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First record of *Taeniothrips eucharii* in South America, a vector of the *Hippeastrum chlorotic ringspot virus*

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Abstract

Taeniothrips eucharii (Whetzel) (Thysanoptera Thripidae), the oriental lily-flower thrips, is recorded for the first time in South America. Specimens were collected in June and September 2023 on orchid (*Dendrobium* sp.), reed canary grass (*Phalaris arundinacea*), African iris (*Dietes bicolor*) and yellow wild iris (*Dietes iridioides*) in southern Brazil. The species is native from Asia and is considered a pest of ornamentals in North America, Europe, Asia and Australia. It is also known as a potential vector of *Orthotospovirus hippeflavi* (= *Hippeastrum chlorotic ringspot virus*). No damage caused by *T. eucharii* or associated viruses has been observed on its hosts in Brazil thus far. Information on pest status, distribution, hosts, and recognition are provided.

Key words: oriental lily-flower thrips, introduced pest, Amaryllidaceae, ornamentals, HCRV.

Introduction

The oriental lily-flower thrips, *Taeniothrips eucharii* (Whetzel) (Thysanoptera Thripidae), is a phytophagous pest species first described from Bermuda, although being considered native to East Asia (Mound and Tree, 2008). This species is mainly associated with Amaryllidaceae and Liliaceae plants, usually feeding and breeding in flowers, but also on leaf bases and bulbs (Mound and Tree, 2020). It can produce discolouration around the leaf bases with their pierce-sucking mouthparts (O'Neill, 1963; Vierbergen, 1991) and is reported as a competent vector of *Orthotospovirus hippeflavi* (= *Hippeastrum chlorotic ringspot virus* - HCRV) in southern China (Xu *et al*., 2017). *T. eucharii* has been studied both outdoors and in glasshouses and their damage to ornamentals can decrease the commercial value of Amaryllidaceae plants as *Crinum*, *Eucharis* and *Hymenocallis* (Mound and Tree, 2020; EPPO, 2021). Additionally, *O. hippeflavi* can produce severe necrotic and chlorotic ringspot symptoms on plants (Dong *et al*., 2013; Xu *et al*., 2017).

The growing plant trade possibly helped to spread *T. eucharii* to many parts outside East Asia. Populations of this species were recorded long ago in Bermuda (Whetzel, 1923), Netherlands (Vierbergen, 1991) and the USA (Denmark, 1981). More recently, *T. eucharii* was recorded on Amaryllidaceae plants in Australia (Mound and Tree, 2008) and Iran (Miri *et al*., 2020) but HRCV has so far been reported only from China.

In the present study, we record this economically important thrips species for the first time in South America, breeding on ornamental lilies in Southern Brazil. We also provide a morphological diagnosis of the female and a list of plants and countries where *T. eucharii* is known.

Materials and methods

All *T. eucharii* specimens studied here were collected outdoors in a flower shop in Pelotas (31.7700S 52.3313W), Rio Grande do Sul, Brazil. Insects were killed in ethanol 70% and mounted in microscopic slides using Canada Balsam following the technique available in Mound and Marullo (1996). The identity of the specimens was confirmed through the key to *Taeniothrips* species given by Mound *et al*. (2012). Vouchers are deposited at the Entomological Collection of the Universidade Federal do Rio Grande (FURG, Rio Grande) and Natural History Collection of the Universidade Federal do Piauí (CHNUFPI, Floriano).

Information on plants associated with *T. eucharii* were obtained from published literature, especially from scientific papers but also few technical reports (table 1). Most of these records primarily involve the observation of adults. Even when larvae are present on the plant, they are frequently overlooked or simply unseen during fieldwork and quarantine inspections. Recognizing the host plant on which thrips breed is essential before considering a particular species as a true host (Mound and Marullo, 1996). Thus, in the absence of information about immature stages, plants where only adults were found are more accurately referred to as 'associated plants' until further confirmation.

Results and discussion

Adult females and larvae were manually collected on little flowering plants of two species of Amaryllidaceae: the African iris (*Dietes bicolor*) and the yellow wild iris (*Dietes iridioides*). Adults were also found on flowers and leaves of reed canary grass (*Phalaris arundinacea*, Poaceae). These plant species were situated closely together, each housed in its own individual plastic vase. According to the seller, all these plant individuals were originally grown in the field in Corupá (26.4279S 49.2398W), Santa Catarina, Brazil. A single dead female was found on *Dendrobium* sp. (Orchidaceae) in the same collection site, but this record is likely to be merely accidental. No apparent feeding damage caused by *T. eucharii* was observed in those plants, nor symptoms of *Orthotospovirus* were detected.

Table 1. Countries and plants in which *T. eucharii* was recorded in the literature[(a)].

Country	Plant	Reference
Australia	*Crinum asiaticum*, *Hymenocallis*, *Zephyranthes*	Mound and Tree (2008)
Bermuda	*Amaryllis**, *Dianthus caryophyllus**, *Eucharis grandiflora**, *Freesia**, *Hibiscus**, *Lilium**, *Lilium ngiflorum**	Whetzel (1923); Nakahara and Hilburn (1989)
Brazil	*Dendrobium*, *Dietes bicolor,* *Dietes iridioides*, *Phalaris arundinacea*	Present work
China	*Hymenocallis littoralis*, *Lamium*, *Teucrium*, *Nolina**, *Ophiopogon**	Steinweden and Moulton (1930); Bhatti (1990); EPPO (2021)
Guatemala	*Beaucarnea**	EPPO (2021)
Hong Kong	*Lycoris**, *Lilium**, *Narcissus**	O'Neill (1963)
Indonesia	*Ophiopogon**	EPPO (2021)
Iran	*Ixiolirion tataricum*	Miri *et al.* (2020)
Japan	*Dianthus**, *Helichrysum bracteatum*, *Liriope*, *Lycoris*	Moulton (1928), O'Neill (1963); EPPO (2021)
Korea	(not mentioned)	Bhatti (1990)
Malaysia	*Hymenocallis*	Mound and Tree (2008)
Netherlands	*Beaucarnea*, *Lycoris*	Bhatti (1990); Vierbergen *et al.* (2010); Vierbergen (1991)
Taiwan	*Helichrysum bracteatum*, *Lycoris**, *Narcissus**	Moulton (1928); O'Neill (1963); EPPO (2021)
Thailand	*Eucharis**, *Haemanthus**	EPPO (2021)
USA	*Amaryllis, Hymenocallis*, *Lilium*, *Narcissus*	Moulton (1937); O'Neill (1963); Bhatti (1990); Diffie *et al.* (2008)
Not indicated	*Eucharis, Liriope, Lycoris,* *Ophiopogon, Rohdea, Sansevieria*	Vierbergen *et al.* (2010); EPPO (2021)

[(a)] Plants where *T. eucharii* specimens were found naturally, but true host relationship information is not available for most of the plants cited in the table.

* Record based in plant quarantine inspection in a foreign country.

There are about 30 extant species listed in the genus *Taeniothrips*, most of them native from Asia, with four European and one North American species. *Taeniothrips inconsequens* (Uzel), is another economically important species in this genus and it is widespread across the Northern Hemisphere. The latter species has been studied distorting leaves of pear, sugar maple and cherry in Canada and USA (Teulon *et al*., 1998). All *Taeniothrips* species are winged and usually dark-bodied, with the head prolonged in front of eyes and constricted behind eyes. They can be distinguished from *Frankliniella*, another major group of flower-feeding thrips in South America, by the lack of long setae on the anterior margin of the pronotum and fore wings with first vein with only few and sparse setae. *T. eucharii* is similar to *T. inconsequens* in general appearance, although can be differentiated by the largely brown antennal segment III with apex yellow and setae S1 and S2 on female sternite VII arising in front of margin (Mound *et al.*, 2012). Moreover, *T. inconsequens* is characteristic is bearing a terminal claw on the fore tarsus, and the paired metanotal median setae arising further apart (Mound and Tree, 2020). *T. eucharii* can also be distinguished from the European species *Taeniothrips picipes* (Zetterstedt) by the paler antennal segment III in the latter species (Mound *et al*., 2012). A key to the world species of *Taeniothrips* is provided by Mound *et al*. (2012).

There are no studies on the biology of *T. eucharii* but O'Neill (1963) pointed out that juveniles are more frequent among the leaves rather than the flowers. The feeding damage usually occurs as scarring markings and discoloration, and the extensive silvering in the leaves and stems might be caused before the leaves open (O'Neill, 1963). An updated list of plants and countries where *T. eucharii* were recorded is provided in table 1. At least 30% of the plant records from table 1 originated from quarantine interceptions of ornamentals from Asia and countries in the Caribbean Sea. Our compilation indicates that *T. eucharii* is recorded from 22 genera from 9 different plant families around the world. Twelve of these genera belong to Amaryllidaceae and 6 to Asparagaceae family. Information regarding the presence of immature stages of this thrips is scarce, and currently, it is limited to monocotyledonous plants belonging to the families Amaryllidaceae (*Crinum*, *Dietes*, *Eucharis*, *Hymenocallis*, *Lycoris*, *Narcissus*, *Zephyranthes*), Asparagaceae (*Beaucarnea*, *Ophiopogon*, *Rohdea*, *Sansevieria*) and Liliaceae (*Lilium*, *Liriope*) (Vierbergen *et al*., 2010; EPPO, 2021). Ornamental plants are frequently shipped in a mixed load (Reid, 2006) and some of the records can be merely accidental, such as *Hibiscus* (Malvaceae), *Lamium* and *Teucrium* (Lamiaceae). Although damages caused by *T. eucharii* have not yet been recorded in Brazil, agencies and producers should remain alert. This study is the first report of *T. eucharii* in South America, a region encompassing two major leaders in global flower exportation, Colombia and Ecuador. Together, these countries contribute to over 20% of the total worldwide export of cut flowers (Hakeem, 2020). This polyphagous pest has the potential to disperse or be transported

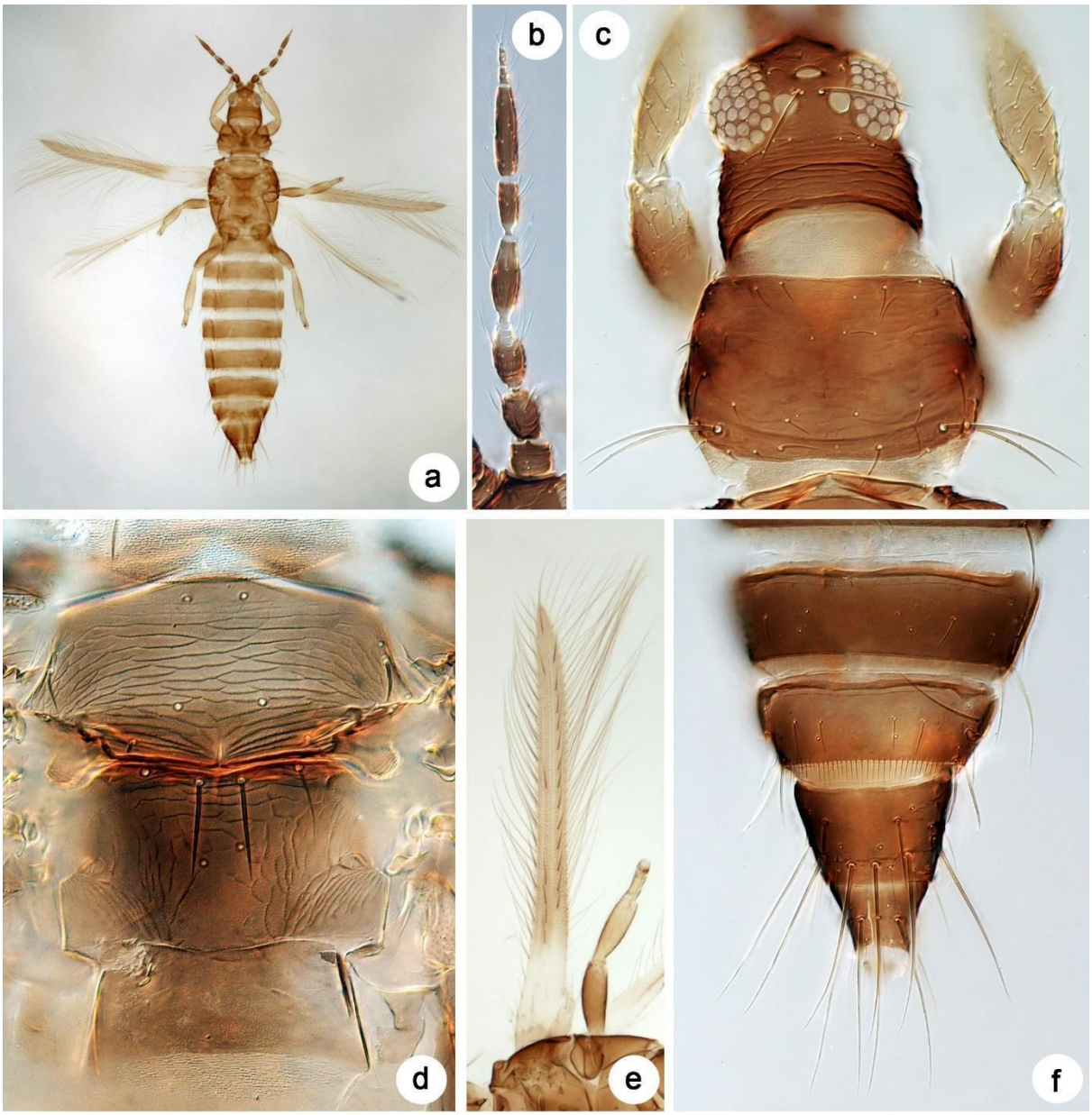

Figure 1. Morphology of *T. eucharii*: **(a)** female; **(b)** antenna; **(c)** head and pronotum; **(d)** meso- and metanotum; **(e)** fore wing; **(f)** abdominal tergites VII-X.

throughout different parts of the continent, ultimately leading to economic losses in cut flower gardens and glasshouses. We recommend further investigations on the presence of this thrips species and the HCRV, especially in South Brazil, where the infested plants originated.

Distinguishing features of *T. eucharii*

Adult females range from 1.7-1.9 mm long. Body colour dark brown, tarsi yellow, fore tibiae extensively yellow (figure 1a); antennae brown with apex of segment III yellowish (figure 1b); fore wings brown with base pale. Antennae 8-segmented, III and IV each with a forked sense cone and without an elongate apical neck (figure 1b). Head longer than wide and constricted behind eyes; only 2 pairs of ocellar setae present, pair III long and arising close together just in front of posterior ocelli; postocular setae small (figure 1c). Pronotum without sculpture, with few discal setae, 2 pairs of long posteroangular setae (figure 1c). Metanotum weakly reticulate, campaniform sensilla present, median setae arising near anterior margin (figure 1d). Fore wing first vein widely interrupted; second vein with complete row of about 10 setae (figure 1e). Tergites with no sculpture mesad of setae S2; VIII with posteromarginal comb of long regular microtrichia (figure 1f). Sternites without discal setae, setae S1 and S2 on sternite VII arising in front of margin. Males were not collected in this study, but according to Mound *et al*. (2012), they are smaller than females, with tergite VIII with complete long comb, IX with 2 pairs of long dorsal setae with the lateral pair arising anterior to the median pair. Male sternites III-VII each bears a broad pore plate. Larvae are pale with extensive red internal pigmentation on thorax and abdomen. A detailed description of the second instar is given

by Vierbergen *et al*. (2010).

Examined material: Brazil, Rio Grande do Sul, Pelotas, *Dendrobium* sp. flower, 10.vi.2023, 1 female (Cavalleri A., col.); flowers and leaves of *Dietes bicolor*, 15.ix.2023, 10 females and larvae (Cavalleri A., col.); flowers and leaves of *Dietes iridioides*, 15.ix.2023, 3 females and larvae (Cavalleri A., col.); flowers and leaves of *Phalaris arundinacea*; 15.ix.2023, 7 females (Cavalleri A., col.); (Cavalleri A., det.) (UFRGS and CHNUFPI).

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