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New host records for *Ceratitis capitata* (Diptera: Tephritidae) in the state of Pará, Brazil

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The Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae), an important pest of fruit crops worldwide, is considered the most cosmopolitan and invasive of tephritid species (Malvasi 2009). In Brazil, *C. capitata* was reported for the first time in 1901, infesting citrus (Sapindales: Rutaceae) in the state of São Paulo (Ihering 1901). Despite the extensive territorial area of Brazil, *C. capitata* spread rapidly to other states, probably as a result of infested fruits being transported between localities. In the 1990s, the Mediterranean fruit fly reached the Brazilian Amazon (Ronchi-Teles & Silva 1996). To date, the only Brazilian states with no official report of the species are 4 states in the north (Acre, Amapá, Amazonas, and Roraima) and 1 in the northeast (Sergipe) (Silva et al. 2011b; Zucchi 2012).

Ceratitis capitata attacks a wide range of host plant species and has been reported on 88 host plant species in Brazil (Zucchi 2012). In the Brazilian Amazon, only 3 hosts of *C. capitata* are known, none of which are native to the region (Silva et al. 2011b). The species has been reported once in the state of Pará, in fruits of star fruit (*Averrhoa carambola* L.; Oxalidales: Oxalidaceae) and barbados cherry (*Malpighia glabra* L.; Malpighiales: Malpighiaceae), in the city of Belém (Silva et al. 1998). Although several fruit surveys were performed in an effort to find additional hosts, no new reports for the state were made until this report (Lemos et al. 2011; Zucchi 2012).

In 2012, 6 collections of fruits of *Garcinia acuminata* Planch. & Triana (sour bacuri) and 2 of *Garcinia brasiliensis* C. Martius (bakupari) (Malpighiales: Clusiaceae) were conducted in the experimental fruit orchard at Embrapa Eastern Amazon (1.466667°S, 48.453056°W), in the city of Belém, state of Pará, Brazil. At the collection site, we also recorded the presence of fruits on trees in orchards of *A. carambola*, *M. glabra*, *Pouteria caimito* (Ruiz & Pav.) Radlk. (Ericales: Sapotaceae), *Eugenia stipitata* McVaugh, *E. uniflora* L. (Myrtales: Myrtaceae), *Psidium guajava* L. and *P. acutangulum* D. C. (Myrtales: Myrtaceae).

The samples were collected at random from plants with maturing or mature fruits. Fruits were removed from the plant or, if it had recently fallen, from the ground. Fruits were individually examined, and adult insects were obtained as described by Silva et al. (2011a). Selected specimens were deposited in the entomological collection at Embrapa Eastern Amazon.

We collected 508 fruits of *G. acuminata* and 150 of *G. brasiliensis*, both native to upland areas of the Amazon Forest (Lorenzi et al. 2006), totaling 9 kg of fruit (Table 1). Fewer *G. brasiliensis* fruits were collected primarily because this species is less abundant, but also in part because birds fed preferentially on *G. brasiliensis* instead of *G. acuminata* (pers. obs.).

In total, 361 puparia were obtained, from which 196 specimens of *C. capitata* emerged: 107 from *G. acuminata* and 89 from *G. brasiliensis* (Table 1). Although the area contained other fruit trees that could potentially be hosts of *Anastrepha* species (Diptera: Tephritidae), only *C. capitata* was obtained from the collected fruits.

Garcinia acuminata and *G. brasiliensis* are new hosts for *C. capitata* in the state of Pará. *Garcinia brasiliensis* is a previously reported host of *C. capitata* in the state of São Paulo (Souza-Filho 1999). The present study makes the first association between a fruit fly species and *G. acuminata* in Brazil.

The percentage of infested fruits was 3 times greater for *G. brasiliensis* (24.0%) than *G. acuminata* (8.0%). *Garcinia acuminata* showed the largest number of puparia per kg of infested fruits (363.7 ± 48.9) and the largest number of puparia per fruit (5.2 ± 0.6) (Table 1). Despite the small size of the fruits (approximately 4 cm long and 3 cm in diameter, average weight 10.2 g), a considerable infestation rate was observed, as well as a pupal viability rate of nearly 50%.

The higher rates of infestation by *C. capitata* in *G. brasiliensis* than in *G. acuminata* may be explained by characteristics of the skin of its fruit. The skin of *G. acuminata* is tougher and may have influenced

Table 1. Rates of infestation of *Garcinia acuminata* and *Garcinia brasiliensis* fruits by *Ceratitis capitata*. Belém, Pará, Brazil.

Hosts	Fruits collected (n)	Weight (kg)	Fruits infested (%)	Puparia (n)	Infestation rate ^a		Pupal viability (%) ^a	<i>C. capitata</i> (n)
					puparia/fruit	puparia/kg		
<i>Garcinia acuminata</i>	508	7.14	8.0	213	5.2 ± 0.6	363.7 ± 48.9	41.9 ± 6.0	107 (49 ♂; 58 ♀)
<i>Garcinia brasiliensis</i>	150	1.86	24.0	148	4.1 ± 0.7	335.9 ± 57.4	52.6 ± 6.5	89 (42 ♂; 47 ♀)
Total	658	9.00	11.7	361				196 (91 ♂; 105 ♀)

^aMean (± SE), considering only infested fruits.

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the death rate of last-instar larvae inside the fruits, as the tough skin may have prevented them from exiting and pupating. We propose this hypothesis after having observed dead larvae inside the fruit during the screening process. This was not observed for *G. brasiliensis*, whose fruits have a thinner and more flexible skin.

Considering the total number of fruits collected (not only infested fruits), the average infestation rates were low for both host species (30.7 puparia per kg for *G. acuminata* and 80.6 puparia per kg for *G. brasiliensis*), when compared with other hosts of *C. capitata*. In southeastern Bahia State, with *C. capitata* showing a predominance of 89.18%, 2 varieties of coffee (*Coffea arabica* L.; Gentianales: Rubiaceae) presented high rates of infestation, namely, 163.89 and 133.17 puparia per kg in shade-grown and sun-cultivated plantations of Caturai Amarelo coffee, respectively, and 112.79 puparia per kg in sun-cultivated Novo Mundo coffee (Torres et al. 2010). Araújo et al. (2005) also reported high rates of infestation by *C. capitata* in star fruit (*A. carambola*), with 5.48 puparia per fruit and 118.8 puparia per kg of fruit, and in kumquat (*Fortunella* sp.; Sapindales: Rutaceae), with 2.16 puparia per fruit and 159.1 puparia per kg of fruit, in the municipalities of Mossoró and Assu, state of Rio Grande do Norte.

When fruits of *G. acuminata* were collected in 2008 in the same experimental orchard used in this study, no fruit flies were observed (Araújo et al. 2011). Infestation by *C. capitata* in the area is likely to be a recent event. The species has likely migrated from other hosts located near the experimental orchard, or from *in natura* fruit trading facilities (potentially infested fruits transported from various states in Brazil). Therefore, *C. capitata* may not be completely established at the study site, and it does not appear to be widely distributed in the region. Our report of *G. acuminata* and *G. brasiliensis* as new hosts for *C. capitata* in the state of Pará contributes towards a better understanding of the occurrence of this fruit fly in the Brazilian Amazon.

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Summary

Natural infestation of fruits of *Garcinia acuminata* Planch. & Triana and *Garcinia brasiliensis* C. Martius (Malpighiales: Clusiaceae) by *Ceratitidis capitata* (Wiedemann) (Diptera: Tephritidae) is reported for the first time in the state of Pará, Brazil. *Garcinia acuminata* is reported as a fruit fly host for the first time in Brazil.

Key Words: Amazon; medfly; *Garcinia acuminata*; *Garcinia brasiliensis*

Sumário

Registra-se pela primeira vez a infestação natural de frutos de *Garcinia acuminata* Planch. & Triana e de *Garcinia brasiliensis* C. Martius

(Malpighiales: Clusiaceae) por *Ceratitidis capitata* (Wiedemann) (Diptera: Tephritidae) no estado do Pará, Brasil. *Garcinia acuminata* é registrado como hospedeiro de moscas-das-frutas pela primeira vez no Brasil.

Palavras Chave: Amazônia; mosca-do-mediterrâneo; *Garcinia acuminata*; *Garcinia brasiliensis*

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