

GEOGRAPHICAL OCCURRENCE AND HOST ASSOCIATIONS OF *APONYCHUS*,
PARAPONYCHUS AND *STYLOPHORONYCHUS* SPECIES (TETRANYCHIDAE:
TETRANYCHINAE)

Short note

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ABSTRACT — We evaluate the geographical occurrence and the hosts of species of *Aponychus*, *Paraponychus* and *Stylophoronychus*. A distinct pattern could be observed, with two groups of species: a first group occurring in the Paleotropical region associated mainly with monocotyledons, and a second group in the Neotropics and North America, associated with dicotyledons. New hosts and records of *A. chiavegato* and *A. schultzi* are reported.

KEYWORDS — host plants; geographical distribution; phytophagous mites

INTRODUCTION

The family Tetranychidae Donnadieu comprises the most serious acarine pests of cultivated plants. Species of the genera *Aponychus* Rimando, *Stylophoronychus* Prasad and *Paraponychus* González and Flechtmann (Tetranychidae: Tetranychinae: Eurytetranychini) are unique among Eurytetranychini in having only one pair of pseudanal setae (*ps*) on anal valves, a feature of notable taxonomic importance for discriminating subfamilies and genera within the family. These phytophagous mites were recorded on numerous plant species from most con-

tinents, some of them infesting bamboo leaves in Asia (Zhang *et al.* 2000a).

Understanding the patterns of occurrence and host association contributes for a clearer picture of the potential of dispersal and colonization process adopted by these mites. In this paper, we evaluate the association between the geographical occurrence of species of this group and their hosts. We also evaluated the hypothesis that species of these three genera associate mainly with monocotyledons in the paleotropical region, while neotropical and holarctic species occur mainly on dicotyledons.

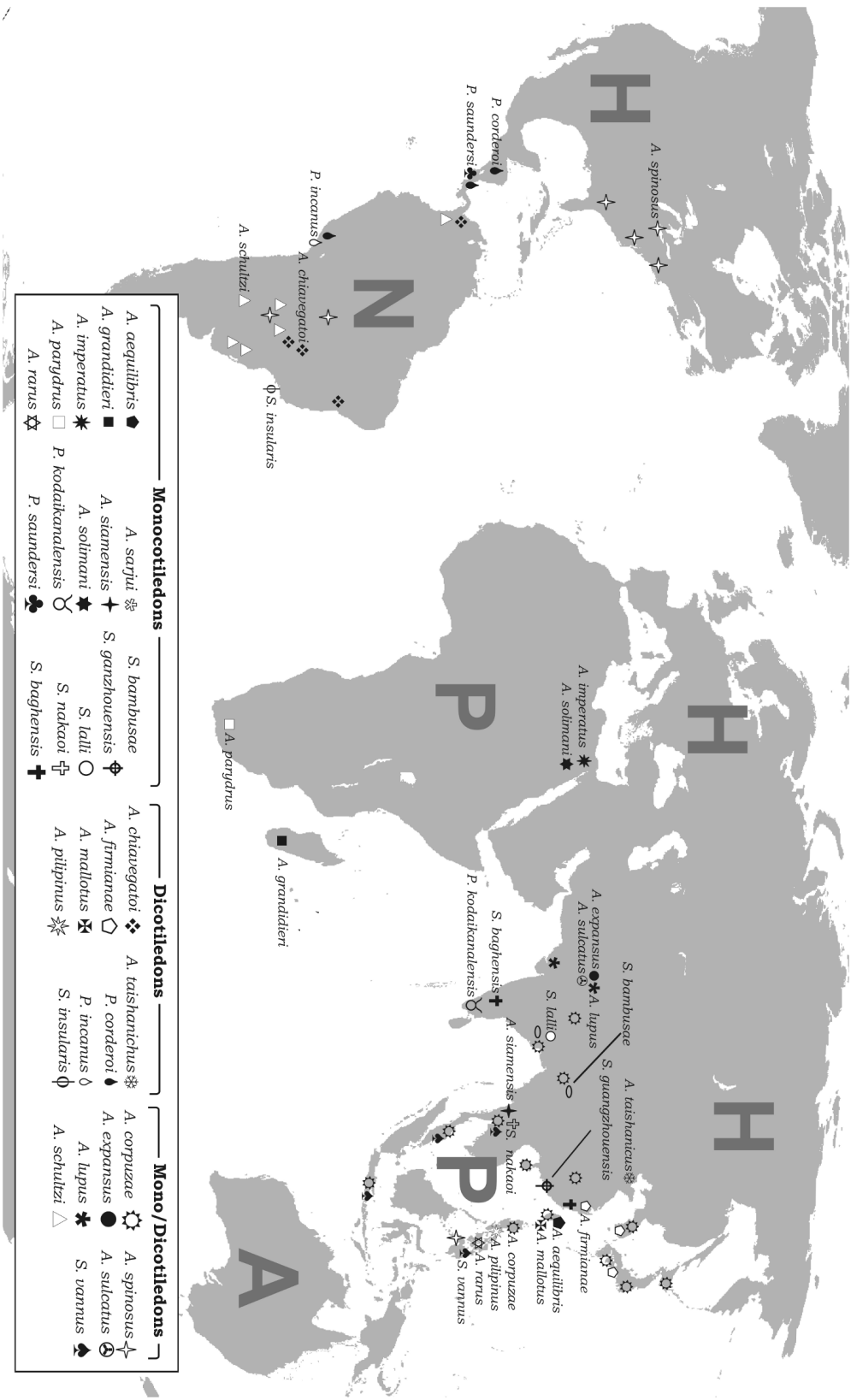


FIGURE 1: Geographical occurrence of *Apomychus*, *Parapomychus* and *Stylophoromychus* species; the species name is represented only in the type locality, additional records are represented only by symbols, biogeographical domains according to Cox and Moore (2005): H=Holarctic, N=Neotropical, P=Palearctic, A=Australian.

MATERIAL AND METHODS

The information was mainly taken from the available literature (Bolland *et al.*, 1998; Migeon and Flechtmann, 2004; Migeon and Dorkeld, 2006), with new records herein reported: *Aponychus chivegatoi*, ex *Hevea brasiliensis* (Euphorbiaceae) and *Theobroma cacao* (Malvaceae) in Ituberá, Bahia, Brazil, 21.IV.2007, A.R. Oliveira coll.; ex *Bombacopsis glabra* (Bombacaceae) in Campinas, SP, Brazil, 12.VI.2008, J.L.C Mineiro coll.; ex *Manihot esculenta* (Euphorbiaceae), in Departamento de Cordoba, Colombia, 25.II.1987, J.M. Guerrero coll.; *Aponychus schultzi*, ex *Solanum granulosoleprosum*, *S. guaraniticum*, *S. variable*, *Vassobia breviflora* (Solanaceae) from several localities of the Southern region of Brazil (states of Paraná, Santa Catarina and Rio Grande do Sul), I, X-XII.2004, I.P. Furtado coll.. Specimens from both species deposited in the Acari Collection at Departamento de Zoologia e Botânica (DZSJRP), São Paulo State University, São José do Rio Preto, SP, Brazil, and Departamento de Zoologia, Escola Superior de Agricultura "Luiz de Queiroz" (MZ-ESALQ), Piracicaba, SP, Brazil.

Because the occurrence of spider mites is intimately associated with the distribution of their host plants, the biogeographical domains adopted here follow the botanical realms, according to Good (1947) and Takhtajan (1986), as summarized by Cox and Moore (2005): Holarctic (North America, Europe and most of Northern Asia), Paletropical (Northern Africa, Southern Asia and Indo-Malayan regions), Neotropical (Central and most of South America excluding its Southern portion), Australian (Australia and Tasmania), Cape (Southern Africa) and Antarctic (Southern America, Antarctica and New Zealand).

The chi-square test was used to verify the hypothesis that species occurring in the Paletropical region associate mainly with monocotyledons, while holarctic species occur mainly on dicotyledons.

RESULTS

Species of *Aponychus*, *Paraponychus* and *Stylophoronychus* were recorded in several world re-

gions, except in Antarctica, Australia and the Palearctic region (Europe and Northern Asia) (Fig. 1). With the exception of *A. spinosus*, recorded in the Paletropical, Holarctic and Neotropical regions, the remaining species occur in a few countries of the same region only. Of the 30 known species, 22 were recorded solely in the Paletropical region (Egypt, South Africa, China, India, Japan, Madagascar, Malaysia, Pakistan, Philippines, South Korea, Thailand), with most of them (17) recorded from a single locality. Six species are restricted to the Neotropical region. Only nine species were collected for a second time following their original description: *A. chivegatoi*, *A. corpuzae*, *A. firmianae*, *A. schultzi*, *A. spinosus*, *P. saundersi*, *S. baghensis* and *S. vannus*. A few species are widely distributed onto several hosts and localities: *A. corpuzae*, *A. schultzi*, *A. spinosus* and *S. vannus*.

The largest number of species (7) is concentrated in India, which is probably a result of the large number of active acarologists working in that country. Other countries with records of species of this group are: China and Philippines (5 species each), Brazil and Thailand (4), Pakistan and Taiwan (3), Costa Rica, Egypt, Indonesia, Japan, Malaysia, Paraguay, Peru, and South Korea (2), Argentina, Canada, Colombia, United States, Honduras, Madagascar, Nicaragua, and South Africa (1).

With regard to the host species, *Aponychus* and related genera were recorded on 93 species, mainly from the two angiosperm groups: Liliopsida (monocotyledons; 32 spp.) and Magnoliopsida (dicotyledons; 60 spp.). *Aponychus schultzi* is the only species recorded on a Cycadopsida, *Cycas revoluta* (Cycadaceae) (Aranda and Flechtmann, 1971). Of the 30 acarine species, 15 were found exclusively on 32 species of monocots (Fig. 1), from the families Poaceae (30 hosts), Musaceae (1) and Strelitziaceae (1). Eight species were found exclusively on dicots, on 59 hosts from 24 families, and seven species were found on both monocots and dicots.

Even for those species occurring on both monocots and dicots, we observed a tendency of association with one group only (Yates' correction, $\chi^2=48,277$, GL=1, $p<0,001$). For example, 16 out of 20 hosts of *A. corpuzae* (80%) and 7 out of 9 hosts of

S. vannus (77.8%) are monocotyledons. Conversely, 16 out of 17 hosts of *A. spinosus* (94%), 20 out of 23 hosts of *A. schultzi* (91.3%) and 6 out of 9 hosts of *A. lupus* (66.6%) are dicotyledons. Only two species, *A. expansus* and *A. sulcatus* (4 and 2 hosts, respectively) were equally associated with hosts from each group.

As for monocots, 32 out of 30 species are from the family Poaceae (93.8%). Of these, 21 are from the subfamily Bambusoideae, tribe Bambuseae, which includes over 1400 species of woody bamboos (CLARK *et al.*, 2007). The bamboos are the main hosts for the Asian species of *Aponychus* and *Stylophoronychus*.

DISCUSSION

We observed a pattern of association between species occurrence and their host plants, and two distinct groups of species can be highlighted: a first group in the Paleotropical region (Africa, Asia and Indo-Malaysia) associated mainly with monocotyledons, especially bamboos, and a second one in the Neotropical and Holarctic regions, associated with dicotyledons. Thus, out of 17 species associated mainly with monocotyledons, the great majority (16) are restricted to Africa and Asia. The only Neotropical species associated with a monocotyledon is *Paraponychus saundersi*, described from *Chusquea tonduzii* (Poaceae) in Costa Rica. The remaining species (6) occurring in the Americas are associated mainly with dicotyledons.

The genus *Stylophoronychus* occurs endemically in Southern Asia and Indonesia, with six species being mainly associated with bamboos in India, Thailand, China and Philippines. The only exception is *S. insularis*, that was described from a single female collected from a South American ivy in Rio de Janeiro, Brazil. Zhang *et al.* (2000b) suggested that the latter species would have independently lost the opisthosomal setae *fl*, the main diagnostic character for the genus *Stylophoronychus*, and therefore should be classified in a separate genus. This species has a distinct morphology in comparison to other species of this genus, with dorsal setae rather long and stylophore devoid of the prominent

bilobed projections. A preliminary phylogeny of species of the three genera (Hernandes and Feres, unpublished data) positioned this species far distant from other species of *Stylophoronychus*.

On the other hand, all but one species of *Paraponychus* were recorded mainly in the Neotropical region, the only exception being *P. kodaikanalensis*, described from Southern India. This species has uncommon features for the genus, such as dorsal setae afilate and bilobed stylophore.

Most species of these three spider mite genera occur mainly in tropical and equatorial latitudes, with only 3 species recorded in latitudes above 40 degrees: *A. spinosus* in Canada, *A. corpuzae* and *A. firmianae* in Japan. The first two species were recorded on several monocotyledons and dicotyledons, respectively, which suggests that these species have developed a high degree of adaptation to various climates and hosts. The record of *A. schultzi* on a gymnosperm probably represents an accidental host.

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