Parasitoids of fruit flies collected in Brazil

Carlos Henrique Marchiori¹
¹ Instituto Federal Goiano

Abstract

The objective of this work was to know the parasitoids of fruit flies in western Minas Gerais and southern Goiás region, Brazil. Then fruits (orange, carrabolla, guava, mango and cherry) were deposited on a 5cm layer of fine sand in plastic cylindrical, transparent and open at the top containers. Weekly pupae were separated from the substrate by flotation. Removed and placed in glass jars with fine sand kept at room temperature until the emergence of flies and/or their parasitoids. Trichopria Anastrepha Costa Lima (Hymenoptera: Diapriidae) was the most common in western Minas specie with 44.5% and Doryctobracon areolatus (Szépligeti) (Hymenoptera: Braconidae) was the most collected species in southern Goiás with 89.6%.

Key words: agricultural, fruits, rural areas, natural enemy, biological control

1. Introduction

Among the many Brazilian agricultural sectors, horticulture noteworthy due to positive characteristics it plays in rural setting. This agricultural activity is present in all Brazilian states and involves more than 5 million people who work directly or indirectly evidencing its importance as an economic activity, generating jobs and responsible farmers remain in rural areas (Fachinello et al., 2011).

The fruit flies (Diptera: Tephritidae) cause economic damage to fruit due to early fruit drop or its depreciation for consumption (Leonel Jr. et al., 1991; Rabelo et al., 2013; Veloso et al., 2012). The fruit flies have wide geographical distribution, being found almost worldwide (Aluja, 1994; 1999; Machado et al., 1995), and causing damage to fruit species of economic importance.

These insects are the most important pest for Brazilian fruit. In Brazil occur in a variety of hosts and in different ecological regions (Malavasi et al., 1980). Among the fruit flies that cause damage to fruit, Ceratitis capitata (Wiedemann) (Diptera: Tephritidae) occur in...
Brazil several Anastrepha species (Nunes, et al., 2002; Alberti et al., 2012; Machota Jr. et al., 2013).

Among the means for controlling flies, chemical insecticides are the most widely used. However, these may lose their efficiency as populations become resistant to them (Silveira et al., 1989). The appearance of resistance to insecticides explains the growing need to introduce alternative control programs aimed towards insects control (Silveira et al., 1989).

As a possibility to control these insects, the natural regulators can be used, such as parasitoids that are the responsible agents for the reduction of the insects pests populations (Vilela et al., 1999; Garcia and Ricalde, et al., 2013).

Parasitoids are responsible for reducing the populations of flies that proliferate on various substrates. Evaluation of these species for natural control over these insects is important for enabling studies that aim towards subsequent selection of species for use in biological control programs (Marchiori and Pentaeo-Dias, 2001). There is little information on native species of hymenopteran parasitoids of fruit flies from the Neotropical region.

The objective of this study was to understand the main species of parasitoids of frugivorous flies in southern Goiás and west Minas Gerais, Brazil.

2. Materials and Methods

The study was conducted at the farm in Santa Therese in this region west of Minas Gerais (MG) (8°20'S and 44°53'W'). In southern Goiás (GO) Brazil. The experiment was conducted at the farm of the Faculty of Agronomy (18°25'S and 49°3'W). Each week the carrabolla and cherry fruits collected were deposited on a 5cm layer of fine sand, in plastic containers (20cm in height and 10cm in diameter), cylindrical, transparent and open at the top. The openings of the containers were sealed after placing the fruit with organza secured with elastic to prevent the entry of other insects. Weekly substrate pupae were separated by flotation bucket with water removed with the aid of a sieve, dried, counted and packaged in glass bottles with fine sand kept at room temperature until the emergence of the flies and/or their parasites. The collections were made in southern Goiás of September 1998 to January 1999 and west of Minas Gerais of November 2001 to January 2002.
The total percentage parasitism was calculated by means of the number of pupae parasitized, divided by the total number of pupae collected, and multiplied by 100. The percentage parasitism of each parasitoid species was calculated by means of the number of pupae parasitized per species of parasitoid, divided by the total number of pupae from that host, and multiplied by 100.

3. Results and Discussion

A total of 304 *Anastrepha* spp. obtained 45 specimens of parasitoids in western Minas Gerais and 870 *Anastrepha* spp. were obtained. 48 specimens of parasitoids in southern Goiás (Table 1).

This difference may be due to the density of hosts, the number of collections made, sample size and characteristics of the area chosen for the collection site, with vegetation that ensures basic conditions to maintain diverse wildlife host insects.

*Trichopria Anastrepha* Costa Lima (Hymenoptera: Diapriidae) was the species most collected in western Minas Gerais with 44.0%, can be considered one of the most important parasitoids of flies in this region. Probably, this fact may have been influenced by the ability to search for and parasitoid density.

*Trichopria anastrephae* is a very common generalist species in Brazil, usually occurring by single parasitoid pupae of the host. According Marchiori and Penteado- Dias (2001), several species of endoparasites and oviposit diapriídeos are both in larvae and in pupae of flies, however, those who attack tephritids are minority, comprising only five species recorded to date (Ovruski et al., 2000).

*Doryctobracon areolatus* (Szépligeti,) (Hymenoptera: Braconidae) (Figure 2) was the most collected species in southern Goiás with 89.6%, probably its efficiency during the larval stage parasitize their host or because of seasonal variation. According Matrangolo et al. (1998), *D. areolatus* could anticipate the parasitism of larvae in relation to other native species that parasitize larvae in more developed stages, resulting in an advantage over other species.

*Doryctobracon areolatus* is solitary endoparasitoid, laying their eggs in the larval stage of fruit flies, but the adults emerge from the pupae of the host (Araújo et al., 1972). According to Nunes et al., (2012) among parasitoids, *D. areolatus* is more common in most of the sampled fruit.
In Costa Rica, Jiron and Mexezon (1989) reported that there predominance of these species as parasitoid flies of the genus *Anastrepha*. According Ovruski et al. (2000) this species has a considerable potential for controlling populations of *Anastrepha*.

Regarding the total percentage of parasitism west region of Minas Gerais was 14.8% and southern Goiás 5.5% (Table 2). Probably related to the low synanthropy of the species of dipterans and parasitoids collected in the southern region of Goiás studied the locality is now surrounded by human populations on all sides.

*T. anastrepha* showed most percentage of parasitism in western Minas Gerais of 6.6 % in southern Goiás was D. areolatus with 5.0%. Guimarães et al. (1999), working in 27 municipalities in the five Brazilian regions, found that parasitism ranged from 0.007 to 42.86%.

*Trichopria anastrephae* was obtained from *Anastrepha fraterculus* (Wiedemann) (Diptera: Tephritidae) in guavas, with a parasitism rate of 5.8%. The species D. areolatus, Utetes anastrephae (Viereck) (Hymenoptera: Braconidae) and *Asobara anastrephae* (Muesebeck) (Hymenoptera: Braconidae) are responsible for the natural control of southern Bahia, with an average of 8.38% parasitism (Melo et al., 2012; Pereira-Rego et al., 2013).

It is possible to control these insects, by using the natural regulators such as parasitoids, responsible which are the agents for the reduction of the insect pests populations.

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Table 1. Relationship of parasitoids collected in Anastrepha spp. in southern Goiás and western Minas Gerais, Brazil

| Taxonomic Group | Parasitoids-west of MG | Parasitoids-southern of MG |
|-----------------|-------------------------|-----------------------------|
| Braconidae:     |                         |                             |
| Doryctobracon areolatus | 05 | 43                          |
| Diapriidae:     |                         |                             |
| Trichopria anastrepha  | 20 | 00                          |
| Figitidae:      |                         |                             |
| Aganaspis pelleranoi  | 10 | 05                          |
| Leptopilina bouardi  | 02 | 00                          |
| Odontosoma anastrepha  | 02 | 00                          |
| Pteromalidae:   |                         |                             |
| Pachycercoides vinemmiæ  | 06 | 00                          |
| Spalangia endius   | 45 | 00                          |
Table 2. Percentage of parasitism of parasitoids collected in southern of Goiás and western of Minas Gerais, Brazil.

| Taxonomic Group | % parasitism-west of MG | % parasitism-southern of GO |
|-----------------|-------------------------|-----------------------------|
| Braconidae:     |                         |                             |
| Doryctobracon areolatus | 1.6                  | 5.0                         |
| Diapriidae:     |                         |                             |
| Trichopria anastrepha | 6.6                 | 0.0                         |
| Figitidae:      |                         |                             |
| Aganaspis pelleranoi | 0.0                 | 0.3                         |
| Leptopilina boulardi | 3.3                 | 0.0                         |
| Oebostosoma anastrepha | 0.7                 | 0.0                         |
| Pteromalidae:   |                         |                             |
| Pachyceropoideus vindemmiae | 0.7        | 0.3                         |
| Spalangia endius | 2.0                    | 0.0                         |
|                 | 304                    | 870                         |

Source: Mitteilungen Klosternburg 2013.