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Aphids (Hemiptera: Aphidoidea) of ornamental plants from São Carlos, São Paulo state, Brazil

Ana Lúcia B. G. Peronti[1] and Carlos Roberto Sousa-Silva[2]
Department of Ecology and Evolutionary Biology, Federal University of São Carlos. C. P. 676, 13565-905 São Carlos, São Paulo, Brazil. Fax: 55-16-260 83 22.
1 palg@iris.ufscar.br
2 dcrs@power.ufscar.br

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Abstract: A total of 25 aphid species were collected from 49 ornamental plant species in São Carlos - São Paulo, Brazil; 12 aphids were monophagous, four oligophagous and nine polyphagous. A total of 58 aphid-plant associations are recorded, 43 unknown from Brazil. *Eucarazzia elegans* (Ferrari, 1872) (Aphididae: Aphidinae: Macrosiphini) is recorded for the first time from Brazil, and *Nectandra megapotamica* Spreng. (Lauraceae) is recorded for the first time as host plant for *Lizerius tuberculatus* (E.E. Blanchard, 1939) (Drepanosiphidae: Drepanosiphinae: Lizeriini). We also describe the injuries caused by aphids to the ornamental plants.

Key words: Aphid diversity, aphid/plant associations, floricultural pests.

Floriculture, which consists of the cultivation of ornamental plants used for cut flowers, flowering and non-flowering potted plants, and of the production of seeds, bulbs and large trees, is an important part of the Brazilian agriculture, with annual gross sales of approximately one billion Brazilian reals (currently half a billion U.S. dollars). The state of São Paulo holds a 70% share of this market and specialists in floriculture estimate an annual growth of 20% in the next few years (Arruda *et al.* 1996).

The aphids (Aphidoidea) stand out as important pests among the insects that feed on ornamental plants (Arruda *et al.* 1996). They may cause damage to plants directly by sucking their sap, and indirectly by injecting toxic salivary secretions, transmitting pathogens, attracting ants and favoring the development of sooty-mold (Lara 1992, Zucchi *et al.* 1993). Besides the impact on the commercial value of ornamental plants, these insects may also affect urban landscapes. When infested, containerized plants may easily become disseminators of harmful insects when they are transported by people to regions or countries far from their place of origin or production.

Despite the increase of ornamental plant production in Brazil, very few studies have been made on the insects associated with plants in gardens. Among the most recent national publications, Bergmann and Alexandre (1995) and Imenes and Alexandre (1996), refer to the occurrence of pests, diseases and forms of control in roses and chrysanthemums, respectively. Favero (1996) describes the principal pests of flowers, ornamental foliage and orchids and how to control them and Imenes and Bergmann (2000) characterize the principal pests of ornamental

plants and forms of control, including some aphid-ornamental plant associations. Special reference is made to the occurrence of aphids in ornamental plants in the work of Leal and Oliveira (1983) who observed the aphid species most frequent in plants of the sixteen public squares in the municipality of Recife, state of Pernambuco, and Bergmann *et al*. (1988) mentioned 16 aphid-plant associations which occur in São Paulo state.

The objective of this study was to survey the aphid diversity in ornamental plants in the city of São Carlos, state of São Paulo (SP), Brazil. In addition, we also classified the species of aphids according to their host specificity, and characterized some injuries caused by these aphids to their host plants.

MATERIALS AND METHODS

The buds, leaves and flowers of ornamental plants infested by aphids were collected in public and private gardens in the city of São Carlos, SP, Brazil, and taken to the laboratory of Department of Ecology and Evolutionary Biology of the Federal University of São Carlos (UFSCar). The collections were made mainly from August 1997 to April 1999. Additional collections were conducted in September 1999 and April 2000.

In the laboratory, the aphids were collected from the plants with brushes and maintained in vials filled with 95% alcohol until they were mounted in slides according to the technique described by Ilharco and Gomes (1967). The aphids were identified under optical microscope according to Holman (1974), Remaudière (1994) and Eastop (1966). Some species were sent to specialists for final identification.

The classification of the aphids according to their host plant specificity was based on the definitions proposed by Ilharco (1976), in which polyphagous are those species that live on plants from different families, oligophagous are species that live on a reduced number of non-related host plants, and monophagous feed on plants of the same family, but not necessarily all the plants of that family.

The aphids were placed in the Insect Collection of the Department of Ecology and Evolutionary Biology (Coleafis/DEBE) at UFSCar.

Ornamental plants were identified according to Lorenzi (1992), Lorenzi and Souza (1995) or sent to specialists.

RESULTS

A total of 137 samples of aphids were collected, from 49 ornamental species (9 trees, 21 shrubs, 18 herbaceous plants and 1 palm tree), distributed among 35 botanical families.

Approximately 63% of the host plants were exotics and, with the exception of *Bidens bipinnata* Baill (Compositae), all were perennials. Fifty-nine aphid-plant associations were recorded, and 43 of them were new for Brazil.

Twenty-five species of aphids, distributed among four families, were identified. Aphididae members were the most common (Appendix 1). This is the first recorded ocurrence of *Eucarazzia elegans* (Ferrari, 1872). *Nectandra megapotamica* (Spreng.) (Lauraceae) is registered for the first time as host plant of *Lizerius tuberculatus* (E.E. Blanchard, 1939). (Drepanosiphidae: Drepanosiphinae: Lizeriini).

According to the host plants of aphids recorded by Patti (1984), Costa *et al.* (1993), Eastop *et al*. (1993), Sousa-Silva and Ilharco (1995), Tavares (1996) and Foureaux and Kato (1999), 12 aphid species collected were monophagous, 4 were oligophagous and 9 were polyphagous (Appendix 1).

An oviparous female of *Tinocallis Kahawaluokalani* (Drepanosiphidae: Drepanosiphinae: Phyllaphidini) was collected on *Lagerstroemia indica* (Lythraceae) during the survey of August 18th 1998, indicating the possibility of sexual reproduction in Neotropical region. This species was also observed by Peronti (1999) in Rio de Janeiro, RJ, Brazil in August 12th 1998.

DISCUSSION

Of all the aphid species collected, only *L. tuberculatus* is a South American native species (Eastop *et al*. 1993). Most of the Brazilian aphidfauna is exotic, as well as the hosts. According to Silva *et al*. 1968, Rossi *et al*. 1990, Costa *et al*. 1993, Sousa-Silva *et al*. 1994, Sousa-Silva and Ilharco 1995, Tavares 1996, Lázzari *et al*. 1996, Carvalho 1998, Hidalgo *et al*. 1998, Lazzarotto and Lázzari 1998, Foureaux and Kato 1999 and Lázzari *et al*. 1999, only 16% of the 144 aphid species registered in Brazil, up to now, are native of the Neotropical region.

In regard to the pattern of host specificity observed among aphid species, monophagy was the most common, followed by polyphagy. Oligophagy was the least-frequently observed pattern.

According to Edwards and Wratten (1981) the insect specificity to the host seems to be an ecological advantage, that is, it allows the insect to adapt itself more exactly to its medium than a species living on a variety of plants.

Among the polyphagous aphids collected, *Aphis gossypii*, *A. spiraecola* and *Toxoptera aurantii* (Aphididae: Aphidinae: Aphidini) which are also significant agricultural pests, were the most common, occurring in 50% of the aphid-infested hosts. *Aphis craccivora*, *A. fabae* (Aphididae: Aphidinae: Aphidini), *Aulacortum solani*, *Macrosiphum euphorbiae*, *Myzus persicae* and *M. ornatus* (Aphididae: Aphidinae: Macrosiphini), were observed in a minor number of ornamental plants (Table 1).

Among the oligophagous aphids, *Aphis nerii* (Aphididae: Aphidinae: Aphidini) was found only on *Nerium oleander* L. (Apocynaceae), although it also appears on species of a few other botanical families. *Cerataphis brasiliensis* (Hempel, 1901) (Hormaphididae: Cerataphidini), a common species of Palmae in Tropical regions, was recorded in Brazil on *Cycas circinalis* (Cycadaceae) and *Musa sapientum* (Musaceae). *Idiopterus nephrelepidis* Davis, 1909 (Aphididae: Aphidinae: Macrosiphini), was found on *Nephrolepis* sp., *Nephrolepis exalta* Schott. *var. florida-ruffle* Hort. (Davalliaceae) and *Adiantum raddianum* Presl. (Pteridaceae), and has already been associated with *Viola* sp. (Violaceae), *Phaseolus vulgaris* (Fabaceae) and *Saintpaulia* sp. (Gesneriaceae) (Sousa-Silva and Ilharco 1995, Tavares 1996). *Macrosiphum rosae* (Aphididae: Aphidinae: Macrosiphini) has been found in Brazil only on species of Rosaceae, more commonly on *Rosa* spp. Its secondary hosts in the Holarctic regions are Dipsacaceae, Valerianaceae and *Ilex* sp. (Aquifoliaceae) (Sousa-Silva and Ilharco *op. cit*.).

Most of the aphids were found on young leaves generally causing the rolling up or wither. More serious damages were observed in *Polyscias guilfoylei* (Araliaceae) infested by *A. spiraecola* that produced premature drying up and falling of the leaves, in *A. raddianum* infested by *I. nephrelepidis* that caused dry leaves, and in *Hemerocallis fulva* and *H. flava* (Liliaceae) attacked by *M. hemerocallis* (Aphididae: Aphidinae: Macrosiphini) that caused yellowing (chlorosis), dry leaves and death (during periods of prolonged drought).

A large amount of honeydew was found in *L. indica* infested by *T. kahawaluokalani*. In some European countries, in the same aphid-plant relationship, intense development of sooty-mold, limb deformation and premature leaf fall were observed (Patti 1984, Leclant and Renoust 1986).

The interactions listed in this study represent a great addition to the knowledge of the species of aphids that attack ornamental plants. Besides, the high host specificity observed among the major aphid species that occur on ornamental plants facilitates both the identification of these aphids when collected on their hosts and, consequently, their control.

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RESUMEN

Se recolectó un total de 25 especies de áfidos de 49 especies de plantas ornamentales en São Carlos - São Paulo, Brasil; 12 áfidos eran monófagos, cuatro olífagos y nueve polífagos. Se registró un total de 58 asociaciones áfido-planta, 43 desconocidas en Brasil. Por primera vez se registran *Eucarazzia elegans* (Ferrari, 1872) (Aphididae: Aphidinae: Macrosiphini) en Brasil y *Nectandra megapotamica* Spreng. (Lauraceae) como planta hospedera de *Lizerius tuberculatus* (E.E. Blanchard, 1939) (Drepanosiphidae: Drepanosiphinae: Lizeriini). También describimos las heridas causadas por los áfidos a las plantas ornamentales.

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APPENDIX 1

Aphids and their host ornamental plants collected in São Carlos - SP from August 1997 to April 1999 and September 1999 to April 2000

Aphids collected	**Host plant species/Common names in Portuguese shown in quotes**	**Plant family**	**Plant origin**	**Plant form**
MONOPHAGOUS				
Aphididae				
Aphis coreopsidis (Thomas, 1978)	**Bidens bipinnata* Baill. "beijo-de-moça"	Compositae	Exotic	Herb
Aphis hederae (Kaltenbach, 1843)	*Schefflera arboricola* (Hay.) Merr. "cheflera-pequena"	Araliaceae	Exotic	Shrub
Eucarazzia elegans (Ferrari, 1872)	**Salvia splendens* Ker-Gawl. "alegria-dos-jardins"	Labiatae	Native	Herb
Macrosiphoniella sanborni (Gillette, 1908)	**Dendrathema grandiflora* (Ram.) Tzv. "crisântemo-da-china"	Compositae	Exotic	Herb
Myzus hemerocallis Takahashi, 1921	**Hemerocallis flava* L. **Hemerocallis fulva* L. "lírio-de-são-josé"	Liliaceae	Exotic Exotic	Herb Herb

* New record of aphid-plant association in Brazil.

Continues ....

Aphids collected	Host plant species/Common names in Portuguese shown in quotes	Plant family	Plant origin	Plant form
Pentatrichopus tetrarhodus (Walker, 1849)	**Rosa* sp. "roseira"	Rosaceae	Exotic	Shrub
Rhodobium porosum (Sanderson, 1901)	*Rosa* sp. "roseira"	Rosaceae	Exotic	Shrub
Sitobion luteum (Buckton, 1876)	*Dendrobium phalaenopsis* Fitzg. "orquídea"	Orchidaceae	Exotic	Herb
Hormaphididae				
Cinara tujafilina (Del Guercio, 1909)	*Thuja* sp. "tuia"	Cupressaceae	Exotic	Shrub
Drepanosiphidae				
Lizerius tuberculatus (E.E. Blanchard, 1939)	**Nectandra megapotamica* Spreng. "canelinha"	Lauraceae	Native	Tree
Tinocallis kahawaluokalani Kirkaldy, 1907	*Lagerstroemia indica* L. "resedá"	Lythraceae	Exotic	Tree
Takecallis taiwanus (Takahashi, 1926)	*Phyllostachys aurea* A. and C. Riv. "bambú-de-jardim"	Poaceae	Exotic	Shrub
OLIGOPHAGOUS				
Aphididae				
Aphis nerii (B. de Fonscolombe, 1841)	*Nerium oleander* L. "espirradeira"	Apocynaceae	Exotic	Shrub
Idiopterus nephrelepidis Davis, 1909	*Adiantum radianum* Presl. "avenca-delta"	Pteridaceae	Native	Herb
	**Nephrolepis* sp. "samambaia"	Davalliaceae	_____	Herb
	**N. exaltata* Schott. var. *florida-ruffle* Hort. "samambaia-crespa"	Davalliaceae	Native	Herb
Macrosiphum rosae (Linné, 1758)	*Rosa* sp. "roseira"	Rosaceae	Exotic	Shrub
Hormaphididae				
Cerataphis brasiliensis (Hempel, 1901)	**Chrysalidocarpus lutescens* Wendl. "areca-bambu"	Palmae	Exotic	Palm tree
POLYPHAGOUS				
Aphididae				
Aphis craccivora Koch, 1854	*Portulaca grandiflora* Hook. "onze-horas"	Portulacaceae	Native	Herb

* New record of aphid-plant association in Brazil.

Continues ....

Aphids collected	Host plant species/Common names in Portuguese shown in quotes	Plant family	Plant origin	Plant form
Aphis fabae Scopoli, 1763	**Anthurium x froebellii* Hort. "antúrio"	Araceae	Exotic	Herb
	**Epidendrum ellipticum* R. Grah "orquídea-da-restinga"	Orchidaceae	Native	Herb
Aphis gossypii Glover, 1877	*Bauhinia variegata* Linn. "pata-de-vaca"	Fabaceae	Native	Tree
	**Calliandra inaequilatera* Rusby "esponginha"	Fabaceae	Native	Shrub
	**Catharanthus roseus* G. Don "boa-noite"	Apocynaceae	Exotic	Shrub
	**Cordilyne terminalis* Kunth. "dracena-vermelha"	Liliaceae	Exotic	Shrub
	Dieffenbachia amoena Hort. ex Gent. "comigo-ninguém-pode"	Araceae	Exotic	Herb
	**Ervatamia coronaria* Stapf. "jasmim-café"	Apocynaceae	Exotic	Shrub
	Hibiscus rosa-sinensis L. "mimo-de-vênus"	Malvaceae	Exotic	Shrub
	**Iresine herbstii* Hook. "coração-magoado"	Amaranthaceae	Native	Shrub
	Kalanchoe blossfeldiana v. Poelln. "calancoê"	Crassulaceae	Exotic	Herb
	**Lagerstroemia indica* "resedá"	Lythraceae	Exotic	Tree
	**Malvaviscus arboreus* Cav. "malvavisco"	Malvaceae	Native	Shrub
	**Schefflera arboricola* "cheflera-pequena"	Araliaceae	Exotic	Shrub
	**Schinus molle* L. "aroeira-mole"	Anacardiaceae	Native	Tree
	**Syngonium podophyllum* Schott. "singônio"	Araceae	Exotic	Herb
	**Spathodea campanulata* Beauv. "espatódea"	Bignoniaceae	Exotic	Tree
	**Tabebuia* sp. "ipê"	Bignoniaceae	Native	Tree
	**Tibouchina granulosa* Cogn. "quaresmeira"	Melastomataceae	Native	Tree
Aphis spiraecola Patch, 1914	**Allamanda blanchetti* DC. "alamanda-roxa"	Apocynaceae	Native	Shrub
	**Bougainvillea spectabilis* Willd. "primavera"	Nyctaginaceae	Native	Shrub
	**Cordilyne terminalis* "dracena-vermelha"	Liliaceae	Exotic	Shrub
	**Gladiolus hortulanus* Hort. "palma-de-santa-rita"	Iridaceae	Exotic	Herb
	**Hibiscus syriacus* L. "hibisco-colunar"	Malvaceae	Exotic	Shrub
	**Pittosporum tobira* (Thumb.) Ait. "pitósporo"	Pittosporaceae	Exotic	Shrub
	**Polyscias guilfoylei* Bailey. "árvore-da-felicidade"	Araliaceae	Exotic	Shrub

* New record of aphid-plant association in Brazil.

Continues ....

Aphids collected	Host plant species/Common names in Portuguese shown in quotes	Plant family	Plant origin	Plant form
	Rosa sp. "roseira"	Rosaceae	Exotic	Shrub
	**Viburnum* sp. "viburno"	Caprifoliaceae	Exotic	Shrub
Aulacorthum solani (Kaltenbach, 1843)	**Salvia splendens* "alegria-dos-jardins"	Labiatae	Native	Herb
Macrosiphum euphorbiae (Thomas, 1878)	**Turnera ulmifolia* L. "turnera"	Turneraceae	Native	Herb
Myzus ornatus Laing, 1932	**Duranta repens* L. var. *aurea* Hort. "pingo-de-ouro"	Verbenaceae	Native	Shrub
	**Gerbera jamesonii* Bolus "margarida-do-transvaal"	Compositae	Exotic	Herb
Myzus persicae (Sulzer, 1776)	**Duranta repens* var. *aurea*	Verbenaceae	Native	Shrub
	**Gerbera jamesonii*	Compositae	Exotic	Herb
Toxoptera aurantii (B. de Fonscolombe, 1841)	**Ficus benjamina* L. "ficus"	Moraceae	Exotic	Tree
	**Murraya exotica* Jack "falsa-murta" Moraceae	Rutaceae	Exotic	Tree
	**Pachystachys lutea* Nees "camarão-amarelo"	Acanthaceae	Exotic	Shrub
	**Schefflera arboricola* "cheflera-pequena"	Araliaceae	Exotic	Shrub
	Camellia japonica L. "camélia"	Theaceae	Exotic	Shrub

* New record of aphid-plant association in Brazil.