

## **Endemic Parasitoids Associated with *Anastrepha* spp. (Diptera: Tephritidae) Infesting Guava (*Psidium Guajava*) in Southern Bahia, Brazil**

Authors: Souza-Filho, Zilton Alves, De Araujo, Elton Lucio, Guimarães, Jorge Anderson, and Silva, Janisete Gomes

Source: Florida Entomologist, 90(4) : 783-785

Published By: Florida Entomological Society

URL: [https://doi.org/10.1653/0015-4040\(2007\)90\[783:EPAWAS\]2.0.CO;2](https://doi.org/10.1653/0015-4040(2007)90[783:EPAWAS]2.0.CO;2)

---

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](http://www.bioone.org/terms-of-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

ENDEMIC PARASITOIDS ASSOCIATED WITH *ANASTREPHA* SPP.  
(DIPTERA: TEPHRITIDAE) INFESTING GUAVA (*PSIDIUM GUAJAVA*)  
IN SOUTHERN BAHIA, BRAZIL

ZILTON ALVES SOUZA-FILHO<sup>1</sup>, ELTON LUCIO DE ARAUJO<sup>2</sup>,  
JORGE ANDERSON GUIMARÃES<sup>3</sup> AND JANISETE GOMES SILVA<sup>1</sup>

<sup>1</sup>Departamento de Ciências Biológicas, Universidade Estadual de Santa Cruz,  
Rodovia Ilhéus-Itabuna km 16, 45650-000-Ilhéus, Bahia, Brazil

<sup>2</sup>Departamento de Ciências Vegetais, Universidade Federal Rural do Semi-Árido,  
BR 110 km47, Costa e Silva, 59625-900-Mossoró, Rio Grande do Norte, Brazil

<sup>3</sup>Embrapa Centro Nacional de Pesquisa de Agroindústria Tropical,  
Rua Sara Mesquita 2270-Pici 60511110-Fortaleza, Ceará, Brazil

Brazil harbors a very high diversity of *Anastrepha* species that infest a wide variety of hosts. Out of the 195 *Anastrepha* species currently described, 95 species are known from Brazil, and these infest fruits in 31 plant families (Zucchi 2000). Many Myrtaceae are important fruit fly hosts, and approximately 25 species in the genera *Psidium*, *Eugenia*, and *Syzygium* are infested (Hernandez-Ortiz 2000). Guava (*Psidium guajava* L.), endemic to the Neotropical region, is the most valuable cultivated species in the Myrtaceae (Thaipong & Boonprakob 2005) and is one of the preferred fruit fly hosts in Brazil (Araujo & Zucchi 2003; Raga et al. 2006). It is also noteworthy that fruit from the family Myrtaceae is particularly attractive to parasitoids in the family Figitidae. This suggests a long-standing tritrophic relationship among these parasitoids, fruit flies, and myrtaceous fruit (Guimarães & Zucchi 2004; Guimarães et al. 1999, 2003).

Recent studies conducted in Central and South America revealed the presence of a large guild of native tephritid parasitoids (Ovruski et al. 2004, for review). Even though native parasitoids are potentially useful biological control agents of fruit flies, the available information on their diversity and abundance is still relatively scant for Brazil, where most systematic parasitoid surveys are restricted to a few locations in the southern and southeastern regions (Canal & Zucchi 2000; Guimarães et al. 2000; Uchôa-Fernandes et al. 2003). There is a considerable gap in these surveys, especially in the northeastern region, which is responsible for significant fruit production in Brazil (Canal & Zucchi 2000; Gonçalves et al. 2006). In the state of Bahia, previous studies have focused on the eastern region, Recôncavo Baiano (between 38°30' and 40°09'S latitude and 12°18' and 13°36'W longitude), approximately 500 km to the north of the current study site (Matrangolo et al. 1998; Canal & Zucchi 2000, for review; Carvalho 2005; Gonçalves et al. 2006).

We present the results of a survey in which we systematically sampled guava fruits in Una, southern Bahia, a region in the coastal zone sur-

rounded by one of the few and largest remnants of the highly endangered mature coastal rainforest in Brazil (Faria et al. 2006). The Brazilian Atlantic rainforest is considered one of the richest biomes on earth, and southern Bahia harbors high levels of endemism and diversity of plants and animals (Thomas et al. 1998; Faria 2006). Little is known regarding tephritid species and their associated parasitoids in southern Bahia wet forest or in agricultural ecosystems surrounded by or next to it. However, it is noteworthy that studies carried out in Mexico confirmed that native host plants in the rainforest area provide an important reservoir of native *Anastrepha* parasitoids (López et al. 1999; Aluja et al. 2003). Our study represents the first report describing the *Anastrepha*-parasitoid guild and the tritrophic relationships among these organisms in southern Bahia.

Our study site was a guava orchard of 0.5 ha within a 30-ha farm located in Una, Bahia, 40 m above sea level at 15°17'36"S latitude and 39°04'31" W longitude. The farm is located in an area surrounded by mature coastal rainforest and the native vegetation is classified as tropical lowland rainforest. Climate is defined as Af (tropical wet) with a mean annual temperature of 24.7°C and 1,827 mm rainfall. There is no distinct rainy season although rainfall is more concentrated from Feb to Apr and a dry period of 1-3 months may occur from Dec to Mar (Faria et al. 2006). The orchard comprised 100 trees of *P. guajava* cv Paluma and has been free of any pesticides for over 3 years. Fruit samples were collected weekly from Feb 2004 to Jan 2005. Samples of 10 ripe or ripening fruit were collected randomly both from the tree canopies and fallen fruit at the ground level. Sample sizes varied due to fruit availability throughout the year. The collected fruit were counted, weighed, and individually placed in plastic containers with a layer of vermiculite and covered with voile cloth until larvae emerged and pupated. All pupae obtained were placed in 30-mL plastic containers with a layer of vermiculite at the bottom and covered with voile cloth until adults emerged. Voucher specimens were depos-

ited at the Laboratório de Moscas-das-frutas, UFERSA (Universidade Federal Rural do Semi-Árido), Mossoró, RN, Brazil.

We collected a total of 505 guavas, weighing 44.5 kg, from which *A. fraterculus* (Wied.), *A. zenildae* Zucchi, and *A. sororcula* Zucchi were identified. A total of 376 guavas (74.5%) were infested by *Anastrepha* larvae and the mean infestation rate was  $10.6 \pm 13.2$  (SD) larvae per fruit or 120.6 pupae per kg of fruit. No specimens of *C. capitata* (Wied.) were recovered. The parasitism rate was 3.8% for all *Anastrepha* pupae recovered from guava fruit. We obtained 142 braconids (78%) (Hymenoptera: Braconidae, Opiinae), 40 figitids (22%) (Hymenoptera: Figitidae, Eucolilinae) and 9 diapriids (4.5%) (Hymenoptera: Diapriidae: Diapriinae). The most common braconid parasitoid recovered was *Doryctobracon areolatus* (Szépligeti) ( $n = 141$ ), along with a single specimen of *Opius* sp. ( $n = 1$ ). All figitid specimens obtained were *Aganaspis pelleranoi* (Brèthes) ( $n = 40$ ). One diapriid species *Trichopria* sp. near *anastrephae* Lima ( $n = 9$ ) was recovered.

Braconids were recovered from fruit collected from the tree canopies and from recently fallen fruit at the ground level. The most abundant parasitoid found in this survey, *Doryctobracon areolatus*, has been collected throughout Brazil (López et al. 1999; Araujo & Zucchi 2002; Uchôa-Fernandes et al. 2003; Carvalho 2005). *D. areolatus* shows a preference for parasitizing host larvae developing in fruits still hung on the tree (Aguiar-Menezes & Menezes 2002); however it is also noteworthy that some braconids, e.g., *D. areolatus* and *Diachasmimorpha longicauda* (Ashmead) are able to parasitize larvae in fallen fruit (López et al. 1999). Among the figitids, *A. pelleranoi* was the most abundant species and preferentially attacked larvae in fallen fruit (87.7%) over larvae in fruit collected from the canopy (12.3%), consistent with known *A. pelleranoi* oviposition behavior (Guimarães & Zucchi 2004; Ovruski et al. 2004; Souza et al. 2005). *Doryctobracon areolatus* was more prevalent in recently fallen fruit that were still intact while *A. pelleranoi* was recovered mainly from fallen fruit that had been on the ground for a longer time and were extremely ripe or almost rotting.

Previous studies have recorded the presence of one species of *Trichopria*, *T. anastrephae* Lima, associated with *Anastrepha* spp. in Brazil in the states of Rio de Janeiro and Santa Catarina (Aguiar-Menezes et al. 2001; Garcia & Corseuil 2004).

Parasitoid diversity was very similar to the results obtained in surveys involving guava fruit in several regions in Brazil, around 4 parasitoid species (Aguiar-Menezes & Menezes 2002; Guimarães et al. 1999, 2003). Further studies, including more intensive and long term sampling of guava and other *Anastrepha* hosts, mainly native fruit, are necessary to determine the entire guild of native parasitoids in this region.

We thank Mr. Carlos Niella and Mrs. Tania Niella for kindly allowing us to use their farm as a study site; Daniela B. Vidal, Mirian S. Santos, Nívea M. O. Silva, and Ricardo A. Nink for invaluable help in the field and at the lab. We are grateful to Bruce A. McPherson, Carter R. Miller, and 3 anonymous reviewers for helpful comments on the manuscript. This study was funded by CAPES (Coordenadoria de Aperfeiçoamento do Pessoal do Ensino Superior, Brasília, Brazil) and Universidade Estadual de Santa Cruz and was part of ZASF M.Sc. thesis.

#### SUMMARY

The occurrence of larval-pupal parasitoids (Hymenoptera) associated with *Anastrepha* spp. (Diptera: Tephritidae) is reported in southern Bahia, Brazil, for the first time. The specimens were obtained from pupae reared from infested guava (*Psidium guajava* L.). Two species of Braconidae, 1 species of Figitidae and 1 species of Diapriidae are reported.

#### REFERENCES CITED

- AGUIAR-MENEZES, E. L., E. B. MENEZES, P. S. SILVA, A. C. BITTAR, AND P. C. R. CASSINO. 2001. Native Hymenoptera parasitoids associated with *Anastrepha* spp. (Diptera: Tephritidae) in Seropédica City, Rio de Janeiro, Brazil. *Florida Entomol.* 84: 706-711.
- AGUIAR-MENEZES, E. L., AND E. B. MENEZES. 2002. Effect of time of permanence of host fruits in the field on natural parasitism of *Anastrepha* spp. (Diptera: Tephritidae). *Neotrop. Entomol.* 31: 589-595.
- ALUJA, M., J. RULL, J. SIVINSKI, A. L. NORRBOOM, R. A. WHARTON, R. MACÍAS-ORDONEZ, F. DIAZ-FLEISCHER, AND M. LÓPEZ. 2003. Fruit flies of the genus *Anastrepha* (Diptera: Tephritidae) and associated parasitoids (Hymenoptera) in the tropical rain forest biosphere reserve of Montes Azules, Chiapas, Mexico. *Environ. Entomol.* 32: 1377-1385.
- ARAUJO, E. L., AND R. A. ZUCCHI. 2002. Parasitóides (Hymenoptera: Braconidae) de moscas-das-frutas (Diptera: Tephritidae) na região de Mossoró/Assu, estado do Rio Grande do Norte. *Arq. Inst. Biol.* 69: 65-68.
- ARAUJO, E. L., AND R. A. ZUCCHI. 2003. Moscas-das-frutas (Diptera: Tephritidae) em goiaba (*Psidium guajava* L.), em Mossoró, RN. *Arq. Inst. Biol.* 70: 73-77.
- CANAL, N. A., AND R. A. ZUCCHI. 2000. Parasitóides—Braconidae, pp. 119-126 In A. Malavasi and R.A. Zucchi [eds.], *Moscas-das-frutas de Importância Econômica no Brasil: Conhecimento Básico e Aplicado*. Holos Editora, Ribeirão Preto, Brazil.
- CARVALHO, R. S. 2005. Avaliação das liberações inundativas do parasitóide exótico *Diachasmimorpha longicauda* (Ashmead) (Hymenoptera: Braconidae) em pomar diversificado em Conceição do Almeida, BA. *Neotrop. Entomol.* 34: 799-805.
- FARIA, D. M. 2006. Phyllostomid bats of a fragmented landscape in the north-eastern Atlantic forest, Brazil. *J. Trop. Ecol.* 22: 531-542.
- FARIA, D. M., R. R. LAPS, J. BAUMGARTEN, AND M. CETRA. 2006. Bat and bird assemblages from forest and

- shade cacao plantations in two contrasting landscapes in the Atlantic Forest of southern Bahia, Brazil. *Biodiv. Conserv.* 15: 587-612.
- GARCIA, F. R. M., AND E. CORSEUIL. 2004. Native hymenopteran parasitoids associated with fruit flies (Diptera: Tephritidae) in Santa Catarina State, Brazil. *Florida Entomol.* 87: 517-521.
- GONÇALVES, G. B., J. C. G. SANTOS, C. E. SILVA, E. S. SANTOS, R. R. NASCIMENTO, A. E. G. SANT'ANA, AND R. A. ZUCCHI. 2006. Occurrence of fruit flies (Diptera: Tephritidae) in the state of Alagoas, Brazil. *Florida Entomol.* 89: 93-94.
- GUIMARÃES, J. A., AND R. A. ZUCCHI. 2004. Parasitism behavior of three species of Eucilinae (Hymenoptera: Cynipoidea, Figitidae) parasitoids of fruit flies (Diptera). *Neotrop. Entomol.* 33: 217-224.
- GUIMARÃES, J. A., R. A. ZUCCHI, N. B. DIAZ, M. F. SOUZA FILHO, AND M. A. F. UCHÔA. 1999. Espécies de Eucilinae (Hymenoptera, Cynipoidea: Figitidae) parasitoides de larvas frugívoras (Diptera: Tephritoidea) no Brasil. *Ann. Soc. Entomol. Brasil* 28: 263-273.
- GUIMARÃES, J. A., N. B. DIAZ, AND R. A. ZUCCHI. 2000. Parasitoides—Figitidae (Eucilinae), pp. 127-134 *In* A. Malavasi and R. A. Zucchi [eds.], *Moscas-das-frutas de Importância Econômica no Brasil: Conhecimento Básico e Aplicado*. Holos Editora, Ribeirão Preto, Brazil.
- GUIMARÃES, J. A., F. E. GALLARDO, N. B. DIAZ, AND R. A. ZUCCHI. 2003. Eucilinae species (Hymenoptera: Cynipoidea: Figitidae) parasitoids of fruit-infesting dipterous in Brazil: Identity, geographical distribution and host associations. *Zootaxa* 278: 1-23.
- HERNANDEZ-ORTIZ, V. 2000. Fytofagia y sus implicaciones evolutivas em Tephritidae, pp. 79-88 *In* Curso Internacional sobre Moscas de la Fruta, 13, Chiapas, Memórias. Metapa de Dominguez, Chiapas.
- LOPEZ, M., M. ALUJA, AND J. SIVINSKI. 1999. Hymenopterous larval-pupal and pupal parasitoids of *Anastrepha* flies (Diptera: Tephritidae) in Mexico. *Biol. Control* 15: 119-129.
- MATRANGOLO, W. J. R., A. S. NASCIMENTO, R. S. CARVALHO, E. D. MELO, AND M. JESUS. 1998. Parasitoides de moscas-das-frutas (Diptera: Tephritidae) associados a fruteiras tropicais. *Ann. Soc. Entomol. Brasil* 27: 593-603.
- OVRSKI, S. M., P. SCHLISERMAN, AND M. ALUJA. 2004. Indigenous parasitoids (Hymenoptera) attacking *Anastrepha fraterculus* and *Ceratitis capitata* (Diptera: Tephritidae) in native and exotic host plants in Northwest Argentina. *Biol. Control* 29: 43-57.
- RAGA, A., M. F. SOUZA FILHO, D. A. O. PRESTES, J. A. AZEVEDO FILHO, AND M. E. SATO. 2006. Susceptibility of guava genotypes to natural infestation by *Anastrepha* spp. (Diptera: Tephritidae) in the municipality of Monte Alegre do Sul, state of São Paulo, Brazil. *Neotrop. Entomol.* 35: 121-125.
- SOUZA, S. A. S., A. L. S. RESENDE, P. C. STRIKIS, J. R. COSTA, M. S. F. RICCI, AND E. L. AGUIAR-MENEZES. 2005. Natural infestation by frugivorous flies (Diptera: Tephritoidea) in shaded and unshaded arabic coffee under organic management in Valença, RJ, Brazil. *Neotrop. Entomol.* 34: 639-648.
- THAIPONG, K., AND U. BOONPRAKOB. 2005. Genetic and environmental variance components in guava fruit qualities. *Scientia Horticulturae* 104: 37-47.
- THOMAS, W. W., A. M. V. CARVALHO, A. M. A. AMORIM, J. GARRISON, AND A. L. ARBELA'EZ, 1998. Plant endemism in two forests in southern Bahia, Brazil. *Biodiversity and Conservation* 7: 311-322.
- UCHÔA-FERNANDES, M. A., R. M. S. MOLINA, I. OLIVEIRA, R. A. ZUCCHI, N. A. CANAL DAZA, AND N. B. DÍAZ. 2003. Larval endoparasitoids (Hymenoptera) of frugivorous flies (Diptera, Tephritoidea) reared from fruits of the cerrado of the State of Mato Grosso do Sul, Brazil. *Rev. Bras. Entomol.* 47: 181-186.
- ZUCCHI, R. A. 2000. Espécies de *Anastrepha*, sinônimas, plantas hospedeiras e parasitoides, pp. 41-48 *In* A. Malavasi and R.A. Zucchi [eds.], *Moscas-das-frutas de Importância Econômica no Brasil: Conhecimento Básico e aplicado*. Holos Editora, Ribeirão Preto, Brazil.