New Records of Aphid-Plant Associations (Hemiptera: Aphididae) from Eastern Costa Rica

Authors: Sánchez-Monge, Alcides, Retana-Salazar, Axel, Brenes, Steven, and Agüero, Renán

Source: Florida Entomologist, 93(4) : 489-492

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/024.093.0402

NEW RECORDS OF APHID-PLANT ASSOCIATIONS (HEMIPTERA: APHIDIDAE) FROM EASTERN COSTA RICA

ALCIDES SÁNCHEZ-MONGE[1], AXEL RETANA-SALAZAR[1], STEVEN BRENES[2] AND RENÁN AGÜERO[2]
[1]Programa Universitario de Biología Aplicata (PUA), Centro de Investigación en Estructuras Microscópicas, Universidad de Costa Rica

[2]Laboratorio de Arvenses, Universidad de Costa Rica

ABSTRACT

Aphids cause damage to numerous crops and ornamentals. Most of them are relatively host specific, but some species are polyphagous and feed on several different hosts. In this paper we present new records for *Aphis gossypii* Glover, *Aphis spiraecola* Patch, *Myzus ornatus* Laing, *Myzus persicae* Sulzer, *Hysteroneura setariae* Thomas and *Schizaphis rotundiventris* Signoret, on several hosts belonging to a wide variety of plant families.

Key Words: arvenses, banana crops, Costa Rica, host plants

RESUMEN

Los áfidos o pulgones causan daños a varias plantas y cultivos. La mayoría son relativamente específicos en cuanto a hospedero, pero algunas especies son polífagas y se alimentan de un espectro mayor. En este escrito se presentan nuevos reportes para *Aphis gossypii* Glover, *Aphis spiraecola* Patch, *Myzus ornatus* Laing, *Myzus persicae* Sulzer, *Hysteroneura setariae* Thomas y *Schizaphis rotundiventris* Signoret, en varias plantas hospederas de diversas familias botánicas.

Translation provided by the authors.

Aphids are well known organisms that can cause direct and indirect injuries to numerous plants and crops worldwide. According to Voegtlin et al. (2003) most species are relatively specific to host genus or to closely related host genera; however, some, such as *Myzus persicae* (Sulzer) and *Aphis gossypii* (Glover), can feed on a wider host range.

Aphids cause direct damage to plant tissues by gall formation or leaf distortion (Hermoso de Mendoza et al. 2000; Williams 2000); in addition, they excrete sugars (honeydew) that promote mold growth (Williams 2000). However, the most damaging aspect of this insect group is its role as vectors of a broad list of viruses. *Myzus persicae*, for example, has been reported as a vector of at least 100 plant viruses (Williams 2000) and *A. gossypii* is the main vector of the Citrus Tristeza Virus (CTV) in the western region of North America (Hermoso de Mendoza et al. 2000).

According to Holman (2009), the study of the host plants of aphids leads to useful information about the ecology, adaptability, and dispersal behavior of aphid species. In addition, knowing the identity of the host plant on which the aphid is found is often an important aid to the identification of the aphid species.

Holman (2009) published a catalog presenting data for 3,654 aphid species identified on 11,793 plants from 246 plant families in the Palaearctic region. For the Neotropic region, Voegtlin et al. (2003) published a guide to 60 species of winged aphids of Costa Rica with an appendix of the aphid host plants from Central America. Additionally, new records such as that on *Greenidea psidii* in Costa Rica have been reported (Pérez et al. 2009).

Many aphid species are worldwide pests of crops (Teulon & Stufkens 2002). The knowledge of their alternate, non-crop hosts is a useful tool for developing an effective pest management strategy to maintain their population below economic injury levels, which may vary throughout the year (Niño et al. 2001; Rondon et al. 2005) due to the plant species diversity in specific regions (Mackenzie et al. 1994; Satar et al. 1999).

In this paper we present records for 7 aphid species found on weeds from the eastern region of Costa Rica. Most of the records are new.

MATERIALS AND METHODS

Throughout 2008, foliar samples of several weed species were collected monthly in Limón, Costa Rica, as part of the project CONICIT FV 24-07, UCR 813-A8-506. Most of the samples were collected within banana farms where they are treated as weeds. A few samples were obtained from a pineapple farm and surrounding areas, and 1 sample from a pasture field. Three samples were collected in non-agricultural areas. Details of sampling locations are presented in Table 1.

TABLE 1. LIST AND DETAILS OF THE LOCATIONS VISITED TO COLLECT WEED SAMPLES IN 2008.

Location code	Date of sampling	Location name	Detail
1	3-IV-2008	La Teresa Banana Farm	Cariari, Limón
2	4-IV-2008	Agrícola 1 Banana Farm	Cariari, Limón
3	4-IV-2008	Junior Jiménez Paddock	Guácimo, Limón
4	7-V-2008	Agrícola 2 Banana Farm	Cariari, Limón
5	7-V-2008	Las Juntas Banana Farm	Cariari, Limón
6	8-V-2008	Roadside to Guácimo	Guácimo, Limón
7	8-V-2008	San Diego Pinneaple Farm	Guácimo, Limón
8	28-V-2008	Est. Exp. Diamantes, INTA (Paddock)	Guápiles, Limón
9	4-IX-2008	San Pablo Banana Farm	Matina, Limón
10	4-IX-2008	28 Millas, CORBANA facilities	Matina, Limón
11	9-X-2008	Calinda Banana Farm	Guácimo, Limón
12	10-X-2008	6 years Organic Banana Farm, EARTH	EARTH University, Guácimo, Limón
13	20-XI-2008	3 years Organic Banana Farm, EARTH	EARTH University, Guácimo, Limón

For the samples that were collected from weeds in banana farms, we selected 1 or 2 fields that had not been treated with herbicides for 6 to 8 weeks. Weed samples were collected in plastic bags and sealed with adhesive tape to prevent escape of captured specimens (Cermeli 2006). Host plants samples were identified *in situ* and verified at the Weed Laboratory of the University of Costa Rica by Steven Brenes. The same procedure was used at all locations sampled.

To extract the aphid specimens, each sample was placed in a container filled with boiling water. After approximately 3 min, the contents of the container were poured through a 212-mesh sieve, and the plant sample was washed twice in the container and the water was poured through the sieve.

Isolated specimens on the sieve were transferred to a Petri plate, and the aphids were stored in 70% ethanol in labeled Eppendorf tubes for further identification. The specimens were mounted on microscope slides and were identified by Nicolás Perez at the Departamento de Biodiversidad y Gestión Ambiental, Universidad de León, España.

RESULTS

Three specimens were not identified due to damage during sampling in the field. We found 7 aphid species on 22 examined plant species belonging to 15 botanical families and 27 aphid-plant associations (Table 2).

DISCUSSION

According to Voegtlin et al. (2003), most of the 27 aphid-host associations reported herein are new records.

Aphis Linnaeus, 1758
Aphis gossypii Glover, 1877

Aphis gossypii is a polyphagous species that is able to colonize a wide variety of host plants (Satar et al. 1999). It was previously recorded on the genus *Acalypha* (Al-Maicoshi et al. 1997; Voegtlin et al. 2003; Evans & Halbert 2007) and on the genus *Alternanthera* (Voegtlin et al. 2003); however, our findings on *Acalypha arvensis* and *Alternanthera sessilis* are new records at species level. Its presence on species of Asteraceae was previously reported (Delfino 2005; Delfino et al. 2007; Voegtlin et al. 2003), but within this botanical family this is the first report on *Synedrella nudiflora.* In addition, the records on *Scoparia dulcis*, *Lindernia crustacea*, *Mecardonia procumbens*, *Phenax sonneratii, Geophila macropoda, Gurania makoyana, Gouania polygama, Sida ulmifolia, Panicum polygonatum, and Cyathula prostrata* are new hosts records for *A. gossypii*; of these, *G. polygama* (Rhamnaceae), *S. dulcis, L. crustacea,* and *M. procumbens* (Scrophulariaceae) are the first species of those families recorded as hosts for this aphid species (Voegtlin et al. 2003).

Aphis spiraecola Patch, 1914

The single specimen of this species that was collected on *Conostegia subcrustulata* (Melastomataceae), represents the first record of *A. spiraecola* on this species and in the Melastomataceae family. The presence of *A. spiraecola* on *Cyathula prostrata* is a new record for this species and for the Amaranthaceae family (Voegtlin et al. 2003). *Aphis spiraecola* has previously been found on Asteraceae species (Delfino 2005; Evans & Halbert 2007; Heie et al. 1996; Voegtlin et al. 2003), but *Mikania micrantha* was not previously listed as a host.

TABLE 2. APHID SPECIES, HOST PLANT SPECIES, AND LOCATIONS FOR THE SAMPLED WEEDS IN EASTERN COSTA RICA IN 2008.

Aphid Species / Host	Host Botanical Family	Location Code[1]
APHIDIDAE		
Aphidinae		
Aphidini		
Aphidina		
Aphis gossypii		
**Acalypha arvensis* Poepp. & Endl.	Euphorbiaceae	5
Alternanthera sessilis L.	Amaranthaceae	13
**Commelina difussa* Burm.	Commelinaceae	10
Cyathula prostrata L.	Amaranthaceae	7, 12, 13
Geophila macropoda Ruiz & Pav.	Rubiaceae	12
Gouania polygama Jacq.	Rhamnaceae	12
Gurania makoyana Lemaire.	Cucurbitaceae	12
Lindernia crustacea L.	Scrophulariaceae	11
Mecardonia procumbens Mill.		
= *Bacopa procumbens*	Scrophulariaceae	5
**Panicum polygonatum* Llanos.	Poaceae	11
Phenax sonneratii Poir.	Urticaceae	6
Scoparia dulcis L.	Scrophulariaceae	12
Sida ulmifolia Mill.	Malvaceae	7, 8
Synedrella nudiflora L.	Asteraceae	7
Aphis spiraecola		
Cyathula prostrata L.	Amaranthaceae	8
Mikania micrantha Kunth ex H.B.K	Asteraceae	1
**Conostegia subcrustulata* Beurl.	Melastomataceae	3
Rhopalosiphina		
Hysteroneura setariae		
Eleusine indica L.	Poaceae	2, 4, 11, 12
Kyllinga odorata Vahl.	Cyperaceae	11
Schizaphis rotundiventris		
Kyllinga odorata Vahl.	Cyperaceae	9
APHIDIDAE		
Aphididae		
Macrosiphini		
Myzus ornatus		
Kyllinga odorata Vahl.	Cyperaceae	10
Myzus persicae		
Cissus verticillata L.	Vitaceae	13
Cyathula prostrata L.	Amaranthaceae	3, 7, 8
Drymaria cordata L.	Cariophyllaceae	8, 13
Laportea aestuans L.	Urticaceae	1
Phenax sonneratii Poir.	Urticaceae	3
Sida spinosa L.	Malvaceae	8

[1]location code details in Table 1.
*Specimens identified partially by the specialist.

Hysteroneura setariae Thomas, 1878

Hysteroneura setariae was found on *Eleusine indica* at 4 different locations. This host was reported in Nicaragua in 1985, but this is the first report for Costa Rica (Voegtlin et al. 2003). The presence of *H. setariae* on the family Cyperaceae was previously recorded (Voegtlin et al. 2003; Cermeli 1970), but our report on *Kyllinga odorata* is a first.

Schizaphis rotundiventris Signoret, 1860

Halbert et al. (2000) reported *Schizaphis rotundiventris* on *Cyperus papyrus*, *C. esculentus,*

and a species of the genus *Kyllinga* (Cyperaceae); however, this is the first record on *K. odorata*.

Myzus ornatus Laing, 1932

We found *Myzus ornatus* on *Kyllinga odorata,* which represents the first record on this host of this polyphagous species (Voegtlin et al. 2003).

Myzus persicae Sulzer, 1776

Myzus persicae is polyphagous and has been reported on more than 875 hosts (Boukhris-Bouhachem et al. 2007). All samples reported in this paper are new hosts for *M. persicae*, and according to Voegtlin et al. 2003, they would be the first report on species of their respective botanical families, except for those on Amaranthaceae (Delfino 2005) and Malvaceae (Voegtlin et al. 2003).

Acknowledgments

This research was possible by economic support of the Consejo Nacional de Investigaciones en Ciencia y Tecnología (CONICIT), Costa Rica, project FV-024-07. We thank Nicolás Perez from the Universidad de León, España for identification of aphid specimens, and we thank the Corporación Bananera Nacional (CORBANA), Costa Rica, for support during sampling visits to the banana farms. We thank Hugo Araya, Junior Jiménez, and Moisés Hernández for facilitating our sampling within the pineapple farm, on his own property, and within the INTA facilities, respectively.

References Cited

Al-Maicoshi, A. A., Aldryhim, Y. N., and Alsuhaibani, A. M. 1997. Aphids of Ornamental Plants in Riyadh City. Agr. Res. Center, King Saud Univ. Res. Bull. 65: 5-18.

Boukhris-Bouhachem, S., Souissi, R., Turpeau, E., Rouzé-Jouan, J., Fahem M., Ben Brahim, N., and Hullé, M. 2007. Aphid (Hemiptera: Aphidoidea) diversity in Tunisia in relation to seed potato production. Ann. Soc. Entomol. France (n.s.), 2007, 43(3): 311-318.

Cermeli, M. 1970. Los afidos (Homoptera, Aphididae) de Venezuela y sus plantas hospederas. Suplemento I. Agronomía Tropical 20(4): 249-256.

Cermeli, M. 2006. Diversidad y origen de la afidofauna venezolana (Hemiptera: Aphidoidea). Entomotropica 21(2): 83-89.

Delfino, M. A. 2005. Inventario de las asociaciones áfido-planta en el Perú. Ecología Aplicada 4(1,2): 143-148.

Delfino, M. A., Monelos, H. L., Peri, P. L., and Buffa, L. M. 2007. Áfidos (Hemiptera, Aphididae) de interés económico en la provincia de Santa Cruz. RIA. 36 (1): 147-154.

Evans, G. A., and Halbert, S. E. 2007. A checklist of the aphids of Honduras (Hemiptera: Aphididae). Florida Entomol. 90(3): 518-523.

Halbert, S. E., Remaudière, G., and Webb, S. 2000. Newly established and rarely collected aphids (Homoptera: Aphididae) in Florida and the Southeastern United States. Florida Entomol. 83(1): 79-91.

Heie, O. E., Pettersson, J., Fuentes-Contreras, E. D., and Niemeyer, H. M. 1996. New Records of Aphids (Hemiptera: Aphidoidea) and their hostplants from Northern Chile. Rev. Chilena Entomol. 23: 83-87.

Hermoso De Mendoza, A., Belliure, B., Carbonell, E. A., and Real, V. 2000. Determinación de los umbrales económicos de tratamiento contra *Aphis gossypii* (Hemiptera, Aphididae) en clementinos. Bol. San. Veg. Plagas. 26: 689-700.

Holman, J. 2009. Host Plant Catalog of Aphids - Palearctic Region. Springer Netherlands. 1140 pp.

Mackenzie, A., Dixon, A. and Kindmann, P. 1994. The relationship between the regional number of aphid species and plant species diversity. European J. Entomol. 91: 135-138.

Niño, L., Cermeli M., Becerra F., and Flores M. 2001. Fluctuación Poblacional de Áfidos Alados en Dos Localidades Productoras de Papa en el Estado de Mérida, Venezuela. Revista Latinoamericana de la Papa. 12: 57-71.

Pérez, N., Villalobos W., and Mier P. 2009. *Greenidea psidii* (Hemiptera: Aphididae: Greenideinae) new invasive aphid in Costa Rica. Florida Entomol. 92(2): 396-398

Rondon, S. I., Cantliffe, D. J., and Price J. 2005. Population dynamycs of the cotton aphid, *Aphis gossypii* (Homoptera: Aphididae), on strawberries grown under protected structure. Florida Entomol. 88(2): 152-158.

Satar, S., Kersting, U., and Uygun, N. 1999. Development and fecundity of *Aphis gossypii* Glover (Homoptera: Aphididae) on three Malvaceae Hosts. Trop. J. of Agriculture and Forestry 23: 637-643.

Teulon, D. A., and Stufkens, M. A. 2002. Biosecurity and aphids in New Zealand. New Zealand Plant Protection 55:12-17.

Voegtlin, D., Villalobos, W., Sánchez M. V., Saborío, G., and Rivera C. 2003. A guide to the winged aphids (Homoptera) of Costa Rica - Guía de los áfidos alados (Homoptera) de Costa Rica. Rev. Biol. Trop. 51(2): 001-214

Williams, D. 2000. Aphids as Pests of Ornamental Plants. Agriculture Notes. AG0182 ISSN 1329-8062. Department of Primary Industries, State of Victoria, Australia. 2 pp.