale insects which may feed on citrus plants have been examined for Croatia and selected countries. Data on distribution of mentioned species are given in Table 2.

Table 2. List of the most important scale insects that may feed on citrus plants recorded in the Mediterranean basin and Croatia

Species	Presence in citrus growing areas in the Mediterranean basin	Reference	Presence in Croatia	Reference
* <i>Aonidiella aurantii</i> (Maskell, 1879) Diaspididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Rosen and DeBach, 1979; Ezzat, 1958; Balachowsky, 1932; Seljak, 2010; Franco et al., 2006; Rosen and DeBach, 1978; Viggiani, 1970; Blay Goicoechea, 1993; Franco et al., 2011	+	Masten Milek, 2007
<i>Aonidiella citrina</i> (Craw, 1890) Diaspididae	Turkey, Greece, Italy	Kaydan et al., 2007; Milonas et al., 2007; Longo et al., 2001	-	-
* <i>Aspidiotus nerii</i> Bouché, 1833 Diaspididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Gerson and Zor, 1973; Ezzat, 1958; Mansour et al., 2011; Seljak, 2010; Velimirović, 1985; Milonas et al., 2007; Viggiani, 1970; Blay Goicoechea, 1993; Fernandes, 1992	+	Masten Milek, 2007
* <i>Chrysomphalus dictyospermi</i> (Morgan, 1889) Diaspididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Ben-Dov, 1980; Ezzat, 1958; Balachowsky, 1932; Seljak, 2010; Velimirović, 1985; Milonas et al., 2007; Longo et al., 1995; Blay Goicoechea, 1993; Franco et al., 2011	+	Masten Milek, 2007
* <i>Chrysomphalus aonidium</i> (Linnaeus, 1758) Diaspididae	Turkey, Israel, Egypt, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Gerson and Zor, 1973; Ezzat, 1958; Seljak, 2010; Velimirović, 1985; Milonas et al., 2007; Pellizzari and Vacante, 2007; Martin-Mateo, 1983; Franco et al., 2011	+	Masten Milek, 2007
* <i>Hemiberlesia rapax</i> (Comstock, 1881) Diaspididae	Turkey, Israel, Egypt, Tunisia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Ben-Dov, 2012; Ezzat, 1958; Balachowsky, 1932; Velimirović, 1985; Milonas et al., 2007; Longo et al., 1995; Blay Goicoechea, 1993; Fernandes, 1992	+	Masten Milek, 2007
* <i>Lepidosaphes beckii</i> (Newman, 1869) Diaspididae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Bodenheimer, 1949; Bytinski-Salz, 1966; Hall, 1922; Danzig and Pellizzari, 1998; Seljak, 2010; Velimirović, 1985; Milonas et al., 2007; Longo et al., 1995; García-Marí and Rodrigo, 1995; Franco et al., 2011	+	Masten Milek, 2007
* <i>Lepidosaphes glowerii</i> (Packard, 1869) Diaspididae	Turkey, Egypt, Tunisia, Greece, Italy, Spain, Portugal	Danzig and Pellizzari, 1998; Abd-Rabou, 2001; Milonas et al., 2007; Longo et al., 1995; Gómez-Menor Ortega, 1937; Franco et al., 2011	+	Masten Milek, 2007
* <i>Parlatoria ziziphi</i> (Lucas, 1853) Diaspididae	Turkey, Egypt, Tunisia, Greece, Italy, Spain, Portugal	Kaydan et al., 2013; Abd-Rabou, 1999; Danzig and Pellizzari, 1998; Milonas et al., 2007; Longo et al., 1995; Blay Goicoechea, 1993; Franco et al., 2011	+	Masten Milek, 2007
<i>Unaspis citri</i> (Comstock, 1883) Diaspididae	Egypt, Portugal	Newstead, 1907; Franco et al., 2011	-	-
* <i>Ceroplastes japonicus</i> (Green, 1921) Coccidae	Turkey, Slovenia, Italy	Fetykó and Kozár, 2012; Seljak, 2008; Kozár et al., 1984	+	Masten Milek, 2007

Table 2. Continued

Species	Presence in citrus growing areas in the Mediterranean basin	Reference	Presence in Croatia	Reference
* <i>Ceroplastes rusci</i> (Linnaeus, 1758) Coccidae	Turkey, Israel, Egypt, Tunisia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Hodgson, 1994; Ezzat and Hussein, 1969; Fetykó and Kozár, 2012; Velimirović, 1985; Kozár et al., 1991; Longo et al., 1995; Gómez-Menor Ortega, 1948; Carvalho et al., 1996	+	Masten Milek, 2007
* <i>Ceroplastes sinensis</i> (Del Guercio, 1900) Coccidae	Turkey, Egypt, Tunisia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Hall, 1924; Hodgson and Peronti, 2012; Velimirović, 1985; Milonas et al., 2007; Longo et al., 1995; Carvalho et al., 1996	+	Masten Milek, 2007
* <i>Coccus hesperidum</i> Linnaeus, 1758 Coccidae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Uygun et al., 1998; Ben-Dov, 1993; Ezzat and Hussein, 1969; Jarraya, 1970; Seljak, 2010; Velimirović, 1985; Kozár et al., 1991; Longo et al., 1995; Lin et al., 2013; Carvalho et al., 1996	+	Masten Milek, 2007
* <i>Coccus pseudomagnoliarum</i> (Kuwana, 1914) Coccidae	Turkey, Israel, Slovenia, Montenegro, Greece, Italy, Spain	Kaydan et al., 2007; Ben-Dov, 1993; Seljak, 2010; Velimirović, 1985; Ben-Dov, 1993; Marotta, 1987; Tena and Garcia-Mari, 2008	+	Masten Milek, 2007
<i>Parasaissetia nigra</i> (Nietner, 1861) Coccidae	Turkey, Israel, Egypt, Italy, Spain, Portugal	Kaydan et al., 2007; Ben-Dov, 1993; Ezzat and Hussein, 1969; Pellizzari, 2010; Gómez-Menor Ortega, 1958; Fernandes, 1992	-	-
* <i>Parthenolecanium persicae</i> (Fabricius, 1776) Coccidae	Turkey, Israel, Egypt, Slovenia, Greece, Italy, Spain, Portugal	Kaydan et al., 2007; Ben-Dov and Drishpoun, 2012; Ezzat and Hussein, 1969; Seljak, 2010; Stathas, 2004; Marotta, 1987; Gómez-Menor Ortega, 1960; Carvalho et al., 1996	+	Masten Milek, 2007
* <i>Saissetia coffeae</i> (Walker, 1852) Coccidae	Turkey, Israel, Egypt, Slovenia, Greece, Italy, Spain, Portugal	Ben-Dov, 1993; Rosen et al., 1971; Ezzat and Hussein, 1969; Seljak, 2008; Ben-Dov, 1993; Longo et al., 1995; Gómez-Menor Ortega, 1965; Carvalho et al., 1996	+	Masten Milek, 2007
* <i>Icerya purchasi</i> Maskell, 1878 Margarodidae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Uygun et al., 1998; Mendel and Blumberg, 1991; Ezzat and Nada, 1987; UK, CAB International, 1971; Seljak, 2010; Velimirović, 1985; Milonas et al., 2007; Barbagallo et al., 1995; Martin-Mateo, 1985; Fernandes, 1992	+	Masten Milek, 2007
* <i>Planococcus citri</i> (Risso, 1813) Pseudococcidae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Uygun et al., 1998; Ben-Dov, 1994; Mahfoudhi and Dhouibi, 2009; Seljak, 2010; Velimirović, 1985; Michelakis and Hamid, 1995; Longo et al., 1995; Martin-Mateo, 1985; Carvalho et al., 1996	+	Masten Milek, 2007
* <i>Pseudococcus longispinus</i> (Targioni Tozzetti, 1867) Pseudococcidae	Turkey, Israel, Egypt, Tunisia, Slovenia, Montenegro, Greece, Italy, Spain, Portugal	Kaydan et al., 2013; Ben-Dov, 1994; Seljak, 2010; Velimirović, 1985; Milonas and Kozár, 2008; Longo et al., 1995; Carvalho et al., 1996	+	Masten Milek, 2007

* Found on citrus plants in Croatia

Whiteflies

Whiteflies belong to only one family Aleyrodidae which, according to Martin and Mound (2007), comprises of 1,556 whiteflies registered all around the world listed in 161 order. According to Evans (2008) 90 species of whiteflies may appear on citrus plants and only 9 species are registered to make serious damage in intensive citrus production. Data on distribution of mentioned species are given in Table 3. Whiteflies have successfully adapted to environmental factors within the areas of citrus

production (Rapisarda et al., 1990), but only 3 species are reported as economically important pests on citrus plants in the Mediterranean: *Dialeurodes citri* (Ashmead, 1885), *Aleurothrixus floccosus* (Maskell, 1896) and *Parabemisia myricae* (Kuwana, 1927) (Barbagalo et al., 1986; Žanić et al., 2000). In Croatia have been determined 30 species of whiteflies listed in 18 different genera and 5 species out of that number were found on citrus plants (Šimala, 2008; Žanić et al., 2012; Šimala et al., 2013; 2019).

Table 3. List of whiteflies that may feed on citrus plants recorded in the Mediterranean basin and Croatia

Species	Presence in citrus growing areas in the Mediterranean basin	Reference	Presence in Croatia	Reference
* <i>Aleurothrixus floccosus</i> (Maskell, 1866) Aleyrodidae	Turkey, Israel, Egypt, Tunisia, Greece, Italy, Spain, Portugal	Özer and Kismali, 2003; Roll et al., 2007; Genduso and Liotta, 1976/1980; Chermiti et al., 1993; Anagnou-Veroniki et al., 2008; Ippolito and Laccone, 1987; Carvalho, 1994	+	Žanić et al., 2012
* <i>Aleurocanthus spiniferus</i> Quaintance, 1903 Aleyrodidae	Montenegro, Italy	Radonjić et al., 2014; Porcelli, 2008	+	Šimala, 2013; Šimala et al., 2019
* <i>Bemisia tabaci</i> (Gennadius, 1889) Aleyrodidae	Turkey, Israel, Egypt, Tunisia, Montenegro, Greece, Italy, Spain, Portugal	Ozgun et al., 1989; Bink-Moenen and Gerling, 1992; Abdel-Gawaad et al., 1990; Gorsane et al., 2011; Hrnčić et al., 2012; Mound and Halsey, 1978; Minelli et al., 1995; Guirao et al., 1997	+	Šimala, 2008
* <i>Dialeurodes citri</i> (Ashmead, 1885) Aleyrodidae	Turkey, Israel, Egypt, Greece, Italy, Spain	Uygun et al., 1990; Bink-Moenen and Gerling, 1992; Nada, 1988-1989; Minelli et al., 1995; International Institute of Entomology, 1996	+	Šimala, 2008
* <i>Parabemisia myricae</i> (Kuwana, 1927) Aleyrodidae	Turkey, Israel, Egypt, Tunisia, Greece, Italy, Spain, Portugal	Öztemiz & Doğanlar, 2015; Bink-Moenen and Gerling, 1992; Abd-Rabou, 2011; EPPO, 1992; Michalopoulos, 1989; Minelli et al., 1995; Garrido, 1995; Franco et al., 1996	+	Šimala et al., 2016
<i>Siphoninus phillyreae</i> (Haliday, 1835) Aleyrodidae	Turkey, Israel, Egypt, Tunisia, Greece, Italy, Spain, Portugal	CABI/EPPO, 2013; Bink-Moenen and Gerling, 1992; Mound and Halsey, 1978; CABI/EPPO, 2013; Evans, 2008; Rapisarda and Patti, 1983	+	Šimala, 2008

* Found on citrus plants in Croatia

Table 4. List of psyllids that may feed on citrus plants recorded in the Mediterranean basin

Species	Presence in citrus growing areas in the Mediterranean basin	Reference
<i>Agonoscena cisti</i> (Puton, 1882) Aphalaridae	Turkey, Israel, Greece, Italy, Spain	Burckhardt and Önuçar, 1993; Halperin et al., 1982; Burckhardt, 1988; Conci et al., 1993; Hodkinson and Hollis, 1981
<i>Trioza erytrae</i> (Del Guercio, 1918) Triozidae	Spain, Portugal	Llorens Climent, 2009; Tumminelli et al., 2006

Psyllids

Psyllids belong to the superfamily of Psylloidea and constitute an important component of the hemipterous fauna. The Psylloidea comprises of more than 1,500 species and most of them are associated with only a few corresponding host plants, and are relatively specific in their food selection (Aubert, 1987).

According to Psyllist internet data base (2020), 17 psyllid occurs on citrus plants: *Agonoscena cisti* (Puton, 1882), *Cacopsylla citricola* (Yang & Li, 1984), *Cacopsylla citrisuga* (Yang & Li, 1984), *Cacopsylla heterogena* Li, 2011, *Cacopsylla murrayi* (Mathur, 1975), *Diaphorina amoena* Capener, 1970, *Diaphorina auberti* Hollis, 1987, *Diaphorina citri* Kuwayama, 1908, *Diaphorina communis* Mathur, 1975, *Diaphorina punctulata* (Petty, 1924), *Diaphorina zebrana* Capener, 1970, *Leuronota fagarae* Burckhardt, 1988, *Mesohomotoma lutheri* (Enderlein, 1918), *Powellia vitreoradiata* Maskell, 1879, *Trioza citroimpura* Yang & Li, 1984, *Trioza erytrae* (Del Guercio, 1918) and *Trioza litseae* Bordage, 1898. Up to now there were no faunistic research on presence of psyllids on citrus plants and it is unknown if some of above listed species are present on Croatian territory, therefore data listed in Table 4. refer to psyllids present in selected countries in the Mediterranean.

DISCUSSION

The results presented in Tables 1-4 show the presence of 37 insects from the Sternorrhyncha suborder in Croatia that may feed on citrus plants and 25 species out of 37 are determined on citrus plants. With regard to Mediterranean basin, the majority of psyllids that may feed on citrus are absent from the selected countries as well

as aphids *Aulacorthum magnoliae*, *Sinomegoura citricola*, *Toxoptera odinae* and whiteflies harmful to citrus plants *Paraleyrodes citri*, *Dialeurodes citrifolii* and *Aleurocanthus woglumi*. Based on pest distribution given in Tables 1-4, their potential to spread, growth of international trade and suitable climatic and environmental conditions, several phytophagous insects have a potential for introduction and establishment in Croatia.

Toxoptera citricida is present Tunisia, Spain and Portugal (Table 1). *T. citricida* mostly feeds on citrus plants, and the most favorable environment for its development is in warm and moisture areas, while in desert, semiarid and cold regions conditions for development are seasonable. Therefore, it is not likely that *T. citricida* can survive outside of the areas or climate respectively where citrus are grown. Investigations conducted in 2006 and 2007 have shown that *T. citricida* in Europe is distributed along the northwest coast of Iberian Peninsula from north Portugal to Cantabria (Hermoso de Mendoza et al., 2008).

Aonidiella citrina is most common on citrus plants and it is not as widely distributed as *Aonidiella aurantii* (Miller and Davidson, 2005). Many potential hosts of *A. citrina* have similar climatic requirements as citrus species and their geographic distributions overlap with the citrus-growing areas. Therefore, they are mainly distributed in the southern EU member states Portugal, Spain, France, Italy, Malta, Croatia, Greece and Cyprus, even though ornamental hosts are available throughout the EU (EFSA, 2014). On the EU territory *A. citrina* was found for the first time in 1994 in Calabria, Italy (Longo et al., 1995) when no serious damages on host plants were recorded and again in the same region in 2001 (Longo et al., 2001).

Parasaissetia nigra in Europe is naturalized in the Azores, Canary Islands, Madeira, Mediterranean coast of France, Corsica, Portugal and Spain (EFSA, 2013). Former findings confirm that in central and northern Europe *P. nigra* is rather common in greenhouses, while in southern Europe is more present outdoors (Pellizzari and Germain, 2010). In parts of south Europe (France, Italy, Portugal and Spain) *P. nigra* was found on several localities but population on those localities was too low to cause some serious damage, (Frank et al., 2013).

Aleurothrixus floccosus was introduced in South Europe in early 70s (Mound and Halsey, 1978; Žanić et al., 2000) and became one of major pests in citrus orchards in Italy (Barbagalo et al., 1986). A single findings of *A. floccosus* on citrus plants without outbreak were recorded in Croatia two times (Žanić et al., 2007; Šimala, 2008).

Parabemisia myricae in Palearctic region is recorded in Cyprus, Crete, Japan, Egypt, Greece, Italy including Sardinia and Sicily, Spain including Canary Islands, Tunisia and Turkey (Šimala et al., 2016). In Croatia, *P. myricae* was found once on Island Korčula in back-yard on lemon tree and paper mulberry *Broussonetia papyrifera* L. Ventenat. Preliminary risk assessment has shown that basic preconditions for introduction and spread of this pest are satisfied, similarly like in the case of *D. citri* and *A. floccosus* in the past (Šimala et al., 2016).

Trioza erytreae belongs to an African group of 10 species attacking four plant families Rutaceae, Menispermaceae, Araliaceae and Salicaceae. In the EU it was found in Spain (Llorens Climent, 2009) and Portugal (Tumminelli et al., 2006). Furthermore, it appeared again in 2014 in the north-western Iberian Peninsula and despite the initial insecticide treatments to eradicate it, *T. erytreae* is now spreading from the north-west to the south-west of the Iberian Peninsula (Pérez-Rodríguez et al., 2019).

From data given in Tables 1-4 it is obvious that several described insects originating in Asian countries have been recently discovered or even spread in EU countries in the Mediterranean. In Croatia that clearly confirms recent findings of *Aleurocanthus spiniferus* in nursery in Split (Šimala, 2013) and after a few years in citrus orchard

near the Montenegro border and in vineyard on the island of Hvar (Šimala et al., 2019) as well as single finding of *Parabemisia myricae* on host plants in house garden on the island of Korčula (Šimala et al., 2016).

Croatian citrus production is not so considerable like in other Mediterranean countries, but mandarin for example is a third important fruit culture in Croatia following apple and olive, with total growing area of around 2,100 hectares and fruit production from 20,000 to 65,000 metric tons in five-year period (Statistical Yearbook of the Republic of Croatia, 2018). Varieties and citrus species which are grown in Croatia are rather specific since the majority of production refers to mandarins from Satsuma group (Velimirović, 1985). The biggest area planted with Satsuma mandarin is situated in the Neretva river valley, whereas small commercial orchards are dispersed on Dalmatian islands, mostly on Brač and Vis (Gugić and Cukrov, 2011).

The risk from further introduction of phytophagous insects from the Sternorrhyncha suborder in Croatia is very high due to similar climatic conditions in coastal part of Croatia and Mediterranean countries where these insects are spread, which is the basic precondition for adaptation and sustainability of introduced species. In addition, apart from citrus plants there is a lot of other plant species which may be suitable hosts for introduced insects and could facilitate their active spread along the coast. Therefore, the synergy of international commercial pathways, satisfactory climatic conditions and abundance of host plants provides relatively easy entry into Croatia for mentioned insects, their further spread and consequently harmfulness for important citrus production and ornamental plants along the coastal part of the country.

CONCLUSIONS

The most important fauna from the Sternorrhyncha suborder that may feed on citrus species and it is determined on different host plants in Croatia by literature review, includes 37 phytophagous insects (13 aphids, 18 scale insects and 6 whiteflies). 25 species out

of that number are determined on citrus plants (2 aphids, 18 scale insects and 5 whiteflies). By literature review it is determined that mentioned insects are also present in the selected countries in the Mediterranean, as well as some insects which are not found in Croatia and where in total by literature review it is determined 46 species (17 aphids, 21 scale insects, 6 whiteflies and 2 psyllids).

Based on their potential to cause damages, ability to spread, distribution in the neighbouring countries (Tables 1-4), suitable climatic conditions and abundance of different host plants along the Adriatic coast, the following species if introduced could be harmful for citrus growing areas in Croatia: *Toxoptera citricida*, *Aonidiella citrina*, *Parasaissetia nigra* and *Trioza erytrae*. Additionally, two whiteflies *Aleurothrixus floccosus* and *Parabemisia myricae* have been already found occasionally in Croatia on few locations so far without visible damages or yield loss.

REFERENCES

- Abdel-Gawaad, A. A., El-Sayed, A. M., Shalaby, F. F., Abo-El-Ghar, M. R. (1990) Natural enemies of *Bemisia tabaci* Genn. and their role in suppressing the population density of the pest. *Agricultural Research Review*, 68 (1), 185-195.
- Abd-Rabou, S. (1999) Parasitoids attacking the Egyptian species of armored scale insects (Homoptera: Diaspididae). *Egyptian Journal of Agricultural Research*, 77 (3), 1113-1129.
- Abd-Rabou, S. (2001) An annotated list of the Hymenopterous parasitoids of the Diaspididae (Hemiptera: Coccoidea) in Egypt, with new records. *Entomologica*, 33, 173-177.
DOI: <https://doi.org/10.15162/0425-1016/829>
- Abd-Rabou, S. (2011) Distribution and key of genus *Bemisia* Quaintance & Baker in Egypt with an updated list of whiteflies in Egypt. *Egyptian Journal of Agricultural Research*, 89 (4), 1303-1312. Available at: <https://pdfs.semanticscholar.org/ef42/2dab0b8601f07db66381446333ab8a93c756.pdf> [Accessed 4 November 2018].
- Abdel-Salam, A.M., Assem, M.A., Hammad, S.M. (1972) Note on the control of leaf-worm of cotton, *Spodoptera littoralis* (Boisduval) and artichoke aphid, *Brachycaudus helichrysi* Kalt. on artichoke. *Indian Journal of Agricultural Sciences*, 42 (2), 179-181.
- Akyürek, B., Zeybekoglu, Ü., Görür, G. (2010) New records of aphid species (Hemiptera: Aphidoidea) for the Turkish fauna from Samsun province. *Turkish Journal of Zoology*, 34 (3), 421-424.
DOI: <http://dx.doi.org/10.3906/zoo-0810-16>
- Allam, E. K., El-Kady, E. A. (1966) A virus causing a mosaic disease of broad bean and its vector *Aphis craccivora* in Egypt. *Entomologia Experimentalis et Applicata*, 9 (4), 413-418.
- Anagnou-Veroniki, M., Papaioannou-Souliotis, P., Karanastasi, E., Giannopolitis, C.N. (2008) New records of plant pests and weeds in Greece, 1990-2007. *Hellenic Plant Protection Journal*, 1 (2), 55-78. Available at: <https://en.bpi.gr/files/journal/2008/july/HPPJISSU202.pdf> [Accessed 10 May 2018].
- Aslan, M.M., Uygun, N. (2005) Aphids (Homoptera: Aphididae) of Kahramanmaraş Province, Turkey. *Turkish Journal of Zoology*, 29 (3), 201-209. Available at: <http://journals.tubitak.gov.tr/zoology/issues/zoo-05-29-3/zoo-29-3-2-0410-2.pdf> [Accessed 10 May 2018].
- Aubert, B. (1987) *Trioza erytrae* (Del Guercio) and *Diaphorina citri* Kuwayana (Homoptera: Psylloidea) the two vectors of Citrus Greening Disease: Biological aspects and possible control strategies. *Fruits*, 42 (3), 149-162.
- Aziza, M. E. G., Ahmed, S. A., El-Bassioni, M. N., Mahfouz, H. M., El-Deeb, M. G. A. (2014) Survey of aphid species and their associated parasitoids and predators on wild plants in North Sinai Governorate, Egypt. *Egyptian journal of pest control*, 24 (2), 283-288. Available at: <https://www.cabi.org/isc/FullTextPDF/2015/20153131026.pdf> [Accessed 12 May 2018].
- Balachowsky, A.S. (1932) Étude biologique des coccides du bassin occidental de la Méditerranée. *Encyclopédie Entomologique*, XV. Paris: P. Lechevalier & Fils.
- Barbagallo, S., Longo, S., Rapisarda, C. (1986) White-flies and psyllids injurious to citrus. In: Cavalloro, R., Martino, E., eds. *Proceedings of the Experts' Meeting on Integrated Pest Control in Citrus Groves*. Rotterdam, Netherlands: A.A. Balkema, pp. 89-98.
- Barbagallo, S., Binazzi, A., Bolchi Serini G., Conci, C., Longo, S., Marotta, S., Martelli, M., Patti, I., Pellizzari, G. (1995) Homoptera Sternorrhyncha. In: Minelli, A., Ruffo, S., La Posta, S., eds. *Checklist delle specie della fauna italiana*. Bologna: 43. Edizioni Calderini, 57 pp.
- Barbagallo, S., Binazzi, A., Pennacchio, F., Pollini, A. (2011) An annotated checklist of aphids surveyed in the Italian regions of Tuscany and Emilia Romagna. *REDIA*, 94, 59-96.
- Bassi, R. (1994) The principal adversities of plum. *Vita in Campagna*, 12 (12), 33-35.
- Ben-Dov, Y. (1980) Observations on scale insects (Homoptera: Coccoidea) of the Middle East. *Bulletin of Entomological Research*, 70 (2), 261-271.
DOI: <http://dx.doi.org/10.1017/S0007485300007537>
- Ben-Dov, Y. (1993) A systematic catalogue of the soft scale insects of the world (Homoptera: Coccoidea: Coccidae). Gainesville, Florida: Sandhill Crane Press Gainesville, Florida & Fauna Handbooks.
- Ben-Dov, Y. (1994) A systematic catalogue of the mealybugs of the world (Insecta: Homoptera: Coccoidea: Pseudococcidae and Putoidae) with data on geographical distribution, host plants, biology and economic importance. Andover, UK: Intercept Scientific, Medical and Technical Publications.
- Ben-Dov, Y. (2012) The scale insects (Hemiptera: Coccoidea) of Israel - Checklist, Host Plants, Zoogeographical Considerations and Annotations on Species. *Israel Journal Of Entomology*, 41-42, 21-48. Available at: <http://www.entomology.org.il/sites/default/files/pdfs/Ben-Dov-final.pdf> [Accessed 14 June 2018].
- Ben-Dov, Y., Drishpoun, Y. (2012) *Parthenolecanium persicae* (F.) a pest of persimmon, *Diospyros kaki* in Israel. *Alon Hanolea*, 66, 44-45.
- Ben Halima, M.K. (2012) Aphid fauna (Hemiptera Aphididae) and their host association of chott mariem, coastal area of Tunisia. *Annals of Biological Research*, 3 (1), 1-11.
- Bink-Moenen, R.M., Gerling, D. (1992) Aleyrodidae of Israel. *Bollettino di Laboratorio di Entomologia Agraria 'Filippo Silvestri'*, 47, 3-49.
- Blackman, R.L., Eastop, V.F. (1984) *Aphids on the World's Crops: An Identification and Information Guide*. London: John Wiley Sons.
- Blackman, R.L., Eastop, V.F. (1994) *Aphids on the World's Trees: An Identification and Information Guide*. Wallingford, Oxon: CAB International.

- Blackman, R.L., Eastop, V.F. (2000) Aphids on the World's Crops. An Identification and Information Guide. 2nd edition. Chichester: JohnWiley & Sons.
- Blay Goicoechea, M.A. (1993) The Diaspididae Targioni-Tozzetti, 1868, from the Spanish peninsula and Baleares (Insecta: Hemiptera: Coccoidea) Doctoral dissertation. Madrid: Editorial de la Universidad Complutense de Madrid.
- Bodenheimer, F.S. (1949) The Coccidea of Turkey. Diaspididae. A monographic study. Ankara: Güney.
- Bodenheimer, F.S. (1951) Citrus entomology in the Middle East with special references to Egypt, Iran, Irak, Palestine, Syria and Turkey. The Hague: Uitgeverij Dr W. Junk S-Gravenhage.
- Boukhris-Bouhachem, S., Souissi, R., Turpeau, E., Rouzé-Jouan, J., Fahem, M., Brahim, N.B., Hullé, M. (2007) Aphid (Hemiptera: Aphidoidea) diversity in Tunisia in relation to seed potato production. *Annales de la Société entomologique de France* (n.s.), 43 (3), 311-318. DOI: <https://dx.doi.org/10.1080/00379271.2007.10697526>
- Burckhardt, D. (1988) The jumping plant lice or psyllids (Homoptera: Psylloidea) from Greece. *Biologia Gallo-hellenica*, 13, 107-109.
- Burckhardt, D., Öncü, A. (1993) A review of Turkish jumping plant-lice (Homoptera, Psylloidea). *Revue Suisse de Zoologie*, 100 (3), 547-574.
- Bytynski-Salz, H. (1966) An annotated list of insects and mites introduced into Israel. *Israel Journal of Entomology*, 1, 15-48.
- CAB International (Invasive Species Compendium). [Online] Available at: <https://www.cabi.org/isc/datasheet/13436#topests> [Accessed 21 April 2018]. International Institute of Entomology (1996) Distribution Maps of Pests 1996 No. 111 (1st rev.), 4 pp.
- Cabello, T., Parra, M.J., Aguirre, A. (1995) Contributions to the new almond pest in Spain: branches aphid (*Pterochloroides persicae*) (Hom.: Lachnidae). *PHYTOMA España*, 69, 26-32.
- CABI/EPPO (2013) *Siphoninus phillyrae*. Distribution Maps of Plant Pests. Wallingford, UK: CABI, Map 773.
- Cambra, M., Olmos, A., Gorris, M., Marroquín, C., Esteban, O., Garnsey, S., Llauger, R., Batista, L., Peña I., De Mendoza, A.H. (2000) Detection of *Citrus tristeza virus* by print capture and squash capture-PCR in plant tissues and single aphids. In: Proceedings of the 14th Conference of the International Organization of Citrus Virologists, 14, 42-49. Available at: <https://escholarship.org/uc/item/1021413r> [Accessed 28 May 2018].
- Carvalho, J. P. (1994) A mosquinha-branca dos citrinos *Aleurothrixus floccosus* (Maskell 1895) (Homoptera, Aleyrodidae). Programa de "Luta contra *Aleurothrixus floccosus* (Mask)". Poseima. Madeira. Direcção Regional de Agricultura da Região Autónoma da Madeira. Madeira: Instituto Nacional de Investigação Agrária.
- Carvalho, J.P.M., Franco, J.C., Aguiar, F., Soares, A.O. (1996) Insect pests of citrus in Portugal. In: Proceedings of the International Society of Citriculture I, pp. 613-618.
- Cavalloro, R. (1986) Integrated Pest Control in Citrus Groves. Rotterdam: A.A. Balkema.
- Chermi, B., Onillon, J. C., Dali, M., Messelmani, H. (1993) Control of the woolly whitefly, *Aleurothrixus floccosus* (Hom., Aleyrodidae) by the parasitoid, *Cales noacki* (Hymenopt., Aphelinidae). *Bulletin OILB/SROP*, 16 (7), 86-98.
- Conci, C., Rapisarda, C., Tamanini, L. (1993) Annotated catalogue of the Italian Psylloidea. First part. (Insecta Homoptera). *Atti dell'Accademia Roveretana degli Agiati*, 242(IIB), 33-135. Available at: <https://common.agiati.org/page/attachments/agiati-atti-b-1992-6750-c-conci-c-rapisarda---l-tamanini-p-33.pdf> [Accessed 8 September 2018].
- Costa, A., Starý, P. (1988) *Lysiphlebus testaceipes*, an introduced aphid parasitoid in Portugal [Hym.: Aphididae]. *Entomophaga*, 33, 403-412. DOI: <http://dx.doi.org/10.1007/BF02373176>
- Danzig, E.M., Pellizzari, G. (1998) Diaspididae. In: Kozar, F., ed. Catalogue of Palaearctic Coccoidea. Budapest: Akaprint Nyomdaipari Kft, pp. 172-370.
- Darwish, E.T.E., Attia, M. B., Kolaib, M. O (1989) Biology and seasonal activity of giant brown bark aphid *Pterochloroides persicae* (Cholodk.) on peach trees in Egypt. *Journal of Applied Entomology*, 107 (1-5), 530-533. DOI: <https://doi.org/10.1111/j.1439-0418.1989.tb00288.x>
- EFSA (2013) Panel on Plant Health (PLH), Scientific Opinion on the risk to plant health posed by *Parasaissetia nigra* (Nietner) in the EU territory, with the identification and evaluation of risk reduction options. European Food Safety Authority. [Online] Available at: <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2013.3318> [Accessed: 4 November 2018].
- EFSA (2014) Scientific Opinion on the pest categorisation of *Aonidiella citrina*. European Food Safety Authority. [Online] Available at: <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2014.3929> [Accessed: 4 November 2018].
- Elnagar, S., El-Sheikh, M.A.K., Makland, F.M., Kabeil, S.S.A. (1996) Substantial loss in potato yield due to the early population of vectors of two aphid-borne viruses in Egypt. *Bulletin of Faculty of Agriculture, University of Cairo*, 47 (4), 677-690.
- EPPO (1992) European Plant Protection Organisation Global Database. [Online] Available at: <https://gd.eppo.int/reporting/article-5267> [Accessed: 12 June 2018].
- Evans, G.A. (2008) The Whiteflies (Hemiptera: Aleyrodidae) of the World and Their Host Plants and Natural Enemies. [Online] Available at: http://keys.lucidcentral.org/keys/v3/whitefly/PDF_PwP%20ETC/world-whitefly-catalog-Evans.pdf [Accessed: 6 November 2017].
- Ezzat, Y.M. (1958) Classification of the scale insects, family Diaspididae, as known to occur in Egypt [Homoptera: Coccoidea]. *Bulletin de la Société Entomologique d'Égypte*, 42, 233-251.
- Ezzat, Y.M., Hussein, N.A. (1969) Redescription and classification of the family Coccidae in U.A.R. (Homoptera: Coccoidea). *Bulletin de la Société Entomologique d'Égypte*, 51, 359-426.
- Ezzat, Y.M., Nada, S.M.A. (1987) List of Superfamily Coccoidea as known to exist in Egypt. *Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'*, 43, 85-90.
- Fernandes, I.M. (1992) Contribuição para o conhecimento de Coccoidea (Homoptera) de Portugal. I - Lista anotada de cochonilhas do jardim do Centro de Zoologia. *Garcia de Orta, Serie de Zoologia, Lisboa*, 17 (1-2), 59-63.
- Ferris, G.F. (1937) Atlas of the scale insects of North America. Palo Alto, California: Stanford University Press.
- Fetykó, K., Kozár, F. (2012) Records of *Ceroplastes* Gray 1828 in Europe, with an identification key to species in the Palaearctic Region. *Bulletin of Insectology*, 65 (2), 291-295. Available at: <https://pdfs.semanticscholar.org/4fa4/9f24a441f3a7ea888f67cd107587a3783210.pdf> [Accessed: 8 June 2018].
- Franco, J.C., Cavaco, M., Carvalho, J.P., Fernandes, J.E. (1996) Sobre a presença de *Parabemisia myricae* (Kuwana) (Homoptera; Aleyrodidae) em Portugal. *Boletín de Sanidad Vegetal, Plagas*, 22 (3), 521-536.
- Franco, J.C., Garcia-Marí, F., Ramos, A.P., Besri, M. (2006) Survey on the situation of citrus pest management in Mediterranean countries. *Bull. IOBC/WPRS* 2006, 29 (3), 335-346.

- Franco, J.C., Russo, A., Marotta, S. (2011) An annotated checklist of scale insects (Hemiptera: Coccoidea) of Portugal, including Madeira and Azores Archipelagos. *Zootaxa*, 3004, 1-32.
DOI: <http://dx.doi.org/10.11646/zootaxa.3004.1.1>
- Frank, S.D., Meineke, E.K., Dale, A.G., Youngsteadt, E., Dunn, R.R. (2013) Hot in the city: effects of urban heat on the ecology and evolution of urban forest pests. In: Mason, P. G., Gillespie, D. R., Vincent, C., eds. Proceedings of the 4th International Symposium of Biological control of Arthropods. Pucón, Chile, pp. 262.
- García-Mari, F., Rodrigo, E. (1995) Life cycle of the diaspidids (*Aonidiella aurantii*, *Lepidosaphes beckii*) and (*Parlatoria pergandii*) in an orange grove in Valencia (Spain). *Bulletin IOBC/wprs*, 18 (5), 118-125.
- García Prieto, F., Pérez Hidalgo, N., Mier Durante, M. P., Nieto Nafria, J. M. (2004) Updated check-list of Iberian-Balearic aphidini (Hemiptera, Aphididae). *Graellsia*, 60 (2), 197-214. Available at: https://www.researchgate.net/publication/258387935_Updated_check-list_of_Iberian-Balearic_Aphidini_Hemiptera_Aphididae [Accessed: 14 May 2018].
- Garrido, A. (1995) Moscas blancas en España en los cítricos: Importancia, interacción entre especies, problemática y estrategia de control. *Phytoma España*, 72, 41-47.
- Genduso, P., Liotta, G. (1976/1980) Presence of *Aleurothrixus floccosus* (Mask.) (Hom. Aleyrodidae) on citrus in Sicily. *Bollettino dell'Istituto di Entomologia Agraria e dell'Osservatorio di Fitopatologia di Palermo*, 10, 205-211.
- Gerson, U., Zor, Y. (1973) The armoured scale insects (Homoptera: Diaspididae) of avocado trees in Israel. *Journal of Natural History*, 7, 513-533.
- Ghosh, A.K., Mier Durante, M.P., Nieto Nafria, J.M. (1994) Distribution of aphidfauna (Homoptera: Aphididae) in the North of Orocantabrian phytogeographic Province, Spain. *Boletín de la Asociación Española de la Entomología*, 18 (3-4), 81-91.
- Gorsane, F., Ben Halima, A., Ben Khalifa, M., Bel-Kadhi, M.S., Fakhfakh, H. (2011) Molecular characterization of *Bemisia tabaci* populations in Tunisia: genetic structure and evidence for multiple acquisition of secondary symbionts. *Environmental Entomology*, 40 (4), 809-817.
DOI: 10.1603/EN10162
- Gotlin Čuljak, T., Grubišić, D., Mešić, A., Juran, I. (2012) List of aphids (Homoptera: aphidoidea) and their host plants in Croatia. *Natura Croatica*, 21 (1), 191-221. Available at: https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=123974 [Accessed: 28 April 2018].
- Gómez-Menor Ortega, J. (1937) *Cóccidos de España*. Madrid: Instituto de Investigaciones Agronómicas, Estación.
- Gómez-Menor Ortega, J. (1948) Adiciones a los "Cóccidos de España" (2a nota). *EOS*, 24, 73-121.
- Gómez-Menor Ortega, J. (1958) Cochinillas que atacan a los frutales (Homoptera, Coccoidea: II. Familias Lecanidae y Margarodidae). *Boletín de Patología Vegetal y Entomología Agrícola*, 23, 43-173.
- Gómez-Menor Ortega, J. (1960) Adiciones a los "Cóccidos de España". V. (Superfamilia Coccoidea). *EOS*, 36, 157-204.
- Gómez-Menor Ortega, J. (1965) Adiciones a los "Cóccidos de España", (6a nota). Especies del genero *Evallaspis* con su distribución geográfica en la Península a las Islas Baleares. *EOS*, 41, 87-114.
- Görür, G. H., Akyildirim, G.O., Akyurek, B. (2012) The aphid fauna of Turkey: An updated checklist. *Archives of Biological Science Belgrade, Belgrade*, 64 (2), 675-692.
DOI: <http://dx.doi.org/10.2298/ABS1202675G>
- Grant Morse, J., Luck, R.F., Gumpf, D.J. (1996) A summary of citrus pest problems in the Near East. In: *Citrus Pest Problems and Their Control in the Near East*. FAO Plant Production and Protection Paper no. 135. Rome, Italy: Food and Agriculture Organization of the United Nations, 1996, pp. 309-349.
- Gugić, J., Cukrov, L. (2011) Status overview and prospects of citrus growing in Croatia. *Pomologia Croatica*, 17 (3-4), 115-133. Available at: https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=117250 [Accessed: 23 December 2019].
- Guirao, P., Beitia, F., Cenis, J. L. (1997) Biotypic determination of Spanish populations of *Bemisia tabaci* (Hemiptera: Aleyrodidae). *Bulletin of Entomological Research*, 87 (6), 587-593. DOI: <http://dx.doi.org/10.1017/S0007485300038682>
- Gullan, P. J., Martin, J. H. (2003) Sternorrhyncha (Jumping Plant Lice, Whiteflies, Aphids and Scale Insects). In: Resh, V. H., Cardf, R.T., eds. *Encyclopedia of Insects*. San Diego, California: Academic Press, pp. 1079-1089. Available at: https://books.google.hr/oks?id=lp57QSMCRk4C&printsec=frontcover&hl=hr&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false [Accessed: 17 September 2018].
- Halima-Kamel, M.B.B., Hamouda, M.H.B. (1993) Aphids from protected crops and their enemies in Tunisia. *Tropicultura*, 11 (2), 50-53.
- Hall, W.J. (1922) Observations on the Coccidae of Egypt. *Bulletin, Ministry of Agriculture, Egypt, Technical and Scientific Service*, 22, 1-54.
- Hall, W.J. (1924) The insect pests of citrus trees in Egypt. *Bulletin, Ministry of Agriculture, Egypt, Technical and Scientific Service*, 45, 1-29.
- Halperin, J., Hodkinson, I. D., Russell, L. M., Berlinger, M. J. (1982) A contribution to the knowledge of the psyllids of Israel (Homoptera: Psylloidea). *Israel Journal of Entomology*, 16, 27-44.
- Hermoso De Mendoza, A., Fuertes, C., Serra, J. (1986) Relative proportions and flight graphs of citrus aphids (Homoptera, Aphidinea) in Spain. *Investigacion Agraria, Produccion y Proteccion Vegetales*, 1 (3), 393-408.
- Hermoso De Mendoza, A., Alvarez, A., Michelena, J.M., Gonzales, P., Cambra, M. (2008) Spread, biology and natural enemies of *Toxoptera citricida* (Kirkaldy) (Hemiptera, Aphididae) in Spain. *Boletín de Sanidad Vegetal - Plagas*, 34 (1), 77-87.
- Hodgson, C.J. (1994) The scale insect family Coccidae: an identification manual to genera. Oxon, UK: CAB International Wallingford.
- Hodgson, C.J., Peronti, A.L.B.G. (2012) A revision of the wax scale insects (Hemiptera: Sternorrhyncha: Coccoidea: Ceroplastinae) of the Afrotropical Region. *Zootaxa*, 3372 (1), 1-265.
DOI: <http://dx.doi.org/10.11646/zootaxa.3372.1.1>
- Hodkinson, I. D., Hollis, D. (1981) The psyllids (Homoptera: Psylloidea) of Mallorca. *Entomologica Scandinavica*, 12 (1), 65-77.
- Hrnčić, S., Radonjić, S., Preović, T., Žanić, K., Škaljac, M. (2012) The current status of the tobacco whitefly *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) in Montenegro. In: Proceedings of the International Symposium on current trends in plant protection, Belgrade, 25-28 September 2012, pp. 489-495.
- Ilharco, F.A., Sousa-Silva, C.R., Alvarez, A. (2005) First report on *Toxoptera citricida* (Kirkaldy) in Spain and continental Portugal (Homoptera, Aphidoidea). *Agronomia Lusitana*, 51 (1), 19-21.
- Ippolito, R., Laccione, G. (1987) Distribution and parastoids of *Aleurothrixus floccosus* Mask. and *Dialeurodes citri* Ashm. (Hom. Aleyrodidae) on citrus in Apulia. *Entomologica*, 22, 157-164.

- Jarraya, A. (1970) Phytosanitary state of Tunisian citrus and control of the main pests. *Al Awamia*, 37, 85-89.
- Katsoyannos, P., Kontodimas, D.C., Stathas, G.J., Tsartsalis, C.T. (1997) Establishment of *Harmonia axyridis* on citrus and some data on its phenology in Greece. *Phytoparasitica*, 25 (3), 183-191.
- Kavallieratos, N.G., Tomanovic, Z., Sarlis, G.P., Vayias, B.J., Zikic, V., Emmanouel, N.E. (2007) Aphids (Hemiptera: Aphidoidea) on cultivated and self-sown plants in Greece. *Biologia*, 62 (3), 335-344. DOI: <http://dx.doi.org/10.2478/s11756-007-0056-x>
- Kaydan, M.B., Ülgentürk, S., Erkilic, L. (2007) Checklist of Turkish Coccoidea species (Hemiptera). *Yüzüncü Yil Üniversitesi Ziraat Fakültesi, Tarım Bilimleri Dergisi*, 17 (2), 89-106.
- Kaydan, M. B., Ülgentürk, S., Erkilic, L. (2013) Checklist of Turkish Coccoidea (Hemiptera: Sternorrhyncha) species. *Türk. entomol. bült.*, 3 (4), 157-182. Available at: https://www.researchgate.net/publication/263506920-Checklist_of_Turkish_Coccoidea_Hemiptera_Sternorrhyncha_species [Accessed: 15 July 2018].
- Kos, K., Tomanović, Ž., Petrović-Obradović, O., Laznik, Ž., Vidrih, M., Trdan, S. (2008) Aphids (Aphididae) and their parasitoids in selected vegetable ecosystems in Slovenia. *Acta agriculturae Slovenica*, 91 (1), 15-22. DOI: <http://dx.doi.org/10.2478/v10014-008-0002-9>
- Kos, K., Trdan, S., Petrović, A., Starý, P., Kavallieratos, N.G., Petrović-Obradović, O., Tomanović, Ž. (2012) Aphidiinae (Hymenoptera, Braconidae, Aphidiinae) from Slovenia, with description of a new *Aphidius* species. *Zootaxa*, 3456 (1), 36-50. DOI: <http://dx.doi.org/10.11646/zootaxa.3456.1.2>
- Kozár, F., Tranfaglia, A., Pellizzari, G. (1984) New records on the scale insect fauna of Italy (Homoptera: Coccoidea). *Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'*, 41, 3-9.
- Kozár, F., Paloukis, S., Papadopoulos, N. (1991) New scale insects (Homoptera: Coccoidea) in the Greek entomofauna. *Entomologia Hellenica*, 9, 63-68. DOI: <http://dx.doi.org/10.12681/eh.13991>
- Lin, Y., Kondo, P., Gullan, T. P., Cook, L.G. (2013) Delimiting genera of scale insects: molecular and morphological evidence for synonymising *Taiwansaissetia* Tao, Wong and Chang with *Coccus* Linnaeus (Hemiptera: Coccoidea: Coccidae). *Systematic Entomology*, 38 (2), 249-264. DOI: <http://dx.doi.org/10.1111/j.1365-3113.2012.00664.x>
- Liotta, G., Manzella, S. (1993) Courtship and mating behaviour in *Aphelinus chaonia* Walker (Hym.: Aphelinidae), an important parasitoid of *Toxoptera aurantii* (B.D.F.) (Hom.: Aphididae). Preliminary note. *Bulletin OILB/SROP*, 16 (7), 26-29.
- Llorens Climent, J.M. (2009) Relación de nuevas plagas de cultivos encontradas en España en los últimos diez años. *Phytoma España*, 212, 50-55.
- Longo, S., Marotta, S., Pellizzari, G., Russo, A., Tranfaglia, A. (1995) An annotated list of the scale insects (Homoptera: Coccoidea) of Italy. *Israel Journal of Entomology*, 29, 113-130.
- Longo, S., Mazzeo, V., Palmeri, D., Benfatto, D., Maurello, S., Di Leo, A. (2001) New remarks on the distribution and biology of *Aonidiella citrina* (Coquillet) (Hemiptera: Coccoidea) in Italy. *Bollettino di Zoologia Agraria e di Bachicoltura*, 33 (3), 508-509.
- Lykouressis, D.P., Tsitsipis, J.A. (1987) Present status of aphids in Greece with emphasis on cereal aphids. In: *Aphid migration and forecasting 'Euraphid' systems in European Community countries*. Luxembourg: Commission of the European Communities, EUR 10046 EN-FR, pp. 21-34.
- Mahfoudhi, N., Dhouibi, M.H. (2009) Survey of mealybugs (Hemiptera: Pseudococcidae) and their natural enemies in Tunisian vineyards. *African Entomology*, 17 (2), 154-160. DOI: <http://dx.doi.org/10.4001/003.017.0205>
- Mansour, R., Mkaouar, R., Grissa Lebdi, K., Suma, P., Russo, A. (2011) A survey of scale insects (Hemiptera: Coccoidea) occurring on olives in Tunisia. *Journal of Entomological and Acarological Research*, 43 (3), 315-322. DOI: <http://dx.doi.org/10.4081/jeur.2011.315>
- Marotta, S. (1987) I Coccidi (Homoptera: Coccoidea: Coccidae) segnalati in Italia, con riferimenti bibliografici sulla tassonomia, geonomia, biologia e piante ospiti. *Bollettino del Laboratorio di Entomologia Agr Filippo Silvestri*, 44, 97-119.
- Martin-Mateo, M.P. (1983) Inventario preliminar de los cóccidos de España. I. Diaspididae. *Graellsia. Revista de Entomólogos Ibéricos*, 39, 47-71.
- Martin-Mateo, M.P. (1985) Inventario preliminar de los cóccidos de España. III. Pseudococcidae, Orthezidae y Margarodidae. *Graellsia. Revista de Entomólogos Ibéricos*, 41, 89-104.
- Martin, J. H., Mound, L. A. (2007): An annotated check list of the world's whiteflies (Insecta: Hemiptera: Aleyrodidae). *Zootaxa*, 1492 (1): 1-84. DOI: <http://dx.doi.org/10.11646/zootaxa.1492.1.1>
- Masten Milek, T. (2007) Fauna of scale insects (Insecta: Coccoidea) in the Republic of Croatia. Doctoral dissertation. Osijek: University in Osijek.
- Matošević, D., Pajač Živković, I. (2013) Alien phytophagous insect and mite species on Woody plants in Croatia. *Forestry bulletin*, 137 (3-4), 191-205. Available at: <https://hrcak.srce.hr/101870> [Accessed: 7 May 2018].
- Melia, A. (1993) Population development of *Toxoptera aurantii* (Boyer de Fonscolombe) (Homoptera: Aphididae) in the last fifteen years and their relation to the appearance of *Lysiphlebus testaceipes* (Cresson) (Hymenoptera: Aphidiidae). *Boletín de Sanidad Vegetal, Plagas*, 19 (4), 609-617.
- Melia, A. (1995) Muestreo de poblaciones y actividad de vuelo de *Aphis frangulae gossypii* Glover (Homoptera, Aphididae) y otros pulgones sobre cítricos en Castellon. *Boletín de Sanidad Vegetal, Plagas*, 21 (4), 601-610.
- Mendel, Z., Blumberg, D. (1991) Colonization trials with *Cryptochetum iceryae* and *Rodolia iceryae* for improved biological control of *Icerya purchasi* in Israel. *Biological Control*, 1 (1), 68-74. DOI: [http://dx.doi.org/10.1016/1049-9644\(91\)90104-8](http://dx.doi.org/10.1016/1049-9644(91)90104-8)
- Michalopoulos, G. (1989) First records of the bayberry whitefly, *Parabemisia myricae* (Kuwana) in Greece. *Entomologia Hellenica*, 7, 43-45. DOI: <http://dx.doi.org/10.12681/eh.13968>
- Michelakis, S., Hamid, H.A. (1995) Integrated control methods of the citrus mealybug, *Planococcus citri* (Risso) in Crete, Greece. *Israel Journal of Entomology*, 29, 277-284. Available at: <http://www.entomology.org.il/sites/default/files/pdfs/IJE-1995.Michelakis.pdf> [Accessed: 17 September 2018].
- Mier Durante, M., Nieto Nafria, J. M. (1974) Notes on the aphid fauna (Homoptera, Aphidinea) of the Toro region (Zamora). *Anales de Instituto Nacional de Investigaciones Agrarias, Serie: Protección Vegetal*, 4, 115-129.
- Milevoj, L. (2002): The cotton aphid, *Aphis gossypii* Glover and predators on *Catalpa bignonioides* Walt. *Acta Agriculturae Slovenica*, 79 (1), 41-44.
- Miller, D.R., Davidson, J.A. (2005) *Armored Scale Insect Pests of Trees and Shrubs*. NY: Cornell Univ., Press Ithaca.
- Milonas, P.G., Kozar, F., Kontodimas, D.C.S. (2007) List of scale insects of Greece. In: *Proceedings of the XI International Symposium on Scale Insect Studies*. Oeiras, Portugal, 24-27 September 2007, pp. 143-147.
- Milonas, P.G., Kozár, F. (2008) Check list of mealybugs (Homoptera: Pseudococcidae) in Greece: three new records. *Hellenic Plant Protection Journal*, 1 (1), 35-38.

- Minelli, A., Ruffo, S., La Posta, S. (1995) Ministero dell'Ambiente e Comitato Scientifico per la Fauna d'Italia, Checklist delle Specie della Fauna Italiana 43. Homoptera Sternorrhyncha. Bologna: Edizioni Calderini.
- Mitrović, M., Petrović, A., Kavallieratos, N. G., Starý, P., Petrović-Obradović, O., Tomanović, Ž., Vorburger, C. (2013) Geographic structure with no evidence for host-associated lineages in European populations of *Lysiphlebus testaceipes*, an introduced biological control agent. *Biological Control*, 66 (3), 150-158. DOI: <http://dx.doi.org/10.1016/j.biocontrol.2013.05.007>
- Modic, Š., Urek, G. (2008) Contribution to the knowledge of the aphid fauna (Sternorrhyncha: Aphidoidea) of Slovenia. *Acta Entomologica Slovenica*, 16 (1), 87-97.
- Modic, Š., Mavrič Pleško, I., Urbančič Zemljič, M., Kozmus, P., Urek G. (2009) Monitoring and identification of aphids (Sternorrhyncha: Aphidoidea) on cultivated plants in Slovenia. In: Lectures and papers presented at the 9th slovenian conference on plant protection with international participation. Nova Gorica, 4-5 March 2009, pp. 285-292.
- Mound, L. A., Halsey, S. H. (1978) Whitefly of the world. A systematic catalogue of the Aleyrodidae (Homoptera) with host plant and natural enemy data. Chichester, UK: John Wiley and Sons.
- Nada, S.M.A. (1988-1989) Three species of Aleyrodidae new to Egypt (Aleyrodidae: Homoptera). *Bulletin de la Societe Entomologique d'Egypte*, 68, 55-59.
- Newstead, R. (1907) List of other known African species of scale pests. In: Draper, W., ed. Notes on the injurious scale insects and mealy bugs of Egypt together with other insect pests and fungi. Cairo: National Printing Department, pp. 15-16.
- Ozgun, A. F., Sekeroglu, E., Ohnesorge, B., Gocmen, H. (1989) Studies on population dynamics of *Bemisia tabaci* Genn. (Homoptera: Aleyrodidae) in Cukurova, Turkey. *Journal of Applied Entomology*, 107 (3), 217-227.
- Özer, G., Kismali, S. (2003) An investigations on the population, distribution and damage of the wooly whitefly, *Aleurothrix floccosus* (Maskell) (Homoptera: Aleyrodidae) on citrus areas in Izmir province of Turkey. *Türkiye Entomoloji Dergisi*, 27 (1), 61-72.
- Öztemiz, S., Doğanlar, M. (2015) Invasive plant pests (Insecta and Acarina) of Turkey. *Munis Entomology & Zoology*, 10 (1), 144-159.
- Pajmon, A. (1997) Maize pests. *Sodobno Kmetijstvo*, 30 (4), 163-166.
- Pellizzari, G., Vacante, V. (2007) Una nuova cocciniglia sugli agrumi in Italia: il *Chrysomphalus aonidum* (Linnaeus) (Hemiptera: Diaspididae). *Informatore Fitopatologico*, 57 (1), 45-47.
- Pellizzari, G. (2010) New Data on the Italian Scale Insect Fauna (Hemiptera, Coccoidea). *Acta Phytopathologica et Entomologica Hungarica*, 45 (1), 89-92. DOI: <http://dx.doi.org/10.1556/APhyt.45.2010.1.6>
- Pellizzari, G., Germain, J.F. (2010) Chapter 9.3 - Scales (Hemiptera, Superfamily Coccoidea). In: Roques, A., Kenis, M., Lees, D., Lopez-Vaamonde, C., Rabitsch, W., Rasplus, J-Y., Roy, D., eds. Alien terrestrial arthropods of Europe. *BioRisk*, 4, pp. 475-510. DOI: <http://dx.doi.org/10.3897/biorisk.4.45>
- Pérez-Rodríguez, J., Krüger, K., Pérez-Hedo, M., Ruíz-Rivero, O., Urbaneja, A., Tena, A. (2019) Classical biological control of the African citrus psyllid *Trioza erytraea*, a major threat to the European citrus industry. *Scientific Reports*, 9, pp. 1-11. DOI: <https://doi.org/10.1038/s41598-019-45294-w>
- Porcelli, F. (2008) First record of *Aleurocanthus spiniferus* (Homoptera: Aleyrodidae) in Apulia, Southern Italy. *Bulletin OEPP/EPPO Bulletin*, 38 (3), 518-520. DOI: <https://doi.org/10.1111/j.1365-2338.2008.01273.x>
- Psyllist (2020) Hemiptera databases. [Online] Available at: <https://www.hemiptera-databases.org/psyllist/> [Accessed 1 June 2020].
- Radonjić, S., Hrnčić, S., Malumphy, C. (2014) First record of *Aleurocanthus spiniferus* (Quaintance) (Hemiptera Aleyrodidae) in Montenegro. *Redia*, 77, 141-145. Available at: <https://journals-crea.4science.it/index.php/redia/article/view/1038> [Accessed: 23 May 2018].
- Rapisarda, C., Patti, I. (1983) Stato Attuale delle Conoscenze sulla Composizione dell'Aleirofauna Siciliana. In: Estratto dagli Atti XIII Congresso Nazionale Italiano di Entomologia, 1983, Università di Torino, pp. 327-332.
- Rapisarda, C., Siscaro, G., Leocata, S., Asero, C. (1990) Una nuova mosca bianca negli agrumeti Italiani. *Terra et vita*, 31 (41), 30-31.
- Reuther, W., Calavan, E. C., Carman, G.E., eds. (1989) The Citrus Industry, Volume 5. Oakland, CA: University of California, Division of Agriculture and Natural Resources.
- Rodrigues, P., Ilharco, F. A., Borges Da Silva, E., Franco, J.C. (2006) Interactions between ground cover management, hedges and aphids in lemon orchards. *Integrated Control in Citrus Fruit Crops*, IOBC wprs Bulletin, 29 (3), 117-125.
- Roll, U., Dayan, T., Simberloff, D. (2007) Non-indigenous insect species in Israel and adjacent areas. *Biological Invasions*, 9, 629-643. DOI: <http://dx.doi.org/10.1007/s10530-006-9064-y>
- Rosen, D., Harpaz, I., Samish, M. (1971) Two species of *Saissetia* (Homoptera: Coccidae) injurious to olive in Israel and their natural enemies. *Israel Journal of Entomology*, 6, 35-53.
- Rosen, D., Debach, P. (1978) Diaspididae. In: Clausen, C.P., ed. Introduced Parasites and Predators of Arthropod Pests and Weeds: a World Review. Washington, D.C.: Agricultural Research Service, United States Department of Agriculture, pp. 78-128.
- Rosen D., Debach P. (1979) Species of Aphytis of the world (Hymenoptera: Aphelinidae). The Hague: Israel Univ. Press, Jerusalem and W. Junk.
- Scale Net (2020) Scale Insects Database. [Online] Available at: <http://scalenet.info/> [Accessed 8 June 2020].
- Seljak, G. (2008) Scale insects introduced into Slovenia in the last fifty years. In: Proceedings of the XI International Symposium on Scale Insect Studies, Oeiras, Portugal, 24-27 September 2007, pp. 121-127.
- Seljak, G. (2010) A checklist of scale insects of Slovenia. *Entomologia Hellenica*, 19, 99-113. DOI: <http://dx.doi.org/10.12681/eh.11577>
- Seljak, G. (2013) The dynamics of introduction of alien phytophagous insects and mites into Slovenia. *Acta entomologica Slovenica*, 21 (2), 85-122.
- Semeada, A.M., Ismail, I.I., Abdel-Salam, S.A. (2004) Host range and population density of *Aphis fabae* Scop. in Sinai Governorates, Egypt. Aphids in a new millennium. In: Proceedings of the Sixth International Symposium on Aphids, Rennes, France, September 2001, pp. 171-175.
- Stathas, G.J. (2004) First record of the scale *Parthenolecanium persicae* on *Viburnum tinus* and *Vitis vinifera* in Greece. *Annals of the Benaki Phytopathological Institute*, 20 (1), 57-59.
- Statistical Yearbook of the Republic of Croatia (2018) Croatian Bureau of Statistics. [Online] Available at: https://www.dzs.hr/Hrv_Eng/ljetopis/2018/sljh2018.pdf [Accessed 10 September 2019].

- Swirski, E., Amitai, S. (1999) Annotated list of aphids (Aphidoidea) in Israel. *Israel Journal of Entomology*, 33, 1-120.
- Swirski, E., Izhar, Y., Wysoki, M. (1991) Appearance of *Aphis gossypii* Glover and *Aphis spiraecola* Patch (Rhynchota: Aphidoidea) on avocado, persimmon and macadamia. *Alon Hanotea*, 45 (5), 413-416.
- Šimala, M. (2008) Fauna of whiteflies (Insecta: Hemiptera: Aleyrodidae) in the Republic of Croatia with special review to species *Bemisia tabaci* (Gennadius, 1889). Doctoral dissertation. Osijek: University in Osijek.
- Šimala, M., Masten Milek T. (2013) First record of the orange spiny whitefly, *Aleurocanthus spiniferus* (Quaintance, 1903) (Hemiptera: Aleyrodidae), in Croatia. *Plant protection bulletin*, 13 (6), 425-433. Available at: https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=253146 [Accessed 7 October 2018].
- Šimala, M., Pintar, M., Milek, T. M., Markotić, V. (2016) First finding of the whitefly *Parabemisia myricae* (Kuwana 1927) (Hemiptera: Aleyrodidae) in Croatia. *Plant protection bulletin*, 16 (3), 307-317. Available at: https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=251275 [Accessed 7 October 2018].
- Šimala, M., Pintar, M., Milek, T. M., Markotić, V., Kajić, Z., Kotlar, A., Paladin, I. (2019) Orange spiny whitefly – Dangeorus invasive pest. *Plant protection bulletin*, 19 (3), 640-648. Available at: https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=344434 [Accessed 8 February 2020].
- Tena, A., Garcia-Mari, F. (2008) Suitability of citricola scale *Coccus pseudomagnoliarum* (Hemiptera: Coccidae) as host of *Metaphycus helvolus* (Hymenoptera: Encyrtidae): Influence of host size and encapsulation. *Biological Control*, 46 (3), 341-347. DOI: <http://dx.doi.org/10.1016/j.biocontrol.2008.05.001>
- Tizado, E.J., Nunez Perez, E. (1998) Fruit tree aphids (Aphididae) and their wild host plants in the Province of Leon (Spain). In: Nieto Nafria, J.M., Dixon, A.F.G., eds. *Aphids in natural and managed ecosystems*. Leon: Universidad de Leon (Secretariado de Publicaciones), pp. 629-633.
- Tsai, J.H. (1999) Biology and control of brown citrus aphid (*Toxoptera citricida*) and citrus tristeza virus in Florida. In: Sivapragasam, A. et al., eds. *Proceedings of the 5th International Conference on Plant Protection in the Tropics*. Kuala Lumpur, Malaysia, 15-18 March, pp. 383-386.
- Tsitsipis, J.A., Katis, N.I., Margaritopoulos, J.T., Lykouressis, D.P., Avgelis, A.D., Gargalianou, I., Zarpas, K.D., Perdakis, D.C.H., Papanayotou, A. (2007) A contribution to the aphid fauna of Greece. *Bulletin of Insectology*, 60 (1), 31-38. Available at: <http://www.bulletinofinsectology.org/pdfarticles/vol60-2007-031-038tsitsipis.pdf> [Accessed 24 May 2018].
- Tumminelli, R., Maltese, U., Pedrotti, C. (2006): New parasites invade citrus fruit. (Nuovi parassiti insidiano gli agrumi). *Informatore Agrario*, 62 (3), 61-63.
- UK, CAB International (1961) *Toxoptera aurantii*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International. Map 131.
- UK, CAB International (1963) *Aphis fabae*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International. Map 174.
- UK, CAB International (1968) *Aphis gossypii*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International, Map 18 (Revised).
- UK, CAB International (1969) *Aphis spiraecola*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International, Map 256.
- UK, CAB International (1971) *Icerya purchasi*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International. Map 51 (Revised).
- UK, CAB International (1971) *Rhopalosiphum maidis*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International. Map 67 (Revised).
- UK, CAB International (1979) *Myzus persicae*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International. Map 45 (Revised).
- UK, CAB International (1983) *Aphis craccivora*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International. Map 99 (Revised).
- UK, CAB International (1984) *Maccosiphum euphorbiae*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International. Map 44 (Revised).
- UK, CAB International (1985) *Aulacorthum solani*. In: *Distribution Maps of Plant Pests*. Wallingford, UK: CAB International, Map 86 (Revised).
- Uygun, N., Sekeroglu, E., Karaca, I. (1987) Studies on integrated control in a newly established citrus orchard in Cukurova. In: *Proceedings of the second Turkish National Congress of Entomology*, Izmir, 13-16 October 1987, pp. 459-469.
- Uygun, N., Ohnesorge, B., Ulusoy, R. (1990) Two species of whiteflies on citrus in eastern Mediterranean: *Parabemisia myricae* (Kuwana) and *Dialeurodes citri* (Ashmead). *Journal of Applied Entomology*, 110 (4), 471-482. DOI: <https://doi.org/10.1111/j.1439-0418.1990.tb00147.x>
- Uygun, N., Sengonca, C., Erkilic, L., Schade, M. (1998) The Coccoidea fauna and their host plants in cultivated and non-cultivated areas in the East Mediterranean region of Turkey. *Acta Phytopathologica Academiae Scientiarum Hungaricae*, 33 (1-2), 183-191.
- Velimirović, V. (1985) Scale bugs (Coccoidea) on citrus trees in the southern part of Montenegro [Yugoslavia] with a special consideration of *Coccus pseudomagnoliarum* Kuwana, 1914. Doctoral dissertation. Zagreb: University in Zagreb.
- Viggiani, G. (1970) Les cochenilles des agrumes en Italie et les problèmes se rapportant aux moyens de les combattre. *Al Awamia*, 37, 47-55. Available at: <https://www.inra.org.ma/sites/default/files/03705.pdf> [Accessed 12 June 2018].
- Weigand, S., Bishara, S.I. (1991) Status of insect pests of faba bean in the Mediterranean region and methods of control. In: Cubero, J.I., Saxena, M.C., eds. *Present status and future prospects of faba bean production and improvement in the Mediterranean countries*. Zaragoza, 27-29 June 1989, pp. 67-74.
- Žanić, K., Kačić, S., Katalinić, M. (2000) Harmful species from family Aleyrodidae (Homoptera) on citrus. *Agriculturae Conspectus Scientificus*, 65 (1), 51-59. Available at: https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=19273 [Accessed 22 November 2018].
- Žanić, K., Ostojić, I., Kohnić, A. (2007) Woolly whitefly – *Aleurothrix floccosus* (Maskell), new pest of citrus in Croatia. In: *Proceedings of the 4th symposium on plant protection in Bosnia and Hercegovina*, Teslić, 11-13 December 2007, pp. 58-59.
- Žanić, K., Škaljac, M., Vitanović, E., Katalinić, M. (2012) Woolly whitefly, *Aleurothrix floccosus* (Maskell) – The newer pest of citrus in Croatia. *Plant protection bulletin*, 12 (5), 399-404. Available at: https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=253103 [Accessed 22 November 2018].
- Žikić, V., Ilić-Milošević, M., Stanković, S., Petrović, A., Petrović-Obradović, O., Kavallieratos, N., Starý, P., Tomanović, Ž. (2012) Aphidiinae (Hymenoptera: Braconidae) of Serbia and Montenegro – tritrophic interactions. *Acta entomologica Serbica*, 17 (1/2), 83-105. Available at: http://aes.bio.bg.ac.rs/index.php/aes/article/view/71/pdf_36 [Accessed 2 June 2018].