ISSN 0100-2945 DOI: http://dx.doi.org /10.1590/0100-29452019047

Revista Brasileira de Fruticultura

Plant protection

First record of *Isia alcumena, Spodoptera cosmioides* and *S. eridania* (LEPIDOPTERA: NOCTUOIDEA) attacking Passion Fruit (*Passiflora edulis* Sims) in Brazil

Tamara Esteves Ferreira[1], Fábio Gelape Faleiro[2], Nilton Tadeu Vilela Junqueira[2], Amabílio Jose Aires de Camargo[2], José Augusto Teston[3], Alexandre Specht[2]

Abstract - Brazil is considered the center of origin and diversity of passifloras. These species have a great importance to *in natura* fruits consumption, industrialization, medicinal use and also as ornamental plants. The different *Passiflora* species are host of a great diversity of arthropods that can cause injuries, economic damages and, in some situations, the plant death. Among the arthropods, leafhopper caterpillars are considered frequent and severe pests in the main passion fruit producing regions. The present work is an occurrence report of *Isia alcumena* and *Spodoptera cosmioides* attacking passion fruit plants (*Passiflora edulis* Sims) in the Federal District, Brazil. The *S. cosmioides* and *S. eridania* caterpillars were collected while consuming leaves of *Passiflora edulis* intra-specific hybrid located in the Germplasm Active Bank 'Flor da Paixão' at Embrapa Cerrados. The caterpillars of *I. alcumena* were collected on leaves of the *Passiflora edulis* cv. BRS Rubi do Cerrado at the Agricultural Support Unit, Embrapa Cerrados. After collected, the caterpillars were individualized in a breeding system with leaves of the host plants. The development of the caterpillar was accompanied until the emergence of the adults, which were identified and fixed in entomological pins for permanent dry preservation.

Index terms: Insecta, polyphagous larvae, passion fruit, owlet moths, occasional pests.

Primeiro registro de *Isia alcumena, Spodoptera cosmioides* e *Spodoptera eridania* (LEPIDOPTERA: NOCTUOIDEA) em maracujazeiro (*Passiflora edulis* Sims) no Brasil

Resumo- O Brasil é considerado o centro de origem e de diversidade das passifloras, que apresentam importância, tanto para o consumo *in natura*, industrialização, uso medicinal e também como plantas ornamentais. As diferentes espécies de *Passiflora* hospedam uma grande diversidade de artrópodes que, ocasionando injúrias podem causar danos econômicos e morte da planta. Dentre os artrópodes, as lagartas-desfolhadoras são consideradas as pragas mais frequentes e severas nas principais regiões produtoras de maracujá. Assim, o objetivo foi informar o primeiro registro da ocorrência das espécies *Isia alcumena*, *Spodoptera cosmioides* e *S. eridania* atacando maracujazeiros no Distrito Federal, Brasil. As lagartas de *S. cosmioides* e *S. eridania* foram coletadas enquanto consumiam folhas de híbridos intraespecíficos de *Passiflora edulis* cultivado no banco ativo de germoplasma "Flor da Paixão" da Embrapa Cerrados. Já as lagartas de *I. alcumena* foram coletadas em folhas da cultivar BRS Rubi do Cerrado, na Unidade de Apoio da Fruticultura da Embrapa Cerrados. Após a coleta, as lagartas foram individualizadas em sistema de criação com folhas das plantas hospedeiras. O desenvolvimento das lagartas foi acompanhado até à emergência dos adultos, que foram identificados e fixados em alfinetes entomológicos para preservação permanente, a seco.

Termos para indexação: Insecta, lagartas polífagas, maracujá, noctuoides, pragas ocasionais.

Corresponding author:
tamaraeferreira@yahoo.com.br

Received: March 13, 2019
Accepted: July 11, 2019

[1]PhD Student in Agronomy from the University of Brasilia (UNB), Brasília-DF, Brazil. Email: tamaraeferreira@yahoo.com.br (ORCID 0000-0001-5546-3174).

[2]PhD, Researcher at Embrapa Cerrados, Planaltina-Distrito Federal, Brazil. Emails: fabio.faleiro@embrapa.br (ORCID 0000-0001-8901-6428); nilton.junqueira@embrapa.br (ORCID 0000-0001-9814-7104); amabilio.camargo@embrapa.br (ORCID 0000-0001-6020-2067); alexandre.specht@embrapa.br (ORCID 0000-0002-8921-0340).

[3]PhD Professor in Biological Sciences, Federal University of Western Pará (UFOPA), Santarém-Pará, Brazil. Email: jateston@ufpa.br (ORCID 0000-0003-0741-0347).

Passion fruit, widely distributed in the tropics and temperate regions, belong to the family Passifloraceae, which is composed of 24 subgenera and approximately 520 species. It is estimated that more than 150 of them are originated from Brazil and about 70 produce edible fruits (BERNACCI et al. 2013; VIEIRA & CARNEIRO, 2004).

The species of the genus *Passiflora* are important since they are associated to the basic needs of the human being and can be used in food, medicine manufacturing and also as ornamental plants due to the beauty and diversity of their flowers and leaves (FALEIRO et al. 2012).

Although there are several different species of *Passiflora*, only some of them are considered economically important. According to Faleiro et al. (2008; 2017), *P. edulis* Sims (sour passion fruit) is the most cultivated species worldwide. In general, in the commercial crops of *P. edulis*, phytosanitary problems occur resulted from the expansion and continued use of the same planting areas Other species such as *P. ligularis*, *P. alata*, *P. setacea*, *P. cincinnata*, *P. tripartita*, *P. quadrangularis* and *P. maliformis* are also commercially cultivated mainly in Brazil and Colombia (FALEIRO et al. 2008; 2017)

Among the insects and pests that can damage the passion fruit tree, the Lepidoptera represented especially by the Nymphalidae and Notodontidae (subfamily Dioptinae), are the most common species that attack passion fruit, which evolution coincides with the Passifloraceae (MILLER, 2009; MASSARDO et al. 2015). However, there have been species of Lepidoptera of other families associated to the *Passiflora* including: Coleophoridae, Cossidae, Erebidae, Geometridae, Gracillariidae, Hepialidae, Noctuidae, Oecophoridae, Psychidae, Pyralidae, Saturniidae, Sphingidae and Tortricidae (SILVA et al. 1968; CHACON e ROJAS 1984; MESSENGER, 1997; CAUSTON et al. 2000; PASTRANA, 2004; BRITO et al. 2013).

The present work is the first occurrence report of *Isia alcumena* (Berg, 1882) (Erebidae: Arctiinae), *Spodoptera cosmioides* (Walker, 1858) and *Spodoptera eridania* (Stoll, 1782) (Noctuidae: Noctuini) caterpillars attacking sour passion fruit plants (*Passiflora edulis* Sims) in the Federal District, Brazil.

The caterpillars of *I. alcumena* (n = 43) were collected on leaves, flowers and fruits of the *P. edulis* cultivar BRS Rubi do Cerrado in a greenhouse at the Fruit Support Unit, at Embrapa Cerrados, in Planaltina, DF. The *S. cosmioides* (n = 27) and *S. eridania* (n = 117) caterpillars were collected while consuming leaves, flowers and fruits of *Passiflora edulis* intra-specific hybrids located in the Germplasm Active Bank 'Flor da Paixão' at Embrapa Cerrados in Planaltina, DF (15°35'30''S; 47°42'00''W). The infestation caused by the larvae of *I. Alcumena* (December 2018), *S. Cosmioides* (September 2018) and *S. Eridania* (January 2019) was recorded (Figure 1).

After collected, the caterpillars were individually placed in transparent plastic containers with lids (30 mL) and fed with leaves of the passion fruit plants where they were found. The development of the caterpillars was monitored until the pupa stage and the emergence of adults. The pupae were kept in moistened containers and with expanded vermiculite. After the emergence, the adults were killed and fixed in entomological pins for permanent dry preservation.

The identification of the emerged adults was performed using bibliographical sources such as from Travassos (1947) for *I. Alcumena*, from the taxonomists and author José Augusto Teston and Pogue (2002) for *S. Cosmioides* and *S. Eridania* from the taxonomists and author Alexandre Specht. There are records of *I. Alcumena* caterpillars feeding on one type of arnica ("arnica do mato" - *Chromolaena odorata* L.) and mango (*Mangifera indica* L.), (GUAGLIUMI, 1966). On the other side, *S. cosmioides* are polyphagous and eat leaves of 126 host plants belonging to 40 botanical families (SPECHT e ROQUE-SPECHT, 2016). It is important to emphasize that *S. eridania* caterpillars were found eating *P. edulis*, in Puerto Rico, during an outbreak after the passage of hurricane Hugo in 1989 (TORRES 1992). Other authors that mention the association between *S. eridania* and *P. edulis* (POGUE 2012, MONTEZANO et al. 2014) also observed this fact. Therefore, the occurrence of *S. eridania* causing damages in passion fruits in Brazil is considered as the first record.

Both species of caterpillar belong to the superfamily Noctuoidea, which is represented by different species with a high degree of polyphagia. As for *I. alcumena*, although the bibliographic record (GUAGLIUMI, 1966) only refers to two host plants ("arnica-do-mato" and mango tree), the current report stating that the caterpillar of *I. alcumena* eat leaves of *P. edulis* cv. BRS Rubi do Cerrado represents the capacity of the caterpillars hosting plants of three different botanical families, which is in agreement with several studies that associate many species of the subfamily Arctiinae (Erebidae) with a high degree of polyphagia (ZENKER et al. 2016). As for the polyphagia, several species of the genus *Spodoptera* are reported as Passifloraceae pests throughout the American continent: *S. androgea* (JANZEN e HALLWACHS, 2009), *S. exigua* (CAUSTON et al. 2000), *S. frugiperda* (MONTEZANO et al. 2018) and *S. ornithogalli* (CHACON & ROJAS, 1984).

The first occurrence record of these caterpillars attacking passion fruits is an alert to make individuals aware that studies on bioecology and behavior are necessary. In the future, these studies will provide information so that if these species become pests, they will be managed more efficiently.

Figure 1. Owlet moths associated to *Passiflora edulis*: *Isia alcumena* - a. caterpillar (35.2 mm long), b. male adult (32.7 mm of wingspan), c. female adult (40.6 mm of wingspan); *Spodoptera cosmioides* - d. caterpillar (47.8 mm long), e. male adult (37.3 mm of wingspan), f. female adult (42.8 mm of wingspan); *Spodoptera eridania* – g. caterpillar (36.8 mm long), h. male adult (30.8 mm of wingspan), i. female adult (30.0 mm of wingspan), j. *I. alcumena* caterpillar eating the leaf of *P. edulis*, k. *S.cosmioides* caterpillar eating the leaf of *P.edulis*, l. *S. eridania* caterpillar eating the fruit of *P.edulis*. Photos: Fabiano Bastos.

Acknowledgments

The authors would like to thank Willian Rogers Ferreira de Camargo for helping them to collect, grow and preserve the samples and also Fabiano Marques Dourado Bastos for the photos of immature and adult samples.

References

BERNACCI, L. C.; CERVI, A. C.; MILWARD-DE-AZEVEDO, M. A.; NUNES, T. S., IMIG, D.C.; MEZZONATO, A.C. **Passifloraceae. Lista de Espécies da Flora do Brasil**. Rio de Janeiro: Jardim Botânico do Rio de Janeiro, 2013. Disponível em: http://floradobrasil.jbrj.gov.br/.

BRITO, R.; GONÇALVES, G.L.; VARGAS, H.A.; MOREIRA, G.R.P. A new Brazilian *Passiflora* leafminer: *Spinivalva gaucha*, gen.n., sp. n. (Lepidoptera, Gracillariidae, Gracillariinae), the first gracillariid without a sap-feeding instar. **ZooKeys**, Sofia, v.291, p.1–26, 2013.

CAUSTON, C.E.; MARKIN, G.P; AND FRIESEN, R. Exploratory survey in Venezuela for biological control agents of *Passiflora mollissima* in Hawaii. **Biological Control**, San Diego, v.18, p.110–119, 2000.

CHACON, P.; ROJAS, M. Entomofauna asociada a *Passiflora mollissima*, *P. edulis f. flavicarpa* y *P. quadrangularis* en el Departamento del Valle del Cauca. **Turrialba**, Costa Rica, v.34, p.297-311, 1984.

FALEIRO, F.G.; JUNQUEIRA, N.T.V.; BRAGA, M.F.; COSTA, A.M. **Conservação e caracterização de espécies silvestres de maracujazeiro (*Passiflora* spp.) e utilização potencial no melhoramento genético, como porta-enxertos, alimentos funcionais, plantas ornamentais e medicinais - resultados de pesquisa**. Planaltina: Embrapa Cerrados, 2012. 34p. (Documentos, 312)

FALEIRO, F.G.; JUNQUEIRA, N.T.V.; BRAGA, M.F.; PEIXOTO, J.R**. Caracterização de germoplasma e melhoramento genético do maracujazeiro assistidos por marcadores moleculares: resultados de pesquisa 2005-2008**. Planaltina: Embrapa Cerrados, 2008. 59 p. (Boletim de Pesquisa e Desenvolvimento, 207).

FALEIRO, F.G.; JUNQUEIRA, N.T.V.; JESUS, O.N.; COSTA, A.M.; MACHADO, C.F.; JUNQUEIRA, K.P.; ARAÚJO, F.P.; JUNGHANS, T.G. Espécies de maracujazeiro no mercado internacional. *In*: JUNGHANS, T.G.; JESUS, O.N. (ed.). **Maracujá**: do cultivo à comercialização. Brasília, DF: Embrapa, 2017. p.15-37.

GUAGLIUMI, P. Insetti e Aracnidi dele piante comuni del Venezuela Segnelati nel período 1938-1963. Relazioni e monografie agrarie subtropicali e tropicali. Istituto **Agronomico per l'Oltremare, Firenze**, Nuova serie, n. 86º, p. 391, 1966.

JANZEN, D.H.; HALLWACHS, W. **Dynamic database for an inventory of the macrocaterpillar fauna, and its food plants and parasitoids, of Area de Conservacion Guanacaste (ACG), northwestern Costa Rica**. 2009. (nn-SRNP-nnnnn voucher codes) Disponível em: http://janzen.sas.upenn.edu.

MASSARDO, D.; FORNEL, R.; KRONFORST, M.; GONÇALVES, G.L.; MOREIRA, G.R.P. Diversification of the silverspot butterflies (Nymphalidae) in the Neotropics inferred from multi-locus DNA sequences. **Molecular Phylogenetics and Evolution**, Orlando, v.82, p.156-165, 2015.

MESSENGER, C. The Sphinx Moths (Lepidoptera: Sphingidae) of Nebraska. **Transactions of the Nebraska Academy of Sciences**, Lincoln, v.24, p.89-141, 1997.

MILLER, J.S. Generic revision of the Dioptinae (Lepidoptera: Noctuoidea: Notodontidae). Part 2: Josiini. **Bulletin of the American Museum of Natural History**, New York, v.321, p.675–1022, 2009.

MONTEZANO, D.G.; SPECHT, A.; SOSA-GÓMEZ, D.R.; ROQUE-SPECHT, V.F.; BARROS, N.M. Immature stages of the armyworm, *Spodoptera eridania*: Developmental parameters and host plants. **Journal of Insect Science**, Tuckson, v.14, p.1-11, 2014.

MONTEZANO, D.G.; SPECHT, A.; SOSA-GÓMEZ, D.R.; ROQUE-SPECHT, V.F.; SOUSA-SILVA, J.C.; PAULA-MORAES, S.V. Host plants of *Spodoptera frugiperda* (Lepidoptera: Noctuidae) in the Americas. **African Entomology**, Hatfield, v.26, n.2, p.286-300, 2018.

PASTRANA, J.A. **Los lepidópteros argentinos**: sus plantas hospedadoras y otros sustratos alimenticios. Buenos Aires: Sociedad Entomológica Argentina, 2004. p.350.

POGUE, G.M. **World database Spodoptera (Lepidoptera: Noctuidae)**. 2012. Disponível em: http://www.sel.barc.usda.gov/lep/spodoptera/spodoptera.html . Acesso em: 10 fev.2019.

POGUE, M.G. A world revision of the genus *Spodoptera* Guenée (Lepidoptera: Noctuidae). **Memoirs of the American Entomological Society**, Philadelphia, v.43, p.1–202, 2002.

SILVA, A.G.D'A.; GONÇALVES, C.R.; GALVÃO, D.M.; GONÇALVES, A.J.L.; GOMES, J.; SILVA, N.M.; SIMONI, L. **Quarto catálogo dos insetos que vivem nas plantas do Brasil, seus parasitos e predadores**. Rio de Janeiro: Ministério da Agricultura, 1968. tomo 1, pt. 2, 622 p.

SPECHT, A.; ROQUE-SPECHT, V.F. Immature stages of *Spodoptera cosmioides* (Lepidoptera: Noctuidae): developmental parameters and host plants. **Zoologia**, Curitiba, v.33, n.4, p.1-10, 2016.

TORRES, J.A. Lepidoptera outbreaks in response to successional changes after the passage of Hurricane Hugo in Puerto Rico. **Journal Tropical Ecology**, Cambridge, v.8, p.285–289, 1992.

TRAVASSOS, L. Contribuição ao conhecimento dos "Arctiidae" XII. Gênero "*Isia*" Walker, 1856. **Revista Brasileira de Biologia**, São Carlos, v.7, n.2, p.181-194, 1947.

VIEIRA, M.L.C.; CARNEIRO, M.C. *Passiflora* spp. Passionfruit. In: LITZ, R. (ed.). **Biotechnology of fruit and nut crops**. Gainesville: University of Florida, 2004. p.436-453.

ZENKER, M.M.; WAHLBERG, N.; BREHM, G.; TESTON, J.A.; PRZYBYLOWICZ, L.; PIE, M.R.; FREITAS, A.V.L. Systematics and origin of moths in the subfamily Arctiinae (Lepidoptera, Erebidae) in the Neotropical region. **Zoologica Scripta**, Stockholm, v.46, n.3, p.348–362, 2016.