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APHID SPECIES (HEMIPTERA: APHIDIDAE) REPORTED FOR THE FIRST TIME IN TUCUMÁN, ARGENTINA

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Abstract

Aphids (Hemiptera: Aphididae) are considered among the most important pests all around the world. The total number of aphid species recorded in Argentina between 2003 and 2013 has risen from 200 to 237, which demonstrates the continuous introduction and discovery of new species in the territory. Therefore, faunistic studies should be conducted without interruption in areas of interest. The aim of this study was to establish if there were aphid species in Tucuman Province, Argentina that had not been recorded previously in the province. Aphids were collected with modified Moericke yellow water pan traps in potato crops during 2 seasons in 3 regions of Tucumán. Seventeen species, among the 47 species identified, and the genus *Illinoia* represent new records for the Province.

Key Words: aphids, diversity, new records, potato crop

Resumen

Los pulgones se incluyen entre las plagas más importantes del mundo entero. El número total de especies de áfidos registrados en Argentina entre 2003 y 2013 se incrementó de 200 hasta 237, lo que demuestra la permanente introducción y hallazgo de nuevas especies en el territorio. Por lo tanto, son necesarios constantes estudios faunísticos en las áreas de interés. El objetivo de este estudio fue determinar si existían especies de áfidos en Tucumán, Argentina, que no habían sido citadas anteriormente en la provincia. Los pulgones se recolectaron con trampas amarillas de agua tipo *Moericke* durante dos temporadas de cultivo de papa, en tres regiones de Tucumán. Entre las 47 especies identificadas, 17 y el género *Illinoia*, representaron nuevas citas para la provincia.

Palabras Clave: pulgones, diversidad, primer registro, cultivo de papa

Aphids are plant-sucking insects that can produce direct damage by feeding on sap and decreasing plant performance or indirect damage by transmitting viruses that affect several crops. The known world fauna of aphids (Aphidinea) recently reached a total of 5,000 species, of which 250 feed on agricultural and horticultural crops throughout the world (Blackman & Eastop 2000).

There have been 336 species of aphids recorded in South America (Ortego pers. comm. 2014) of which 237 are present in Argentina (Nieto Nafría et al. 1994; Ortego et al. 2004; Ortego et al. 2006; Mier Durante et al. 2011; Mier Durante et al. 2012; Ortego et al. 2014). In Tucumán province, located in northwestern Argentina, 64 different species associated with several crops and ornamental plants have been cited (Ovruski de Martínez & Delfino 1990; Nieto Nafría et al. 1994; Ovruski de Martínez et al. 1997). According to Taylor (cited by Cermeli 1987), the species involved in an agro-ecosystem and their densities are highly variable among seasons and locations. For this reason, the aim of this work was to establish if there were aphid species in Tucuman, Argentina, that have not been previously recorded in the Province.

Materials and Methods

Aphid sampling were conducted in potato crops, during the 2010 to 2012 seasons, in 3agro-

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logical regions of Tucumánprovince that have different geographical and climatic characteristics (Alto Verde: S 27°21' -W 65°40' O; Tafí del Valle: S 26º 54' -W 65°45'; Las Talitas: S 26°48'-W 65° 12').

Every week winged forms of aphids were collected with modified *Moericke* yellow water pan traps (Moericke 1955). Each pan was made of plastic and was slightly smaller (53 × 35 × 11 cm) than the original. Specimens were preserved in 70% ethanol until identification. Several keys were used to identify the species: Remaudière & Seco Fernandez (1990); Blackman & Eastop (2000) and Taylor & Robert (1984), although sometimes only the genera could be determined. The Remaudière, Stroyan & Quednau extended classification (from Nieto Nafría & Colin 2011) is used in this work.

Literature was consulted to determine which of the species collected were cited previously in Argentina and Tucumán Province (Nieto Nafría et al. 1994; Ortego et al. 2004; Ortego et al. 2006; Ovruski de Martínez et al. 1997; Mier Durante et al. 2011; Mier Durante et al. 2012; Ortego et al. 2014). A table was prepared taking into account the following information for each species: Family, subfamily, tribe, valid name, name of author and first report in Argentina. Voucher specimens were slide mounted and deposited in the EEAOC collection.

Results

Forty-seven species among 56 taxa were identified in this work. All of them had already been cited in Argentina in the past, but 17 of them and the genus *Illinoia* are mentioned for the first time in Tucumán province. All species belonged to the Aphididae family and within it to 4 subfamilies. Aphidinae was the subfamily with the most species, 10 of which belong to the Macrosiphini tribe (Table 1). An annotated list of the species recorded for the first time in Tucumán is given below.

Capitophorus hippophaes (Walker)

Aphidinae: Macrosiphini

This species is recognized among other members of this genus to present swollen siphunculi. In the spring apterae colonize Elaeagnaceae (*Elaeagnus* spp., *Hippophae* spp.). They are pale green, slender, with a faint pattern of green spots. Fundatrices are very different; broadly oval, greenish with reddish spots, and their antennae are dark, 5-segmented and have a short processus terminalis. Alatae, produced in the second and third generations, are grayish-green with a black head and thorax, dark antennae, legs and siphunculi and a large quadrate dark green patch on the dorsal abdomen; they migrate to various *Polygonum* and *Persicaria* spp. (Hille Ris Lambers 1953). Able to transmit *Potato virus Y* (PVY) (Van Hoof 1980). Occurs in Europe, North Africa, South-West Asia, and America (USA, Canada, Colombia, Cuba, Mexico, Brazil, Bolivia). In South America, is found in Chile and Argentina (Ortego et al. 2004). In Argentina has been cited in Santa Fe (Ortego et al. 2002), Buenos Aires, Mendoza and Misiones (Ortego et al. 2010).

Chaitophorus leucomelas Koch

Chaitophorinae: Chaitophorini

Apterae are rather elongate oval, pale green or yellow, typically with black or dark green longitudinal pleural stripes that may be segmentally divided, and dark siphunculi. Alatae have dark brown dorsal abdominal cross-bands and separate marginal sclerites. Males can be winged or wingless. The cauda is less pigmented than siphunculi. On young shoots of *Populus* spp. in spring, and later under leaves; always ant-attended. Common and widely distributed in Europe, Asia, South Africa, North and South America (Chile, Muñoz & Beéche 1995 and Argentina). In Argentina was cited in Mendoza (Ortego et al. 1999), Río Negro and Neuquén (Delfino 2002).

Cryptomyzus (*Cryptomyzus*) *ballotae* Hille Ris Lambers

Aphidinae: Macrosiphini

On *Ballota nigra*, *Lamium album*, *Leonurus* sp., *Marrubium vulgare* and *Melittis melissophyllum*. In Europe, and possibly Pakistan, where it may be heteroecious holocyclic with a sexual phase on *Ribes orientale*. Probably anholocyclic in Europe, although oviparae and alate males have been obtained in the laboratory. Able to transmit *Potato virus Y*(PVY). Mentioned for the first time in Argentina in 1991 in Mendoza (Ortego 1991) on *Marrubium vulgare* and *Lamium amplexicaule* and in Chile (Ortego 1998a).

Dysaphis (*Pomaphis*) *aucupariae* (Buckton)

Aphidinae: Macrosiphini

Spring generations live on *Sorbus torminalis.* Migration occurs in the third and subsequent generations to *Plantago* spp., especially *P. lanceolata*, where it colonizes the undersides of leaves, in grooves between veins, attended by ants. In Europe, also populations are found on *Plantago* in Australia (Carver & Hales 1983), New Zealand (Sunde 1984) and Argentina (Ortego 1998a), and alatae have also been trapped in Washington, USA (BMNH collection; leg. S. H. Halbert).

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TABLE 1. APHID SPECIES OF THE FAMILY APHIDIDAE NOT PREVIOUSLY RECORDED IN TUCUMÁN PROVINCE, ARGENTINA. THESE SPECIES ALSO OCCUR ELSEWHERE IN ARGENTINA.

Subfamily	Tribe	Species	First report in Argentina
Chaitophorinae	Chaitophorini	*Chaitophorus leucomelas* Koch	Ortego et al. 1999
	Siphini	*Sipha maydis* Passerini	Delfino 2002; Ortego & Difabio 2002
Calaphidinae	Panaphidini	*Takecallis arundinariae* (Essig)	Delfino 2001
		Takecallis taiwanus (Takahashi)	Delfino 2001
		Therioaphis riehmi (Börner)	Ortego 2000
		Tuberculatus annulatus (Hartig)	Blanchard 1926
		Tuberculatus querceus (Kaltenbach)	Smith & Cermeli 1979
Saltusaphidinae		*Saltusaphis scirpus* Theobald	Ortego et al. 2006
Aphidinae	Macrosiphini	*Capitophorus hippophaes* (Walker)	Ortego 1991
		Cryptomyzus ballotae Hille Lis Lambers	Ortego 1991
		Dysaphis aucupariae (Buckton)	Ortego 1998a
		Eucarazzia elegans (Ferrari)	Ortego 1994
		Hyadaphis foeniculi (Passerini)	Blanchard 1935
		Illinoia sp.Wilson	Ortego et al. 2004
		Macrosiphoniella artemisiae (Boyer de Fonscolombe)	Nieto Nafría et al. 1994
		Macrosiphoniella tapuskae (Hottes & Frison)	Ortego et al. 2006
		Pleotrichophorus glandulosus (Kaltenbach)	Ortego 1991
		Rhopalomyzus poae (Gillette)	Ortego 1998b

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EUCARAZZIA ELEGANS (FERRARI)

Aphidinae: Macrosiphini

Rather small, broadly oval, green aphids feeding on the undersides of leaves, shoots or flowers of *Mentha* spp. and various other Labiatae. The alatae of *E. elegans* are easily identifiable by observing the siphunculi, which have a dark swollen extremity and a pale cylindrical base, and their wings, which have dark triangular spots at the ends of all the veins. In the Mediterranean area, Madeira, Middle East, Central Asia, Pakistan, India, Australia, Africa, western USA and South America (Bolivia, Argentina and Brazil). In Argentina was first cited by Ortego in 1994 on *Lavandula* sp.

HYADAPHIS FOENICULI (PASSERINI)

Aphidinae: Macrosiphini

Apterae are small to medium size, predominantly grayish-green with dark antennae, legs, siphunculi and cauda; body variably dusted with fine white wax. Alatae have the abdomen green mottled with darker green and with darker patch around the base of each siphunculus. Primary host are *Lonicera* spp. and secondary hosts are numerous species of Umbelliferae. Vector of about 13 plant viruses, including *Celery mosaic potyvirus, Potato virus Y potyvirus, Celery yellow spot luteovirus,* and *Honeysuckle latentcarlavirus*. Almost cosmopolitan: Europe, Middle East, southern Africa, India, Australia, New Zealand and North and South America. In Argentina was cited in Buenos Aires, San Juan, Córdoba (Nieto Nafría et al. 1994) and Mendoza (Ortego 1998a).

ILLINOIA WILSON

Aphidinae: Macrosiphini

About 45 North American species and one from the Caucasus. *Illinoia* are pale spindle-shaped aphids with long appendages, most easily recognized by the long weakly to moderately clavate siphunculi, similar to those of *Amphorophora*, but ornamented on the distal, constricted region with a few rows of polygonal reticulation. There is no host alternation. In Argentina, the only species cited is *Illinoia* (*Illinoia*) *azaleae* (Mason), recorded for the first time on *Rhododendron* sp. in Mendoza province (Ortego et al. 2004).

MACROSIPHONIELLA (*MACROSIPHONIELLA*) *ARTEMISIAE* (BOYER DE FONSCOLOMBE)

Aphidinae: Macrosiphini

Large, green aphids with fine white wax; head, antennae, legs, siphunculi and cauda dark, without dorsal sclerotization. The siphunculi are wider at the ends than in the middle and the reticulation covers half of its length, which is similar to the cauda. Common on upper parts of *Artemisia vulgaris*, especially between inflorescences, and frequently forming large colonies. Throughout Europe, Siberia, Mongolia and China, and introduced to North and South America. In Argentina was cited in Buenos Aires, Cordoba, Santa Fe province (Nieto Nafría et al. 1994; Ortego et al. 2002) and Mendoza (Ortego 1998a).

MACROSIPHONIELLA (*MACROSIPHONIELLA*) *TAPUSKAE* (HOTTES & FRISON)

Aphidinae: Macrosiphini

Apterae are pale green, with a darker green spot on abdominal tergite 5 between the siphuncular bases. On various Anthemidae (*Achillea, Anacyclus, Anthemi, Argyranthemum, Artemisia, Chrysanthemum, Matricaria, Tanacetum*), usually feeding on lower leaves. Europe, Russia, Asia, North Africa and North America, and more recently recorded from Argentina (Ortego et al. 2006).

PLEOTRICHOPHORUS GLANDULOSUS (KALTENBACH)

Aphidinae: Macrosiphini

Apterae are yellowish white, sometimes greenish, occasionally with pale green median stripes. On undersides of lower leaves of *Artemisia vulgaris*, and sometimes on other *Artemisia* spp. In Europe and across Asia and introduced to North America. Also, was found in Mendoza, Argentinaon *A. verlotorum* and *A. absinthium* (Ortego 1991, 1998a) and Uruguay (BMNH collection, leg. V. F. Eastop).

RHOPALOMYZUS POAE (GILLETTE)

Aphidinae: Macrosiphini

Apterae are small, broadly pear-shaped, pale to dark-brown or almost black, shiny and with a bluish waxy bloom. Alatae have extensive black dorsal abdominal pigmentation. This species lives on the basal parts of grasses close to soil level and often on etiolated stems under stones. Is recorded as vector of *Barley yellow dwarf luteovirus* and *Maize dwarf mosaic potyvirus* (Blackman & Eastop 2000). Widely distributed in Europe and the USA. There are also records from Argentina (Ortego 1991), Pakistan, Bolivia and Peru.

SALTUSAPHIS SCIRPUS THEOBALD

Saltusaphidinae

Apterae are greyish yellow to greenish yellow, with dark markings tending to form longi-

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tudinal bands, the dorsum being powdered with a very thin layer of greyish white wax. Alatae have broad dark dorsal abdominal cross bars and dark-bordered wing veins with spots at their apices, and antennae with 10-21 rhinaria on III. On various Cyperaceae (*Carex, Cyperus, Scirpus*). In Europe (not UK), across Asia and Africa. Also now in Argentina, recorded in Mendoza (Ortego et al. 2006) and Córdoba (Ortego, data not published).

Sipha (*Rungsia*) *maydis* Passerini

Chaitophorinae: Siphini

Apterae are rather small, pear-shaped dorsoventrally flattened, shining dark brown to almost black on dorsal surface, which is fully sclerotized. Usually live on upper sides of leaf blades near the bases and sometimes on stems or flower heads, of grasses and cereals, often attended by ants. Alatae have a solid black patch extending over abdominal tergites 4-7, with separate dark transverse bands on tergites 1-3. Recorded only from Gramineae, in all the economically important cereal crops. Able to transmit *Cucumber mosaic cucumovirus*and *Barley yellow dwarf luteovirus* (Blackman & Eastop 2000). Present in Europe, the Mediterranean, the Middle East, Central Asia, India, Pakistan and South Africa. In North America was recently found (Sorensen 2007; Halbert et al. 2013). In Argentina was recorded in 2002 (Delfino 2002; Ortego & Difabio 2002).

Takecallis arundinariae (Essig)

Calaphidinae: Panaphidini

Alatae are whitish, pale yellow or greyish-yellow, with paired black elongate spots on abdominal tergite 1-7 and a pale cauda. An apterous morph has been described, but only from high altitudes in Taiwan. On undersides of mature leaves of bamboos (especially *Arundinaria* and *Phyllostachys*, but sometimes also *Bambusa, Dendrocalamus, Pseudosasa* and *Sasa*). In India, China, Taiwan, Korea, Japan and introduced to England, Madeira (Aguiar & Ilharco 1997), Australia (Valenzuela et al. 2010), New Zealand, North and South America (Chile and Argentina). In Argentina was cited in Cordoba (Delfino 2001), Mendoza and Buenos Aires (Ortego et al. 2004).

Takecallis taiwanus (Takahashi)

Calaphidinae: Panaphidini

Alatae are pale green with a pale cauda. On young, still unrolled leaves and on new shoots of bamboos (*Arundinaria* and *Phyllostachys*, sometimes *Bambusa, Sasa*). In China, Taiwan, Japan and introduced to Europe, South Africa, New Zealand, USA, and more recently to South America (Chile and Argentina). In Argentina was registered for the first time in 2001 (Delfino 2001) and then in Mendoza (Ortego et al. 2004).

Therioaphis (*Rhizoberlesia*) *riehmi* (Börner)

Calaphidinae: Panaphidini

Apterae do not occur; alatae are yellowish, with 2 rows of large dark dorsal spots. On undersides of leaves of *Melilotus* spp., the preferred hosts, causing yellow sectors in the leaves. There are also records from species of *Medicago, Trigonella* and *Trifolium*. In Europe, Middle East, India, China, introduced to North and South America (Blackman & Eastop 2000). In Argentina, it has been previously cited in Mendoza, San Juan and Córdoba province (Ortego 2000). Monoecious holocyclic with oviparae and alate males in September (Hille Ris Lambers & Van den Bosch 1964).

Tuberculatus (*Tuberculatus*) *querceus* (Kaltenbach)

Calaphidinae: Panaphidini

The alatae forms are dirty greenish to straw-colored, covered with fine powdery white wax, with a dark bifurcate spinal process have only one pair of large, black, spinal tubercles in the first segment of the abdomen. A dark patch near end of hind femur and dark siphunculi. There are no records of their capacity of virus transmission (Blackman &Eastop 2000). On undersides of leaves of *Quercus robur* in Europe, Iran, Turkey and the Caucasus (Heie 1982), and introduced to British Columbia, Canada (Blackman & Eastop 2000), and to South America (Argentina and Chile, Caballero et al. 2000, Nieto Nafría et al. 1994; Ortego et al. 2006).

Tuberculatus (*Tuberculoides*) *annulatus* (Hartig)

Calaphidinae: Panaphidini

Alatae (only oviparae are apterous) have 3 pairs of spinal tubercles lightly pigmented or pale on anterior abdominal segments. Yellowish, greyish-green or pink to purple in summer, with black-banded antennae, black tarsi, and dark distal two thirds or more of siphunculi. On undersides of leaves of *Quercus* spp., especially *Q. robur,* less commonly *Q. petraea*. There are no records of their capacity of virus transmission. Present in all continents (Blackman & Eastop 2000). Throughout Europe, Siberia (Pashchenko 1988b), north-west China (Qiao et al. 2005). In North America, Canada and USA and introduced on European oaks to Australia, New Zealand,

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North and South America (Chile and Argentina). In Argentina,it was found in Buenos Aires, Cordoba, Corrientes, Entre Ríos, Mendoza and Santa Fe (Nieto Nafría et al. 1994).

Discussion

Results indicate that the geographic distributions of aphid taxa are unrelentingly expanding and therefore faunistic studies should be conducted without interruption in areas of interest. This research updates previous surveys and provides new data, both in terms of locations and species diversity. As other authors have previously proposed (Remaudière et al. 1992; Nieto Nafría et al. 1994; Ortego 1998b; Ortego et al. 2002), it is necessary to intensify the aphid studies in Argentina. This study, conducted only in fields of potato, was sufficient to find 17 species and a genus that had not been previously cited in our province. Given the importance of aphids as agricultural pests and virus vectors, it is highly recommended to enhance species diversity surveys in Tucumán and other provinces of Argentina. Such taxonomic and ecological information is essential for developing strategies to manage aphid pest and aphid transmitted pathogens of various crops.

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