First record of *Duponchelia fovealis* (Lepidoptera: Crambidae) in South America

Primer registro de *Duponchelia fovealis* (Lepidoptera: Crambidae) en América del Sur

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ABSTRACT

The European pepper moth *Duponchelia fovealis* Zeller (Lepidoptera: Crambidae) is reported for the first time in South America, in the State of Paraná, Brazil. *D. fovealis* causes damage to strawberries and weakens the plants. Three natural enemies controlling *D. fovealis* were found and identified as *Apanteles* sp. (Hymenoptera: Braconidae), *Hyaliodocoris insignis* (Heteroptera: Miridae) and the entomopathogenic fungus *Beauveria bassiana*.  

**Key words:** Neotropical region, *Fragaria × ananassa*, European pepper moth, natural enemies.

RESUMEN

El primer reporte de *Duponchelia fovealis* Zeller (Lepidoptera:Crambidae) fue por daños a la fresa (*Fragaria × ananassa*) en América del Sur en el Estado del Paraná, Brasil. Se encontraron tres enemigos naturales para controlar *D. fovealis* identificados como *Apanteles* sp. (Hymenoptera: Braconidae), *Hyaliodocoris insignis* (Heteroptera: Miridae) y el hongo entomopatogenico *Beauveria bassiana*.  

**Palabras clave:** región Neotropical, *Fragaria × ananassa*, “Polilla del pimiento europeo”, enemigos naturales.

A significant problem of the strawberry plant is the diversity of insects and mites that attack the crop (Botton & Nava, 2010; Zawadneak et al., 2014). High infestations of Crambidae larvae were reported in strawberry crops in 2010 in various regions of the State of Paraná, Brazil, causing damage to the crown, leaves, flowers and fruits of the plant. The lepidopteran insects were present throughout the year in the production areas, with food availability depending on the plant cycle. The aim of this study was to report the presence of *Duponchelia fovealis* in South America and of three natural enemies of the pest.

Strawberry plants were collected from areas with high insect concentrations in the municipality of São José dos Pinhais, Paraná, Brazil (25º37’05.32” S; 49º04’46” W). Insect larvae and pupae were maintained in the laboratory until the adult stage was reached. The adults that emerged did not resemble species previously described in the literature as strawberry or vegetable pests growing near strawberry fields. Specimens were sent to the Systematic Entomology Laboratory, Washington D.C. The species was identified as *Duponchelia fovealis* Zeller (Lepidoptera: Pyraoloidea: Crambidae: Spilomelinae). This is the first report of this species in South America. This insect originated in the Mediterranean region and the Canary Islands; however there are records of its occurrence in different regions of Europe, Asia, Africa and North America (Epstein 2004; Bonsignore & Vacante, 2010; Brambila & Stocks, 2010; EPPO, 2010; Hoffman, 2010; NAPPO, 2010; Stocks & Hodges, 2011; CABI, 2015). *D.
fovealis has been reported to cause damage to strawberry fields in Portugal, France, Italy, and Turkey (Bonsignore & Vacante, 2010; Franco & Baptista, 2010; Efili et al., 2014). Information on how the pest entered Brazil is unknown, but it may have been introduced by planting material from ornamental plants, which are significantly affected by the pest in Europe (Solis, 2006; Stocks & Hodges, 2011; CABI, 2015).

Adults are 9-12 mm in length with a 19-21 mm wingspan. The male abdomen is slender, while the female abdomen is robust (Figures 1A

![Duponchelia fovealis (Lepidoptera: Crambidae). A. Dorsal aspect of the male (7.1× magnification). B. Dorsal aspect of the female (7.1× magnification). C. Eggs (6.5× magnification). D. 5th instar larvae (7.1× magnification). E. Pupa sheltered under senescent plant material at the base of the plant. F. Larvae damaging fruit. G. Initial damage by caterpillar feeding on the outside of the leaves (holes with irregular edges) and presence of excrement.](image-url)
and 1B). The forewings are brown, darker on the apices, with two transverse lines, featuring a more outward line, and in the central region there is a spot toward the apex of the wing (Figures 1A and 1B). The hindwings are pale brown, with a thin wavy line across the middle of the wing (Figures 1A and 1B). The eggs are cream in color, measuring 0.3-0.6 mm on average, and oviposited singly or in groups of 3-10. After oviposition they have a cream color, and when near eclosion they have a reddish tone (Figure 1C). The larvae are white-cream to light-brown and measure approximately 20 mm in the last instar. The cephalic capsule is dark brown in color, with dark spots and sparse hair standing straight throughout the body; the pronotum is the same color as the head (Figure 1D). The pupa is obtecte, measuring 9-12 mm, and is surrounded by strands of silk and covered with plant debris, soil particles, and excrement (Figure 1E). Near the emergence of the adult, the pupa is darker (Trematerra, 1990; Svensson, 1999; Bethke & Vander Mey, 2010; Bonsignore & Vacante, 2010; Brambila & Stocks, 2010; Hoffman, 2010; Stocks & Hodges, 2011; CABI, 2015).

_D. fovealis_ is oligophagous, with more than 35 known hosts (Stocks & Hodges, 2011; CABI, 2015); however peppers, green peppers, tomatoes, corn, cucumber, squash, and strawberry are crops with higher risk of economic damage (Bethke & Vander Mey, 2010; Stocks & Hodges, 2011). The larvae parasitize leaves, stems, inflorescences, roots and fruit, occurring mainly in protected crops and nurseries (Bethke & Vander Mey, 2010; Bonsignore & Vacante, 2010; Stocks & Hodges, 2011; Zawadneak et al., 2011; CABI, 2015).

In strawberry plants, the larvae feed on tissues from the crown, leaves and fruit, thus reducing plant strength, productivity, quality and the commercial value of the fruit (Figures 1F, 1G, 1H, and 1I). In the strawberry crown region the larvae open galleries, resulting in interruption of the sap flow, wilting, yellowing and death of the plant (Figure 1J). In the fruit, in addition to the damage caused by feeding, pulp exposure promotes microbial growth, thus increasing loss. Additionally, larval excrement compromises fruit health. Adults shelter under the plant leaves during the day, conducting short and infrequent flights when disturbed. When at rest, the moths keep their wings closed flat against the body and bend the abdomen upwards at nearly a 90° angle.

During the collection of _D. fovealis_ individuals in various regions of the state, we observed parasitism of the larvae by _Apanteles_ sp. (Hymenoptera: Braconidae) (Figures 2A and 2B), and predation of the eggs by nymphs and adults of _Hyaliodocoris insignis_ (Stal) (Heteroptera: Miridae) (Figures 2C and 2D), in addition to the infection of the larvae and pupae of _D. fovealis_ by _Beauveria bassiana_ (Balsamo) (Hypocreales: Cordycipitaceae) (Figures 2E and 2F). These observations of recently identified beneficial organisms naturally controlling the pest provide new insights for future research on biological control with the aim of managing this species. Since this pest has been recently introduced in Brazil, insecticides have not yet been authorized for use against _D. fovealis_. Predatory mites _Stratiolaelaps miles_ (Berlese) (Acari: Mesostigmata: Laelapidae), _Hypoaspis miles_ (Berlese), and _Hypoaspis aculeifer_ (Canestrini) (Acari: Laelapidae) (Brambila & Stocks, 2010; Stocks & Hodges, 2011), entomopathogenic nematodes _Heterorhabditis bacteriophora_ (Poinar) and _Steinernema carpocapsae_ (Weiser) (Nematoda: Rhabditida), and parasitoids _Trichogramma_ (Hymenoptera: Trichogrammatidae) were reported to have potential for the control of _D. fovealis_ (Brambila & Stocks, 2010; Stocks & Hodges, 2011).

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Figure 2. Natural enemies found with the potential to control Duponchelia fovealis in strawberry (*Fragaria × ananassa*) in the State of Paraná, Brazil. Larvae with a parasite and parasitoid cocoon (A) and side view (B) of *Apanteles* sp. (Hymenoptera: Braconidae); Nymph (C) and Adult (D) of *Hyaliodocoris insignis* (Heteroptera: Miridae) predating eggs; Larvae infected by *Beauveria bassiana* (Hypocreales: Cordycipitaceae) (E and F).
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**Literature Cited**

Bethke, J.; Vander Mey, B.  
2010. Pest Alert: *Duponchelia fovealis*. University of California Cooperative Extension San Diego. Available: http://ucanr.org/sites/cetest/files/55177.pdf. Consulted: 31/Jul/2015.

Bonsignore, C.P.; Vacante, V.  
2010. *Duponchelia fovealis* Zeller. Une nuova emergenza per la fragola? *Protezione delle colture* 3: 40-43.

Botton, M.; Nava, D.E.  
2010. Principais pragas do morangueiro. *Revista Campo e Negócios HF* 1: 74-75.

Brambila, J.; Stocks, I.  
2010. The European pepper moth, *Duponchelia fovealis* Zeller (Lepidoptera: Crambidae), a Mediterranean pest moth discovered in central Florida. FDACS - Division of Plant Industry. Available at: http://www.freshfromflorida.com/content/download/23893/486212/duponchelia-fovealis.pdf. Consulted: 31/Jul/2015.

CABI (Centre for Agriculture and Biosciences International).  
2015. *Duponchelia fovealis* (southern European marshland pyralid). Wallingford. Available at: http://www.cabi.org/isc/datasheet/20168. Consulted: 31/Jul/2015.

Efif, L.; Özgür, O.; Efif, F.  
2014. A new pest, *Duponchelia fovealis* Zeller, on strawberries in Turkey - damage, distribution and parasitoid. *Journal of Entomology and Zoology Studies* 2: 328-334.

EPPO (European and Mediterranean Plant Protection Organization).  
2010. European and Mediterranean Plant Protection Convention Reporting Service. Paris. Available at: https://archives.eppo.int/EPPOReporting/2010/Rse-1010.pdf. Consulted in 31/Jul/2015.

Epstein, M.E.  
2004. New Pyraloidea in California. 2004. Plant Pest Diagnostics Laboratory Report. Available at: http://www.cdfa.ca.gov/pphs/ppd/PDF/PPDC2004.pdf. Consulted in 31/07/2015.

Franco, M.C.; Baptista, M.C.  
2010. *Duponchelia fovealis* Zeller - nova praga em Portugal. *Frutas, legumes e flores* 110: 34-35.

Hoffman, K.  
2010. CDFA Detection Advisory for a Cramid moth: *Duponchelia fovealis* (Zeller) (Pyraloidea: Crambidae). Available at: http://www.kernag.com/dept/news/2010/2010-san-diego-duponchelia-fovealis-07-16-2010.pdf. Consulted in: 31/07/2015.

NAPPO (North American Plant Protection Organization).  
2010. Phytosanitary Alert System: thirteen new state detections of *Duponchelia fovealis*. Ottawa. Available at: http://www.pestalert.org/oprDetail.cfm?oprID=466. Consulted in: 31/07/2015.

Solis, M.A.  
2006. Key to selected Pyraloidea (Lepidoptera) larvae intercepted at U.S. ports of entry: revision of Pyraloidea in “keys to some frequently intercepted lepidopterous larvae” by Weisman 1986. Available at: http://www.sel.barc.usda.gov/lep/selected_pyraloid_larval_key.pdf.

Stocks, S.D.; Hodges, A.A.  
2011. European Pepper Moth or Southern European Marsh Pyralid *Duponchelia fovealis* (Zeller). Available at: http://edis.ifas.ufl.edu/pdffiles/IN/IN91000.pdf.

Svensson, I.  
1999. Remarkable records of Microlepidoptera in Sweden during 1998. *Entomologisk Tidskrift* 120: 23-35.

Trematerra, P.  
1990. Morphological aspects of *Duponchelia fovealis* Zeller (Lepidoptera: Pyralidae). *Redia* 73: 41-52.

Zawadneak, M.A.C.; Gonçalves, R.B.; Kuhn, T.M.; Araújo, E.S.; Dolci, E.; Rocha, C.S.; Santos, B.; Benatto, A.; Vidal, H.R. 2011. *Novo desafio. Cultivar HF* 8/9: 24-26.

Zawadneak, M.A.C.; Botton, M.; Schuber, J.M.; Santos, B.; Vidal, H.R.  
2014. Pragas do morangueiro. In: Zawadneak, M.A.C.; Schuber, J.M.; Mogor, Á.F. 2014. *Como produzir morangos*, 1st ed. Editora UFPR, Curitiba, PR. pp. 101-145.
