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Source: Florida Entomologist, 97(2) : 854-856

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/024.097.0279

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FIRST RECORD OF *HELICOVERPA ARMIGERA* (LEPIDOPTERA: NOCTUIDAE) IN ARGENTINA

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The Old World cotton bollworm, *Helicoverpa armigera* Hübner (Lepidoptera: Noctuidae), is one of the most important pests in the world, and is widely distributed, being present in Europe, Asia, Africa, and Oceania (Zalucki et al. 1986; Guo 1997). Recently, this species was found in Brazil (Czepak et al. 2013) and Paraguay (Senave 2013).

Helicoverpa armigera is a polyphagous agricultural pest and was reported in more than 180 cultivated crop species, which include cotton (*Gossypium hirsutum* L.; Malvales: Malvaceae), sorghum (*Sorghum bicolor* [L.] Moench; Poales: Poaceae), corn (*Zea mays* L.; Poales: Poaceae), soybean (*Glycine max* L.; Fabales: Fabaceae), tomato (*Solanum lycopersicum* L.; Solanales: Solanaceae), chickpea (*Cicer arietinum* L.; Fabales: Fabaceae), sunflower (*Helianthus annuus* L.; Asterales: Asteraceae), fruit trees, and wild plants belonging to a broad spectrum of families (Asteraceae, Fabaceae, Malvaceae, Poaceae, and Solanaceae). Larvae damage vegetative and reproductive plant stages. They feed on leaves, stems, buds, inflorescences, fruits, and pods, where voracious larval feeding leads to substantial economic loss (Reed 1965; Fitt 1989; Czepak et al. 2013; Tay et al. 2013). According to Lammers & MacLeod (2007), the worldwide annual costs for controlling this pest along with yield losses, reach and estimated US$ 5 billion.

Control tactics applied for this pest in various countries include traps baited with the pest's sex pheromone, resistant cultivars, *Bt*-transgenic cultivars, destruction of crop remnants, release of natural enemies and use of insecticides (Czepak et al. 2013). This pest has developed resistance to the Cry endotoxins of *Bacillus thuringiensis* and to synthetic chemical insecticides, as demonstrated in several laboratories in India, China, and Australia (Akhurst et al. 2003; Gao et al. 2009).

The life cycle of this moth (egg to adult) lasts from 4 to 6 weeks. The adults are highly mobile, having been known to disperse up to 2,000 km, and they have the capability to survive even under adverse conditions (Fitt 1989; Czepak et al. 2013; Tay et al. 2013). Additional information about the biology of *H. armigera* can be found in Pedgley (1985), Kurban et al. (2005), Ávila et al. (2013), and Czepak et al. (2013).

In Argentina, 3 species of the Heliothinae subfamily have been observed causing damage to different crops: *Heliothis virescens* (Fabricius), *Helicoverpa zea* (Boddie), and *Helicoverpa gelotopoeon* (Dyar) (Velasco de Stacul et al. 1969; Cordo et al. 2004). The design of wing pattern is useful to differentiate these species (Velasco de Stacul et al. 1969; Navarro et al. 2009). A complication is that *H. armigera* is a close relative of *H. zea*, and both species emit the same pheromone compounds, but in different concentrations (Pogue 2004; Witzgall et al. 2004*). Helicoverpa zea* males are attracted to the sex pheromone containing a blend of compounds used in traps for the field capture of males *H. armigera* and vice versa. Specimens collected from pheromone traps are usually in poor condition. Therefore, the genitalia are used to accurately identify adult males collected with pheromones (Pogue 2004; Tay et al. 2013). Molecular identification is another tool to identify members of the *Helicoverpa* complex (Specht et al. 2013; Tay et al. 2013). Considering the presence of *H. armigera* in Brazil and Paraguay in 2013, the great mobility of the adults, and the lack information about the occurrence of this pest in Argentina, the main aim of this study was to use pheromone traps to determine if this noctuid pest species was present in Argentina.

Pheromone traps were installed in chickpea crops in 2 localities of Tucumán province, Viclos (Leales county) (S 27° 9' -W 64° 55'), and La Cocha (La Cocha county) (S 27° 48' -W 65° 29'). Sampling was conducted weekly from Aug to Oct 2013 and the lures were changed every 20 or 30 days.

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Unitrap yellow® traps were installed according to ChemTica Internacional S.A. recommendations and pheromones of *H. armigera* and *H. gelotopoeon* provided by ChemTica® were used.

Collected *Helicoverpa* spp. adults were identified by one of the authors (F. Navarro) and voucher specimens were deposited in the entomological collection of the Instituto y Fundación Miguel Lillo (IFML) at Tucumán, Argentina. Each sample was placed in a jar of 10% KOH, heated in a water bath, and left to simmer for 40 mins. The genitalia were dissected from the abdomen, and the aedeagus was removed as described by Lafontaine (2004). The vesica was inflated using 99% isopropyl alcohol following the technique described by Pogue (2004).

When working with frayed specimens, like those collected from pheromone traps, it may be impossible to distinguish *H. armigera* from *H. zea* or *H. gelotopoeon* by external appearance. In such cases, differentiation is straightforward if the genitalia are dissected following the protocol proposed by Pogue (2004). Of the total traps used and considering the quality of the specimens, only 48 adults were identified. Specimens from La Cocha were sorted as follows: 25 adults were identified as *H. armigera*; also adults of *H. zea* (3) and *H. gelotopoeon* (5) were captured. All individuals of *H. zea* were captured in traps that captured *H. armigera*. All 15 specimens captured at Viclos, Tucumán province were identified as *H. armigera*.

These results confirm the presence for the first time of *H. armigera* in Argentina. Previously, Chiarelli de Gahan & Touron (1954) reported the occurrence of *H. armigera* in Argentina but clearly this was a misidentification as stated by Hardwick (1965).

The arrival of this moth in Argentina poses a risk to the extensive *Bt*-based and conventional agriculture, mainly because of this pest's history of rapidly evolving resistance to insecticides (Fitt & Wilson 2000; Martin et al. 2005). It will require effective integrated pest management and insecticide resistance management to cope with *H. armigera*. Further studies should be conducted to determine the distribution of *H. armigera* in Argentina and its potential as a pest of soybean, corn, cotton, chickpea, as well as to develop effective control methods, and techniques for monitoring the pest's resistance to insecticides and available *Bt* cultivars of these crops.

Endnotes

Dra. M. Gabriela Murúa and Ing. Franco S. Scalora contributed equally to this work. We thank Ing. Claudio Bleckwedell (Consorcios Regionales de Experimentación Agrícola C.R. E.A. Group) for excellent technical support and assistance in the collection of material. We also thank Lic. Eduardo Willink (EEAOC) for constructive comments on an earlier draft of the manuscript. This study was supported by Estación Experimental Agroindustrial Obispo Colombres (EEAOC) and Consejo de Investigaciones de la Universidad Nacional de Tucumán (Project 26/G431).

Summary

Because of the recent presence of *Helicoverpa armigera* in Brazil and Paraguay in 2013, pheromone traps were deployed in chickpea crops at 2 localities in Tucumán province to determine if this noctuid was present in Argentina. This pest was detected at both locations, confirming the presence of *H. armigera* in Argentina for first time.

Key Words: Old World cotton bollworm, Heliothinae, invasive species, pest, leguminous plants

Resumen

Debido a la reciente detección de *Helicoverpa armigera* en Brasil y Paraguay en 2013, se colocaron trampas de feromonas en el cultivo de garbanzo en dos localidades de la provincia de Tucumán para detectar la presencia de este noctuido en Argentina. Esta plaga fue detectada en ambas localidades confirmando la presencia de *H. armigera* en Argentina por primera vez.

Palabras Claves: Oruga del Viejo Mundo, Heliothinae, plagas, plantas leguminosas

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