

SYSTEMATICS, MORPHOLOGY AND PHYSIOLOGY

Phytoseiid Mites (Acari) Associated With Rubber Trees And Other Euphorbiaceous Plants In Southeastern Brazil

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Ácaros Fitoseídeos (Acari) Associados à Seringueira e Outras Euforbiáceas no Sudeste do Brasil

RESUMO – Em um levantamento conduzido em espécies arbóreas da família Euphorbiaceae, incluindo plantas nativas e a seringueira, em três regiões do Estado de São Paulo, vinte e cinco espécies já descritas de ácaros da família Phytoseiidae foram encontradas. Vários dos ácaros coletados eram conhecidos até o momento apenas pela descrição original. Cinco das espécies relatadas neste trabalho correspondem a novas combinações. Descrições complementares de várias das espécies coletadas são apresentadas.

PALAVRAS-CHAVE: Controle biológico, predadores, Phytoseiidae, taxonomia, Euphorbiaceae.

ABSTRACT – Twenty five known mite species of the family Phytoseiidae were found in a survey conducted on trees of the family Euphorbiaceae, including native plant species and rubber tree, in three regions of the State of São Paulo. Several of the species collected were known until now only from the original description. Five of the mite species mentioned in this paper correspond to new combinations. Complementary descriptions of several of the species collected are provided.

KEY WORDS: Biological control, predator, Phytoseiidae, taxonomy, Euphorbiaceae.

Mites of the family Phytoseiidae have been extensively studied as biological control agents of different mite and insect pests. Moraes *et al.* (1986) reported 93 phytoseiid species on plants of the family Euphorbiaceae, eight of which were collected on plants of the genus *Hevea*, to which rubber tree belongs. Seven of the latter species were reported from Asia and one from Central America. Feres (2000) reported 28 mite species of 24 genera belonging to 11 families on *Hevea* spp. in the States of Minas Gerais, São Paulo, Mato Grosso and Mato Grosso do Sul, Brazil. Only three of those were phytoseiids: *Euseius citrifolius* Denmark & Muma, *E. concordis* (Chant) and *Typhlodromus annectens* DeLeon. They are the only phytoseiids reported from rubber trees in Brazil.

Native to Northern South America, rubber tree is now one of the main cultivated plants in western and southeastern Brazil. A few mite species have been considered harmful to rubber tree (Feres 2000); despite the absence of published supporting data, at least two of those have been commonly considered by growers to be of significant importance, namely, *Calacarus heveae* Feres and *Tenuipalpus heveae* Baker. In a study to determine the possibility to control those mites biologically, the first step consists on determining of

natural enemy species associated with them on rubber tree and other native trees of the same family present in a given region.

The objective of this work was to determine the phytoseiid species on rubber tree and associated native plants of the family Euphorbiaceae in the State of São Paulo, to subsidize future studies on biological control of *C. heveae* and *T. heveae*.

Material and Methods

The mites were collected in Pariqueira-Açu, Cananéia and Piracicaba, State of São Paulo, Brazil. In Pariqueira-Açu, the sampling was conducted in an experiment station (Estação Experimental J. Cione, at 24° 36' 50" S, 47° 53' 00" W); in Cananéia, it was conducted along Highway SP-226 (24° 55' 00" S, 47° 50' 00" W); in Piracicaba, it was conducted on the *campus* of Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo (22° 42' 30" S, 47° 37' 40" W). The former two sites are located in a region dominated by the Atlantic Forest, and the latter is located in an agricultural region with patches of secondary forest.

The following plant species were sampled: *Alchornea*

glandulosa Poepp. & Endl., *A. sidifolia* M. Arg., *A. triplinervea* M. Arg., *Aparisthmium cordatum* (A. Juss.) Baill., *Croton floribundus* Spreng., *C. urucurana* Baill., *Hevea brasiliensis* (H.B.K.) M. Arg. clones C7 and 527-A, *Hura crepitans* Linn., *Joannesia princeps* Vell., *Pachystroma longifolium* M. Arg., *Pera glabrata* (Schott) Baill. and *Sebastiania* sp..

Plant material was taken to the laboratory, where mites were collected under a dissecting microscope and mounted for identification. Ten to 20 leaves, according to their size, were collected from each of 1-4 plants of each species, according to their availability. Samplings were conducted in April 1998 in Pariquera-Açu and Cananéia and in June 1998 in Piracicaba.

New measurements are given in this paper for species considered incompletely described as well as for those showing morphological variation in relation to available descriptions. Measurements are presented in micrometers. The nomenclature used in this paper is that of Rowell *et al.* (1978) for the dorsal setae and of Chant & Yoshida-Shaul (1991) for the ventral setae. Information on geographical distribution of species is based mostly on Moraes *et al.* (1986); additional information are provided with the respective references.

Representative specimens of each species were deposited at "Setor de Zoologia Agrícola, Departamento de Entomologia, Fitopatologia e Zoologia Agrícola", Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, Piracicaba-SP, Brazil.

Results and Discussion

Twenty five known species of the family Phytoseiidae were collected in this study, as indicated subsequently.

Amblyseiinae Muma

Amblyseiulella sooretama (El-Banhawy) n. comb.
Amblyseius sooretamus El-Banhawy, 1984: 128

Distribution. Brazil

Examined Material. Pariquera-Açu: *A. glandulosa*

Remarks. The average measurements of four specimens from Pariquera-Açu followed (in parentheses) by their respective ranges are: length of dorsal shield 297 (292-303), width of dorsal shield 167 (165-171), j1 31 (30-32), j3 70 (68-73), j4 4, j5 3 (3-4), j6 5 (4-7), J2 5, J5 5, z2 8 (8-9), z4 11, z5 5 (4-5), Z1 6 (5-7), Z4 106 (103-111), Z5 127, s4 130 (127-132), S2 11 (11-12), S5 12 (11-14), r3 36 (35-38), R1 10 (9-11), Sge I 18 (16-19), Sge II 16 (15-16), Sge III 15 (15-16), Sti III 15 (14-16), Sge IV 69 (65-73), Sti IV 94 (89-97), St IV 67 (65-70), St1-St3 67 (65-68), St2-St2 72 (70-73), St5-St5 68 (65-70), width of ventrianal shield at level of Zv2 73 (70-76), width of ventrianal shield at level of anus 61 (59-62), length of ventrianal shield 102 (97-105), calyx of spermatheca 5, fixed digit 29 (27-30), movable digit 36 (35-38). These measurements are close of the original description except that setae j1, z2, z4 and S5 are ca. 20% shorter and Sge IV is

ca. 20% longer. The specimens collected have more elongate metapodal shields and the dorsal shield has less conspicuous lateral notches at level of s4; they have 11-13 teeth on the fixed digit as opposed to the 7 teeth shown by the illustration of the original description. It is conceived that the most distal teeth may have been overlooked in the original description, because of their very small size.

Amblyseius herbicolus (Chant)

Typhlodromus (Amblyseius) herbicolus Chant, 1959: 84
Amblyseius herbicolus, Daneshvar & Denmark 1982: 5;
McMurtry & Moraes 1984: 34; Denmark & Muma 1989: 59
Amblyseius deleoni Muma & Denmark, 1970: 68
(synonymy, according to Daneshvar & Denmark 1982: 5)
Amblyseius impactus Chaudhri, 1968: 553 (synonymy,
according to Daneshvar & Denmark 1982: 5).

Distribution. South Africa, Angola, Australia, Brazil, China, Colombia, USA, Guatemala, India, Indonesia, Iran, Japan, Madagascar, New Caledonia, Papua New Guinea, Puerto Rico, Thailand and Taiwan; Costa Rica, Honduras, El Salvador (Denmark *et al.* 1999); Guadeloupe, Martinique, Les Saintes (Moraes *et al.* 2000)

Examined Material. Piracicaba: *P. longifolium*

Amblyseius impeltatus Denmark & Muma
Amblyseius impeltatus Denmark & Muma, 1973: 241;
1989: 91

Distribution. Brazil

Examined Material. Pariquera-Açu: *A. triplinervea*, *A. glandulosa*, *H. brasiliensis*

Remarks. The average measurements of four specimens of Pariquera-Açu followed (in parentheses) by their respective ranges are: length of dorsal shield 365 (339-377), width of dorsal shield 267 (247-286), j1 18 (15-20), j3 22 (21-23), j4 6 (4-8), j5 5 (3-7), j6 7 (5-8), J2 8 (5-11), J5 7 (6-8), z2 13 (11-13), z4 10 (8-12), z5 7 (6-9), Z1 9 (5-11), Z4 34 (32-39), Z5 128 (126-131), s4 37 (35-39), S2 10 (9-11), S4 10 (10-11), S5 9 (8-10), r3 11 (10-12), R1 9 (8-9), Sge I 30 (27-31), Sge II 30 (29-31), Sge III 37 (35-39), Sti III 26 (25-26), Sge IV 60 (56-65), Sti IV 45 (43-48), St IV 49 (48-51), St1-St3 53 (51-55), St2-St2 72 (69-74), St5-St5 79 (77-80), width of ventrianal shield at level of Zv2 85 (84-85), width of ventrianal shield at level of anus 76 (75-79), length of ventrianal shield 98 (89-102), calyx of spermatheca 11 (10-12), fixed digit 28 (26-29), movable digit 31 (30-32). The measurements correspond closely to those of the original description of the species.

Amblyseius neochiapensis Lofego, Moraes & McMurtry
Amblyseius neochiapensis Lofego *et al.*, 2000: 462

Distribution. Brazil (Lofego *et al.* 2000)

Examined Material. Piracicaba: *A. glandulosa*, *A. sidifolia*, *C. floribundus*, *C. urucurana*

***Amblyseius operculatus* DeLeon**

Amblyseius operculatus DeLeon, 1967:26;
Denmark & Muma 1989: 47

Distribution. Brazil and Trinidad-Tobago

Examined Material. Pariquera-Açu: *A. glandulosa*, *A. sidifolia*, *A. triplinervea*, *H. brasiliensis*, *Sebastiania* sp.

Remarks. The measurements of three specimens collected are close to those of Denmark & Muma (1989), which are ca. 15% smaller than those of the original description. The shape of calyx of spermatheca is also close to that given by Denmark & Muma (1989), differing only slightly from the original description.

***Amblyseius saopaulus* Denmark & Muma**

Amblyseius saopaulus Denmark & Muma, 1973: 243;
1989: 32

Distribution. Brazil

Examined Material. Cananéia: *P. glabrata*. Pariquera-Açu: *A. sidifolia*, *A. triplinervea*, *H. brasiliensis*

***Euseius alatus* DeLeon**

Euseius alatus DeLeon, 1966: 87; Denmark & Muma
1973: 262; Moraes & McMurtry 1983: 137;
Feres & Moraes 1998: 127

Euseius paraguayensis Denmark & Muma, 1970: 224
(synonymy, according to Moraes & McMurtry 1983: 137)

Distribution. Brazil, Colombia, Guyana and Paraguay; Peru (McMurtry & Moraes 1989); Martinique (Moraes *et al.* 2000)

Examined Material. Pariquera-Açu: *A. triplinervea*. Piracicaba: *A. glandulosa*, *H. brasiliensis*, *J. princeps*, *P. longifolium*

***Euseius citrifolius* Denmark & Muma**

Euseius citrifolius Denmark & Muma, 1970: 222;
Moraes & McMurtry 1983: 138; Moraes *et al.* 1991: 131;
Feres & Moraes 1998: 127

Distribution. Brazil and Paraguay; Peru (McMurtry & Moraes 1989); Colombia and Nicaragua (Moraes *et al.* 1991)

Examined Material. Piracicaba: *H. brasiliensis*, *H. crepitans*, *J. princeps*, *P. longifolium*

***Euseius ho* (DeLeon)**

Amblyseius (Euseius) ho DeLeon, 1965: 125
Euseius ho, Denmark & Muma 1973: 262; Moraes &
McMurtry 1983: 139; Moraes *et al.* 1991: 132

Distribution. Brazil, Jamaica and Puerto Rico; Colombia, Ecuador, Mexico and Peru (Moraes *et al.* 1991)

Examined Material. Pariquera-Açu: *A. glandulosa*, *A. sidifolia*. Piracicaba: *A. glandulosa*, *A. sidifolia*, *C. floribundus*

***Iphiseiodes zuluagai* Denmark & Muma**

Iphiseiodes zuluagai Denmark & Muma, 1972: 23; Aponte
& McMurtry 1995: 165; Kreiter & Moraes 1997: 377;
Feres & Moraes 1998: 127
Amblyseius zuluagai, Moraes & Mesa 1988: 79;
Moraes *et al.* 1991: 125

Distribution. Brazil, Colombia and Puerto Rico; Cuba and Panama (Moraes *et al.* 1991); Guadeloupe (Kreiter & Moraes 1997); Maria Galante, Martinique (Moraes *et al.* 2000)

Examined Material. Piracicaba: *A. glandulosa*, *A. sidifolia*, *C. floribundus*, *C. urucurana*, *H. brasiliensis*, *H. crepitans*, *J. princeps*, *P. longifolium*

***Paraphytoseius multidentatus* Swirski & Shechter**

Paraphytoseius multidentatus Swirski & Shechter, 1961:
114; McMurtry & Moraes 1984:27

Paraphytoseius bhadrakaliensis (Gupta, 1969);
Paraphytoseius horrifera (Pritchard & Baker, 1962);
Paraphytoseius hyalinus (Tseng, 1973); *Paraphytoseius narayanani* (Ehara & Ghain, 1967); *Paraphytoseius nicobarensis* (Gupta, 1977); *Paraphytoseius orientalis* (Narayanan, Kaur & Ghain, 1960); *Paraphytoseius parabilis* (Chaudhri, 1967); *Paraphytoseius santurcensis* DeLeon, 1965; *Paraphytoseius subtropicus* (Tseng, 1972) and *Paraphytoseius urumanus* (Ehara, 1967) (synonymy, according to Matthyse & Denmark 1981)

Distribution. Cosmopolitan

Examined Material. Pariquera-Açu: *A. glandulosa*, *A. cordatum*. Piracicaba: *A. glandulosa*, *C. floribundus*, *C. urucurana*

***Phytoscutus sexpilis* Muma**

Phytoscutus sexpilis Muma, 1961: 275; DeLeon 1967:17;
Muma & Denmark 1970: 24; Yoshida-Shaul & Chant
1997: 234

Typhlodromus sexpilis, Hirschmann 1962: 17
Amblyseius sexpilis, van der Merwe 1968: 161

Distribution. Cuba, USA and Trinidad-Tobago; Guadeloupe (Moraes *et al.* 2000)

Examined Material. Cananéia: *P. glabrata*. Pariquera-Açu: *H. brasiliensis*. Piracicaba: *A. glandulosa*, *A. sidifolia*

***Proprioseiopsis cannaensis* (Muma)**

Amblyseiulus cannaensis Muma, 1962:4
Amblyseius cannaensis, Moraes & McMurtry 1983:132;
Moraes & Mesa 1988: 77; Moraes *et al.* 1991: 126
Proprioseiopsis cannaensis, Muma *et al.* 1970: 38;
Kreiter & Moraes 1997: 379

Distribution. Guyana, New Caledonia, Paraguay and USA; Brazil, Colombia, Cuba, Ecuador (Moraes *et al.* 1991); El Salvador, Guadeloupe (Kreiter & Moraes 1997); Maria Galante, Martinique (Moraes *et al.* 2000)

Examined Material. Piracicaba: *P. longifolium*

Remarks. Measurements of the specimens collected are close to those given by Moraes & McMurtry (1983) for specimens from Brazil; the shape of calyx of spermatheca is also close to the illustration for the holotype, given by Moraes & McMurtry (1983).

Proprioiseiopsis dominigos (El-Banhawy) n. comb.

Amblyseius dominigos El-Banhawy, 1984: 130; McMurtry & Moraes 1989: 185; Moraes *et al.* 1991: 126; Feres & Moraes 1998: 126

Distribution. Brazil; Peru (McMurtry & Moraes 1989); Colombia (Moraes *et al.* 1991)

Examined Material. Pariquera-Açu: *A. glandulosa*, *A. sidifolia*, *A. cordatum*, *H. brasiliensis*. Piracicaba: *A. glandulosa*, *P. longifolium*

Remarks. Measurements of the specimens collected are ca. 30% larger than those of the original description.

Proprioiseiopsis neotropicus (Ehara) n. comb.

Amblyseius neotropicus Ehara, 1966: 133; Moraes & Mesa 1988: 79; Moraes *et al.* 1991: 127

Distribution. Brazil; Colombia (Moraes & Mesa 1988); Ecuador (Moraes *et al.* 1991)

Examined Material. Pariquera-Açu: *A. glandulosa*, *A. sidifolia*, *A. triplinervea*, *A. cordatum*. Piracicaba: *C. floribundus*

Remarks. Measurements of the specimens collected are similar to those given by Moraes & Mesa (1988), which are close to the original description, except for j3 and r3 that are ca. 50% longer.

Typhlodromalus aripo DeLeon

Typhlodromalus aripo DeLeon, 1967: 21; Denmark & Muma 1973: 257
Amblyseius aripo, Moraes & McMurtry 1983: 132; Moraes & Mesa 1988: 73

Distribution. Brazil, Colombia, El Salvador, Guyana, Jamaica, Trinidad-Tobago; Guadeloupe (Moraes *et al.* 2000)

Examined Material. Piracicaba: *A. glandulosa*

Remarks. Only one specimen was collected in this study. Measurements of all setae and the proportion between the lengths of z2 and z4 are close to what was reported by Moraes & Mesa (1988).

Typhlodromalus manihoti (Moraes) n. comb.

Amblyseius manihoti Moraes *et al.*, 1994: 211

Distribution. Bolivia, Brazil, Colombia, Cuba, Ecuador,

Nicaragua, Paraguay, Peru, Suriname, Trinidad-Tobago, Venezuela (Moraes *et al.* 1994)

Examined Material. Pariquera-Açu: *A. sidifolia*, *A. triplinervea*. Piracicaba: *C. urucurana*

Remarks. Measurements of the specimens collected are close to the original description. Specimens of different developmental stages were collected, suggesting that this species reproduces and develops on the plants on which they were collected. Measurements of a single female collected in Piracicaba are close to those of the original description, but the sclerotized portion of the calyx of the spermatheca of this specimen seems longer than in the type specimens. Further collections on the same plant may clarify whether this corresponds to another, close species.

Typhlodromalus villacarmelensis Moraes

Typhlodromalus villacarmelensis Moraes *et al.*, 1994: 214

Distribution. Colombia, Peru (Moraes *et al.* 1994)

Examined Material. Pariquera-Açu: *A. glandulosa*

Remarks. Measurements of two specimens collected agree well to the original description, except for seta Z4 which is ca. 20% shorter.

Typhlodromalus peregrinus (Muma)

Typhlodromus peregrinus Muma, 1955:270
Typhlodromus (Amblyseius) peregrinus, Chant 1959: 97
Amblyseius peregrinus, McMurtry 1983: 255
Typhlodromalus peregrinus, Muma *et al.* 1970: 88
Typhlodromus (Amblyseius) robineae, Chant, 1959: 98;
Typhlodromus (Amblyseius) evansi, Chant, 1959: 99;
Typhlodromus (Amblyseius) primulae, Chant, 1959: 99
(synonymy, according to Muma 1964)

Distribution. Brazil, Colombia, Costa Rica, Ecuador, Guatemala, Guyana, Hawaii, Honduras, Mexico, Nicaragua, Puerto Rico, Suriname

Examined Material. Pariquera-Açu: *A. triplinervea*

Remarks. Measurements of the specimens collected are close to those given by Moraes & Mesa (1988); however, the macroseta of tarsus IV is not acute and macroseta of genu I is distinctly thicker but not larger than other setae on the same segment.

Typhlodromips cananeiensis Gondim Jr. & Moraes

Typhlodromips cananeiensis Gondim Jr. & Moraes, 2001: 84

Distribution. Brazil (Gondim Jr. & Moraes 2001)

Examined Material. Cananéia: *A. triplinervea*, *P. glabrata*. Pariquera-Açu: *A. glandulosa*, *A. triplinervea*, *H. brasiliensis*, *Sebastiania* sp.

Typhlodromips linharis* El-BanhawyTyphlodromips linharis* El-Banhawy, 1984: 136**Distribution.** Brazil**Examined Material.** Pariquera-Açu: *Sebastiania* sp.

Remarks. The average measurements of four females followed (in parentheses) by their respective ranges are: length of dorsal shield 311 (286-330), width of dorsal shield 204 (193-215), j1 19 (19-20), j3 26 (24-27), j4 8, j5 8, j6 12 (9-14), J2 13 (11-14), J5 8, z2 12 (11-12), z4 18 (16-19), z5 8, Z1 16 (14-18), Z4 53 (51-54), Z5 59 (57-59), s4 27, S2 20 (19-22), S4 13 (11-14), S5 10 (8-11), r3 11 (11-12), R1 11, Sge I 15 (14-16), Sge II 15 (12-16), Sge III 16 (15-16), Sti III 15 (14-16), Sge IV 29 (27-30), Sti IV 18 (16-19), St IV 29 (27-30), St1-St3 58 (57-59), St2-St2 66 (58-68), St5-St5 69 (58-76), width of ventrianal shield at level of Zv2 94 (92-95), width of ventrianal shield at level of anus 77 (76-81), length of ventrianal shield 88 (81-92), calyx of spermatheca 11, fixed digit 29 (27-30), movable digit 39 (38-41). These measurements are slightly smaller than those of the original description. Judging from the original illustration, it seems that the calyx of the spermatheca is slightly longer in the specimens collected; no measurement of the calyx was provided in the original description.

Typhlodrominae Wainstein***Galendromimus alveolaris* (DeLeon)***Typhlodromus alveolaris* DeLeon, 1957: 141*Typhlodromus* (*Typhlodromus*) *alveolaris*, Chant 1959: 52*Galendromimus alveolaris*, Muma 1961: 297;

DeLeon 1962: 175; 1967: 13; Wainstein 1962: 19,

Muma *et al.* 1970: 58*Cydnodromella alveolaris*, Chant & Yoshida-Shaul 1986:

2820; Moraes & Mesa 1988:80

Galendromimus (*Galendromimus*) *alveolaris*, Chant &

McMurtry 1994: 242

Distribution. Costa Rica, Jamaica, Mexico, Trinidad-Tobago; Brazil (Feres & Moraes 1998); Martinique (Moraes *et al.* 2000)

Examined Material. Piracicaba: *A. glandulosa*, *C. floribundus*

Remarks. Of the three females measured, one had Z4 and Z5 ca. 20% shorter and the dorsal shield distinctly less sclerotized than the others.

Typhlodromus annectens* DeLeonTyphlodromus annectens* DeLeon, 1958: 75; Chant &

Yoshida-Shaul 1984: 1868; Moraes & McMurtry 1983:

142; Moraes & Mesa 1988: 82; Moraes *et al.* 1991: 134;

Feres & Moraes 1998: 128

Galendromus annectens, Muma 1961: 298; 1963: 30;

Muma & Denmark 1970: 135; Denmark & Muma 1973:

274; Denmark 1982: 142; Moraes *et al.* 1982: 21

Distribution. Brazil, Canada, Colombia, USA, Galapagos, Honduras, Mexico and Puerto Rico; Costa Rica and El Salvador (Denmark *et al.* 1999)

Examined material. Pariquera-Açu: *A. sidifolia*. Piracicaba: *A. glandulosa*, *C. floribundus*

Remarks. The average measurements of three females from Piracicaba followed (in parentheses) by their respective ranges are: length of dorsal shield 274 (264-282), width of dorsal shield 138 (134-141), j1 19 (18-21), j3 39 (36-41), j4 33 (32-34), j5 40 (38-42), j6 47 (46-47), J2 50 (48-51), J5 6 (5-6), z2 43 (41-45), z3 40 (38-41), z4 43 (41-45), z5 42 (41-43), Z4 51 (47-55), Z5 48 (46-49), s4 46 (45-47), s6 53 (51-55), S2 54 (53-55), S5 45 (44-47), r3 33 (32-35), St1-St3 59 (58-61), St2-St2 53 (50-55), St5-St5 46 (45-46), width of ventrianal shield at level of Zv2 56 (55-58), width of ventrianal shield at level of anus 61 (60-63), length of ventrianal shield 94 (86-103), calyx of spermatheca 35 (34-35). Average measurements of three females from Pariquera-Açu followed (in parentheses) by their respective ranges are: length of dorsal shield 309 (301-319), width of dorsal shield 155 (148-162), j1 25 (23-26), j3 50 (48-53), j4 37 (36-38), j5 48 (47-50), j6 59 (57-61), J2 60 (58-63), J5 6 (4-8), z2 54 (52-56), z3 43 (39-46), z4 54 (52-55), z5 48 (46-51), Z4 54 (51-56), Z5 57 (54-60), s4 57 (57-58), s6 61 (59-64), S2 64 (62-67), S5 56 (55-59), r3 42 (37-47), R1 16 (15-16), St1-St3 64 (62-65), St2-St2 55 (54-56), St5-St5 51 (49-53), width of ventrianal shield at level of Zv2 58 (56-60), width of ventrianal shield at level of anus 63 (59-65), length of ventrianal shield 101 (100-102), calyx of spermatheca 33 (32-34). Measurements of specimens from Piracicaba are close to those given by Moraes & Mesa (1988), which are larger than those of the type specimens. Specimens from Pariquera-Açu are still larger, but the lower end of the ranges of the measurements of those mites overlap the upper end of the ranges of the measurements given by Moraes & Mesa (1988). The distance between the preanal pores is about the same as the distance between setae Jv2 for specimens from both Piracicaba and Pariquera-Açu, as also verified by Moraes & Mesa (1988).

Typhlodromina camelliae* (Chant & Yoshida-Shaul) n. comb.Typhlodromus camelliae* Chant & Yoshida-Shaul, 1983b: 1053; Feres & Moraes 1998: 130

Distribution. Uruguay, Brazil (Feres & Moraes 1998)

Examined Material. Piracicaba: *H. brasiliensis*, *H. crepitans*, *J. princeps*, *P. longifolium*

Nine of the species mentioned in this paper correspond to new records of phytoseiid mites on euphorbiaceous plants in Brazil, in addition to those already reported in Moraes *et al.* (1986), Feres & Moraes (1998) and Feres (2000). The new records are: *A. impeltatus*, *A. operculatus*, *A. saopaulus*, *E. alatus*, *I. zuluagai*, *P. sexpilis*, *P. dominigos*, *T. cananeiensis* and *T. camelliae*.

Species with the widest substrate ranges were *A. operculatus* in Pariquera-Açu (five plant species, including rubber tree), *T. cananeiensis* in Cananéia and *I. zuluagai* in Piracicaba (eight plant species, including rubber tree). The most abundant phytoseiid species in Pariquera-Açu was *T. cananeiensis*, while in Piracicaba it was *T. camelliae*. Feres & Moraes (1998) had already reported this species on the euphorbiaceous *Mabea fistulifera* in the northwestern part of the State of São Paulo.

Six species (*A. saopaulus*, *A. operculatus*, *A. impeltatus*, *P. sexpilis*, *P. dominigos* and *T. cananeiensis*) were found on rubber tree in Pariquera-Açu. Four species (*E. alatus*, *E. citrifolius*, *I. zuluagai* and *T. camelliae*) were found in Piracicaba. There was no overlap between those two sets of species.

In Pariquera-Açu, four plant species harbored at least two phytoseiid species that were also found on rubber tree: *A. glandulosa*, *A. sidifolia*, *A. triplinervea* and *Sebastiania* sp.. In Piracicaba, four plant species harbored at least two phytoseiid species also found on rubber tree: *A. glandulosa*, *H. crepitans*, *J. princeps* and *P. longifolium*.

The results of this study indicate that the most abundant phytoseiid species on rubber trees are also found on euphorbiaceous plants that are common in the areas where the study was conducted. From the latter, they may conceivably disperse periodically to rubber trees and help maintain low levels of phytophagous mites that could otherwise cause significant damage to rubber trees. Further studies to determine the actual commuting of those predators between rubber trees and other plant species are warranted, to determine the actual role of the natural vegetation as reservoirs of natural enemies, and, eventually, to subsidize the establishment of management programs related to the conservation of those predators.

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