

Manduca quinquemaculata and *M. sexta* (Lepidoptera: Sphingidae)

This short description has been prepared in the framework of the EPPO Study on Pest Risks Associated with the Import of Tomato Fruit. The whole study can be retrieved from the EPPO website.

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Africa	Asia	Oceania	North America	South-Central America and Caribbean
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***Manduca quinquemaculata* and *M. sexta* (Lepidoptera: Sphingidae) (respectively tomato hornworm and tobacco hornworm)**

Why Identified in the EPPO tomato study. *M. quinquemaculata* and *M. sexta* are pests of Solanaceae. Their distribution differs, but they are dealt with together in US publications, and therefore considered together here.

Where **EPPO region:** absent

Manduca quinquemaculata

North America: Canada, USA (CABI CPC), Mexico? (Bayer Mexico ND mentions *M. quinquemaculata* in relation to treatments with Sevin on tomato), Opler et al (2012) also mention Mexico, but no other record found). In the USA, uncommon in the south-east and Great Plains, occasionally southern Canada (Opler et al., 2012), common in northern States (Villanueva, 2009)

Central America: Nicaragua? (Maes and Schmit, ND - mention that although recorded this species may not exist in Nicaragua).

The site <http://www.silkmoths.bizland.com/mquinqui.htm> mentions Brazil, Uruguay, Hawaii, Nicaragua, Mexico. For Nicaragua, it refers to Maes, but Maes and Schmidt (ND) (see above). No records were found for other countries.

Manduca sexta

North America: Canada (Ontario, Quebec), Mexico, USA (throughout) (CABI CPC)

Caribbean: Antigua and Barbuda, Bahamas, Barbados, British Virgin Islands, Caribbean, Cayman Islands, Cuba, Dominica, Dominican Rep., Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States Virgin Islands (CABI CPC); Guadeloupe, Martinique (also Les Saintes, St-Martin, St-Bartholomew, Marie-Galante) and throughout the Antilles (Zagatti et al., 1995-2006).

Central America: Belize, Costa Rica, Guatemala, Honduras, Nicaragua, Panama (CABI CPC)

South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela (also Morales et al., 2003) (CABI CPC)

Doubtful record: CABI CPC (2013) lists Oceania: Papua New Guinea, referring to the CABI/EPPO 2002 distribution map, which does not list Papua New Guinea. No other record was found for Papua New Guinea.

Climatic similarity High. 13 common climates considering the countries and areas listed above, but possibly lower depending on the distribution within countries (*M. quinquemaculata* uncommon in the south-east and Great Plains). No information was found on whether *M. sexta*, recorded under tropical climates in the Caribbean and Central America, overwinters in the northern part of its range.

On which plants For both species, Solanaceae, incl. tobacco, tomato, sweet pepper, eggplant, potato, some weeds (CABI CPC, Clemson University Extension, ND, also King and Saunders, 1984 for *M. sexta*). Tomato and tobacco are the most common hosts according to Villanueva (2009), rarely on eggplant, pepper and potato (in Florida only?).

For *M. sexta*, CABI CPC (2013) lists non-solanaceous hosts: sesame and verbena, and Zagatti et al. (1995-2006) also mentions Verbenaceae as larval hosts.

Damage For both species. Eggs are on leaves. Damage is done by larvae, which mostly feed on leaves (fruit damage is less common than leaf damage). They may totally defoliate plants. In high infestations, larvae may also feed on fruit. Pupae are in the soil. Adults fly (CABI CPC, ClemsonCooperativeExtension, 2009). Mature larvae of both species are big (8 cm length) (Georgia University, ND). On tomato, larvae feed on blossom, leaves and fruit (UC IPM, 2011).

For North America. *M. quinquemaculata* and *M. sexta* are mentioned amongst major pest of economic importance for tomato by Berlinger (1987). However, Wold-Burkness & Hutchison (ND – Minnesota), Georgia University (ND), UC IPM (2011) note that they normally do not cause economic damage on commercial farms, but may cause damage in gardens.

For *M. sexta* in other regions. In Argentina SENESA (2010) cite publications relating to tomato and tobacco. For Central America, King and Saunders (1984) note it most damaging for tobacco, and is minor (although common) on tomato.

Dissemination	Adults fly. There was an incursion of <i>M. sexta</i> in Germany in 2003 (EPPO RS 2004/01), with adults suspected to have escaped from a research facility; the pest was eradicated.
Pathway	Fruit and vegetables (especially if green parts attached), plants for planting of host plants, soil, from countries where <i>M. quinquemaculata</i> / <i>M. sexta</i> occurs.
Possible risks	Solanaceae that are hosts are major crops in the EPPO region. The climatic similarity according to the EPPO Study between the area where they occur and the EPPO region is high.
Categorization	None found.
Sources	<p>Bayer Mexico. ND. Productos Fitosanitarios. Sevin http://www.bayercropscience.com.mx/bayer/cropscience/bcsmexico.nsf/id/B761D798DA10FE13C125706C005C06E7/\$file/ind_sevin-80.pdf (Accessed January 2014)</p> <p>Berlinger MJ. 1987. Pests. pp 391-441 In The Tomato Crop, A scientific basis for improvement (eds Atherton JG and Rudich J). Chapman and Hall, London - New York.</p> <p>CABI CPC. 2013</p> <p>Clemson Cooperative Extension. 2009. Tomato insect pests. HGIC 2218HOME & GARDEN INFORMATION CENTER http://www.clemson.edu/extension/hgic, http://www.clemson.edu/extension/hgic/pests/pdf/hgic2218.pdf (Accessed January 2014)</p> <p>Georgia University. ND. Hornworms (Order: Lepidoptera, Family: Sphingidae) - Tomato hornworm (<i>Manduca quinquemaculata</i> (Haworth)), Tobacco hornworm (<i>Manduca sexta</i> (Linnaeus)) http://www.ent.uga.edu/veg/solanaceous/hornworm.pdf (Accessed January 2014)</p> <p>King ABS and Saunders JL. 1984. The invertebrate pests of annual food crops in Central America. Overseas Development Administration, London. http://books.google.dk/books?id=qMwOAOAAIAAJ&dq=agrotis+repleta+king&source=gbs_navlinks_s (Accessed January 2014)</p> <p>Maes JM, Schmit P. ND. Familia Sphingidae, specific page for <i>Manduca quinquemaculata</i> http://www.bio-nica.info/Ento/Lepido/sphingidae/Manduca%20quinquemaculatus.htm. In Catalogo De Insectos Y Artrópodos Terrestres De Nicaragua http://www.bio-nica.info/Ento/0-Ordenes.htm. (Accessed December 2013 - not active at January 2014 – see printout)</p> <p>Morales V P, Cermeli M, Godoy F, Salas B. 2003. Lista de insectos relacionados a las solanáceas ubicados en el Museo de Insectos de Interés Agrícola del CENIAP _ INIA. Entomotropica 18(3):193-209.</p> <p>SENASA. 2010. Sistema Nacional Argentino de Vigilancia y Monitoreo de Plagas. [Data sheets for pests in Argentina] http://www.sinavimo.gov.ar/ (Accessed January 2014)</p> <p>Villanueva JR. 2009. <i>Manduca sexta</i>, <i>Manduca quinquemaculata</i>. Featured creatures. University of Florida. http://entomology.ifas.ufl.edu/creatures/field/hornworm.htm (Accessed January 2014)</p> <p>Wold-Burkness SJ, Hutchison WD. ND. Tomato Hornworm. University of Minnesota. http://www.vegedge.umn.edu/vegpest/hornworm.htm (Accessed January 2014)</p> <p>Zagatti P, Lalanne-Cassou B, le Duchat d'Aubigny J. 1995-2006. Catalogue of the lepidoptera of the French Antilles. INRA Database. http://www7.inra.fr/papillon/indexeng.htm (Accessed January 2014)</p>