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Species of Chrysopidae (Neuroptera) associated to trellised tomato crops in two cities of Rio de Janeiro State, Brazil

Espécies de Chrysopidae (Neuroptera) associadas à cultura do tomateiro estaqueado em dois municípios do estado do Rio de Janeiro, Brasil.

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ABSTRACT: This research aimed to investigate the diversity of species of lacewings (Chrysopidae) associated to trellised tomato crops in the counties of Cambuci and Seropédica, in Rio de Janeiro State, Brazil. Eggs and adults of chrysopids were collected, manually and by oral suction device, respectively, in Cambuci (commercial farming) and Seropédica (experimental farming). Four species were obtained: *Ceraeochrysa cincta* (Schneider, 1851), *Ceraeochrysa* sp1., *Chrysopodes elongatus* (Freitas; Penny, 2001) and *Chrysopodes* sp1. in the experimental farming in Seropédica, while in the commercial farming in Cambuci only two species were found: *Chrysoperla externa* (Hagen, 1861) and *Ceraeochrysa cubana* (Hagen, 1861).

KEYWORDS: biological control; diversity; green lacewings; predators; *Solanum lycopersicum*.

RESUMO: Objetivou-se, com a presente pesquisa, conhecer a diversidade de espécies de crisopídeos (Chrysopidae) em cultivos de tomateiro estaqueado localizados nos municípios de Cambuci e Seropédica, no Rio de Janeiro, Brasil. Ovos de crisopídeos foram coletados manualmente, e os adultos do predador, com o uso de aspirador bucal em lavoura comercial, em Cambuci, e em lavoura experimental, em Seropédica. Em Seropédica foram obtidas quatro espécies de crisopídeos: *Ceraeochrysa cincta* (Schneider, 1851), *Ceraeochrysa* sp1., *Chrysopodes elongatus* (Freitas; Penny, 2001) e *Chrysopodes* sp1. e em Cambuci, duas espécies: *Chrysoperla externa* (Hagen, 1861) e *Ceraeochrysa cubana* (Hagen, 1861).

PALAVRAS-CHAVE: controle biológico; crisopídeos, diversidade; predadores; *Solanum lycopersicum*.

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Chrysopidae (Neuroptera) is a family of entomophagous insects with a great diversity of species, which are distributed worldwide, being found everywhere except in Antarctica (Brooks; Barnard, 1990; Albuquerque et al., 2001). In Nearctic and Neotropical ecozones the chrysopids occur from Canada until the south end of South America (Albuquerque et al., 1994; Tauber et al., 2000). Chrysopids are present in both natural ecosystems and in human modified (anthropic) environments, thus evidencing a remarkable ecological plasticity (Carvalho; Souza, 2009).

Taxonomically, Chrysopidae is divided into three subfamilies: Apochrysinae, Chrysopinae and Nothochrysinae. Chrysopinae, the largest subfamily, encompasses over 97% of the known chrysopid species, comprising four tribes, out of which Chrysopini is considered the most relevant group, including all chrysopids of economic and applied importance (New, 2001). According to Brooks; Barnard (1990), there are 927 described species in the subfamily Chrysopinae, out of which 91 species belong to the tribe Ankylopterygini; 116, to the tribe Belonopterygini; 175, to the tribe Leucochrysini; and 545, to the tribe Chrysopini.

Chrysopids, commonly known as green lacewings, are considered to be voracious predators of small arthropods (Senior; McEwen, 2001). They are important natural enemies of crop pests, such as aphids, thrips, mealybugs, leafhopper, whiteflies, psyllids, eggs and larvae of coleopterous and dipteran, eggs and neonate lepidopterous larvae, besides mites and several very small arthropods, which present soft integument (Canard; Principi, 1984; Carvalho; Souza, 2009).

Lacewings occur naturally in several crops of economic importance, including vegetables (Tauber et al., 2000; Penny, 2002). In tomato crops, lacewings feed on a wide diversity of pests, such as the sweet potato whitefly *Bemisia tabaci* (Gennadius, 1889) biotype B (Hemiptera: Aleyrodidae), the green peach aphid *Myzus persicae* (Sulzer, 1776) and the potato aphid *Macrosiphum euphorbiae* (Thomas, 1878) (Hemiptera: Aphididae), eggs and larvae of the tomato fruitworm *Helicoverpa zea* (Boddie, 1850) (Lepidoptera: Noctuidae), and eggs of the South American tomato leafminer *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae), playing an important role in the regulation of phytophagous pest populations in several countries (Szentkirályi, 2001), including Brazil (Oliveira et al., 2003).

Despite its importance as biological control agents in vegetables crops, little information is available about the diversity of lacewings species associated to those crops in some regions of Brazil. Therefore, this study aimed at knowing the species of lacewings occurring in trellised tomato crops in two cities of the Rio de Janeiro State.

Lacewings were collected in tomato crops located in Cambuci (21° 34' 22" S and 41° 54' 35" W; 104 m high) on May 8, 2009, and in Seropédica (22º 44' 29" S and 43º 42' 19" W; 36 m high) on May 20, 2009, in the Rio de Janeiro State, Brazil. For each day, the insects were collected for one hour.

In Cambuci, the lacewings were collected in commercial trellised tomato crops grown with 'Paron' hybrid, containing around 5,000 plants. Moreover, in Seropédica the insects were collected in an experimental trellised tomato crop grown with 'Karina' hybrid, located in the campus of *Universidade Federal Rural do Rio de Janeiro* (UFRRJ), containing about 550 plants.

Eggs and adults of lacewings were collected, manually and by using an insect vacuum collecting chamber (glass vial aspirator), respectively, placed into glass tubes (8.5 cm high x 2.5 cm in diameter), which were closed with PVC film, individually identified and transported to the Official Laboratory of Phytosanitary Diagnostics (UFRRJ). From Cambuci, four eggs and five adults were collected, whereas from Seropédica five eggs and two adults were collected.

In the laboratory, the eggs were individualized into new glass tubes and kept under controlled conditions at 25 ± 2ºC, RH of 70 ± 10%, with 12 hours of photophase, until the larvae hatched. Afterwards, the larvae were fed *ad libitum* with eggs of the factitious prey *Anagasta kuehniella* (Zeller, 1879) (Lepidoptera: Pyralidae) until the late third-instar stage, when they reached the pupae stage, being kept into the tubes until the emergence of adults.

Both field-collected adults and adults originated from field-collected eggs were placed into glass tubes (8.5 cm high x 2.5 cm diameter), which were closed with PVC film, individually identified and sent to a specialist for accurate identification.

In the trellised tomato crops located in Cambuci and Seropédica counties, in the Rio de Janeiro State, specimens belonging to three different genus of Chrysopini (*Ceraeochrysa* – Adams, 1982; *Chrysoperla* – Steinmann, 1964 and *Chrysopodes* – Navás, 1913) were obtained. From Seropédica, four species were obtained: *Ceraeochrysa cincta* (Schneider, 1851) (one specimen), *Ceraeochrysa* sp1. (one specimen), *Chrysopodes elongatus* (Freitas; Penny, 2001)(one specimen) and *Chrysopodes* sp1. (one specimen), and from Cambuci, two species were collected: *Chrysoperla externa* (Hagen, 1861) (five specimens) and *Ceraeochrysa cubana* (Hagen, 1861) (two specimens).

Records of *Chrysopodes elongatus*, *Chrysoperla externa* and *Ceraeochrysa cubana* in Brazil were recently published by Ribeiro et al. (2009) in mango orchards located in the semiarid area of the Southwestern Bahia State.

There are reports in literature showing that the genus *Ceraeochrysa*, among the Chrysopini, is characterized as the largest one, as well as the dominant in the New World, regarding both the number of species and the number of individuals, being the second largest genus of Chrysopidae,

after the *Leucochrysa* McLachlan, 1868 (Adams, 1982; Brooks; Barnard, 1990). Most *Ceraeochrysa* species occur in tropical regions, being frequently found in agricultural systems, including vegetables, cereals, orchards, forests etc., where *Ceraeochrysa* larvae feed on a great diversity of arthropod-pest species (Tauber et al., 2000; Freitas et al., 2009), and are considered an important group of biological control agents (Albuquerque et al., 2001).

Chrysoperla is also globally distributed, and in Brazil there are four species: *Chrysoperla defreitasi* (Brooks, 1994), *Chrysoperla raimundoi* (Freitas; Penny, 2001), *Chrysoperla genanigra* (Freitas, 2003) and *C. externa*, which are not restricted to Brazil (Morales; Freitas, 2010). *Chrysoperla* is, among the Chrysopidae, the most frequently used in biological control programs in North and South America (Albuquerque et al., 2001).

Chrysopodes have been neglected, despite having a large number of species and being diverse in the Neotropical region. Several species of *Chrysopodes* are often found in agricultural and horticultural environments, as well as in forests, parks, and gardens, which demonstrates its importance as biological control agents (Silva et al., 2007). On the other hand, the genus *Chrysoperla* and *Ceraeochrysa* are the most studied ones (Albuquerque et al., 2001).

It is believed that the small number of collected insects in both visited cities (Cambuci and Seropédica) is due to the management that is adopted to control pests and diseases in tomato crops, which is subjected to a large number of pesticide sprayings. However, the larger number of species found in Seropédica may be associated to the proximity of this crop area with native vegetation.

In conclusion, the species *Chrysoperla externa*, *Ceraeochrysa cubana*, *Ceraeochrysa cincta*, *Ceraeochrysa* sp1., *Chrysopodes elongatus* and *Chrysopodes* sp1. can be associated with tomato crops in Cambuci and Seropédica, Rio de Janeiro State, Brazil.

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