

COMUNICAÇÃO CIENTÍFICA

**OCCURRENCE OF *Helicoverpa armigera* (HÜBNER, 1808)
ON CITRUS IN THE STATE OF SAO PAULO, BRAZIL¹**REGIANE CRISTINA OLIVEIRA DE FREITAS BUENO², PEDRO TAKAO YAMAMOTO³,
MARINA MOUZINHO CARVALHO⁴, NÁDIA MAEBARA BUENO⁵

ABSTRACT - The occurrence of *Helicoverpa armigera* (Hübner, 1808) was first reported in citrus orchard in the state of São Paulo (SP). High infestation levels of *H. armigera* were observed in October 2012, in the city of Botucatu, SP. The larvae was fed of all parts of the plants. The injuries on the leaves caused drastic reduction in the leaf area and the fruits attack occurred from an early stage of development to the ripe fruit. Thus, the first occurrence of *H. armigera* in this citrus culture adds to the list of hosts of this pest, and is of great importance, because it confirms *H. armigera* potential dispersion and polyphagia.

Index terms: Quarantine pest, Heliiothinae, Lepidoptera, Noctuidae, citrus.

**OCORRÊNCIA DE *Helicoverpa armigera* (HÜBNER, 1808)
EM CITROS NO ESTADO DE SÃO PAULO, BRASIL**

RESUMO - A ocorrência de *Helicoverpa armigera* (Hübner, 1808) foi relatada pela primeira vez em pomar comercial de cítrus no Estado de São Paulo (SP). Altos níveis de infestação de *H. armigera* foram observados em outubro de 2012, na cidade de Botucatu-SP. As larvas alimentaram-se em todas as partes de plantas. As lesões nas folhas causaram drástica redução da área foliar, e o ataque aos frutos ocorreu a partir do estágio inicial de desenvolvimento até a fase do fruto maduro. Assim, o relato da primeira ocorrência de *H. armigera* acrescenta a cultura de cítrus à lista de hospedeiros desta praga, e é de grande importância, pois confirma a polifagia e o potencial de dispersão de *H. armigera*.

Termos para indexação: Praga quarentenária, Heliiothinae, Lepidoptera, Noctuidae, cítrus.

Helicoverpa armigera (Hübner, 1808) (Lepidoptera: Noctuidae) is important polyphagous agricultural insect pest, highly mobile and has a worldwide distribution; inhabits diverse ecological habitats and is the most important insect pest occurring in the developing world that causes heavy yield losses of a diverse range of dicot and monocot crops (PRIYA et al., 2012). It has been recorded as a damaging pest on 181 cultivated and wild plant species in at least 45 families (SRIVASTAVA et al., 2010). This fact can be attributed to its high fertility, migration behavior, high adaptability to various climatic conditions and the development of resistance to broad range of insecticides (NASERI et al., 2010). Almost 30% of all pesticides used worldwide are directed against this insect pest (JOUBENA et al., 2012). But, the repeated use of

synthetic chemicals to manage this pest has resulted in resurgence and outbreak, resistance to insecticides, elimination of existing natural enemies in addition to polluting soil, water, air and food (BASKAR; IGNACIMUTHUA, 2012). Until the moment *H. armigera* has not been recorded in the Americas, being considered quarantine pest in Brazil (REED 1965; MORAL GARCIA, 2006). However, this species was highlighted as the most damaging pest to crops such as soybeans, cotton, tomatoes and corn in 2011/2012 crop season in several Brazilian agricultural regions with economic losses estimated at around R\$ 140.00/ha in soybean crop in 2012/2013 (CZEPAK et al., 2013). The *H. armigera* adult has a wingspan of approximately 40 mm. The forewings have a yellowish color, with a darker cross-sectional stripe, dispersed dark spots and a highlighted

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²DR^a. Professora Assistente Doutor do Depto de Proteção de Plantas – UNESP, Campus Botucatu, Botucatu-SP. Autor para correspondência. E-mail: regiane@fca.unesp.br

³DR. Professor do Depto de Entomologia e Acarologia – ESALQ, Piracicaba-SP. E-mail: pedro.yamamoto@usp.br

⁴Eng.^a Agr.^a Mestranda em Agronomia: Proteção de Plantas – UNESP, Campus Botucatu, Botucatu-SP. E-mail: marina_mouzinho@fca.unesp.br

⁵Eng.^a Agr.^a Mestranda em Agronomia: Proteção de Plantas – UNESP, Campus Botucatu, Botucatu-SP. E-mail: nadia.bueno@gmail.com

comma-shaped spot on the bottom of the wings. The hindwings are paler in color with a darker border. Throughout the adult stage, which lasts from 12 to 15 days, each female is able to lay an average of 1,000 to 1,500 eggs. The moths have a preference for oviposition on the upper face of the leaves and/or rough and pubescent surfaces, with eggs laid isolated (SRINIVASAN et al., 2013). The larvae vary in color from green to black, with longitudinal stripes. The larval stage lasts from 13 to 25 days and comprises 5 instars. When fully developed, the larvae can measure up to 50 mm in length. The last-instar larvae leave the plant/fruits where the eggs were laid and migrate to the soil, where they pupate. This stage lasts approximately 14 days, according to the temperature variations. The caterpillars have light brown head capsule with white lines on the side and there is hairiness. From the 4th instar in the fourth segment there is presence of abdominal, dark and conspicuous tubercles. Another peculiar characteristic of *H. armigera* is the presence of integument with slightly coriaceous texture, very different from the other species Heliiothinae (CZEPAK, 2013). Considering the importance of *H. armigera* in Brazilian territory this present study reports the occurrence of this species in a commercial citrus orchard, confirming its polyphagous habits, aiming at expanding the available information about this species. High densities were found in October 2012 on a farm located in Botucatu, State of São Paulo, Brazil (latitude: 22° 53' 09" S; longitude: 48° 26' 42" E; altitude: 804 m). In the infested orchard, there were plots with plant varieties at different development stages, from the flowering stage to that of fully ripe fruits ready to be harvested. The larvae showed no feeding preference, consuming whatever food was available, i.e., leaves, ripe and unripe fruits as well as weeds spontaneously occurring in the orchards (Figure 1). The *H. armigera* attack was severe and caused losses near 100% in plantations where it was found. The *H. armigera* larvae were collected and transported to the Entomology Laboratory of the São Paulo State University (Universidade Estadual Paulista – UNESP), Botucatu, São Paulo, where they were maintained under an artificial diet and controlled temperature until the emergence of the adults, for their identification. The insects were identified as belonging to the species *H. armigera* after molecular analysis. To perform the molecular analysis of *H. armigera*, the moths were stored in sealed containers with silica gel at -20°C. Molecular characterization was performed by amplification of partial sequences of genes of cytochrome c oxidase (subunits I and II) and cytochrome B. The DNA

extraction was performed based on salts of CTAB and the amplifications were performed with primer pairs: LCO 1490–J–1514. Two mtDNA primer sets were designed for COI and Cyt b. The primer set COI-F02 (5' CTC AAA TTA ATT ACT CCC CAT C 3') and COI-R02 (5' GGA GGT AAG TTT TGG TAT CAT T 3') was used to amplify 511 base pairs (bp) of partial COI. The primer set Cytb-F02 (5' GAA TCC TTT AAT TTA AAA TAT AC 3') and Cytb-R02 (5' AAA TAT GGG TTA GTTAAA GTT AA 3') was used to amplify 434 bp of partial Cyt b. PCR conditions had the following profile: 94° C for 4 min (one cycle), 30 s each of 94° C, 50° C and 1 min at 72° C (35 cycles) followed by a final extension cycle of 72° C for 10 min (BEHERE et al., 2007).

The present study is the first report of *H. armigera* occurrence in citrus crops, adding this crop to the list of *H. armigera* hosts. This result is of great relevance in confirming the adaptive and dispersive potentials of this pest. This insect represents a serious threat to citrus crops, because in addition to the damage caused in that crop, the moth damage can hinder the following year's production. Taking action to characterize the magnitude of the problem and proposing integrated pest-management strategies is important for its successful control.

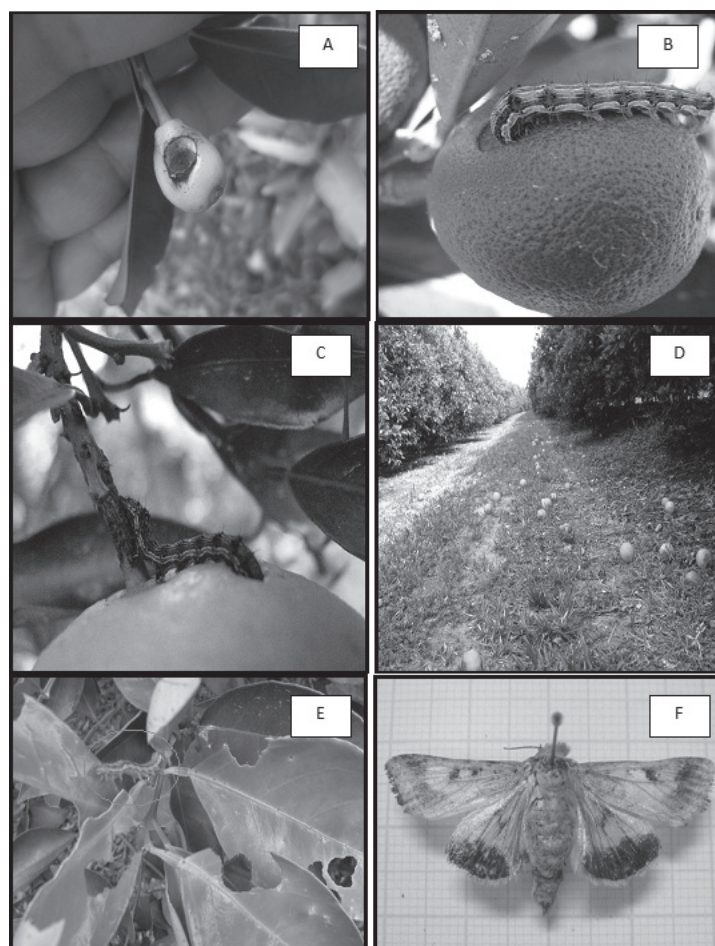


FIGURE 1- *Helicoverpa armigera* in citrus. (A) Damage in early stages of fruit development; (B) *H. armigera* attacking unripe fruit; (C) Larva feeding on ripe fruit; (D) Fruits fallen to the ground as a result of damage caused by larvae; (E) Larva feeding on leaves; (F) Adult *Helicoverpa armigera*.

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