DACS-P-01752

PEST ALERT

Florida Department of Agriculture and Consumer Services, Division of Plant Industry
Charles H. Bronson, Commissioner of Agriculture

The European Pepper Moth, *Duponchelia fovealis* Zeller (Lepidoptera: Crambidae), a Mediterranean Pest Moth Discovered in Central Florida

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INTRODUCTION: The European pepper moth, *Duponchelia fovealis* (Fig. 1), was detected outside a wholesale nursery in Orlando, Orange County, Florida, on October 13, 2010, and a nursery in Apopka, also Orange County, Florida, on October 14, 2010. The specimens were collected by a USDA-APHIS-PPQ inspector during a national survey triggered by finds in other US states. The European pepper moth was first reported in North America in 2004. This species had not previously been collected in Florida. It is highly likely it entered Florida via the transport of infested plants or other nursery material from other states.

DESCRIPTION: The eggs are oval, 0.020 to 0.028 inches (0.5 to 0.7 mm) long, whitish-green in color, changing to bright red as they develop. The larvae measure from 0.8 to 1.2 inches (20 to 30 mm) when fully grown, and are creamy white to brown with dark spots, and have a dark head capsule (Fig. 2). The pupae are light brown and 0.35 to 0.39 inches (9 to 10 mm) in length. The cocoon that encloses the pupa is 0.59 to 0.748 inches (15 to 19 mm) long, oval, and made with silk, frass and soil particles and is constructed beneath the soil. Adults have wing spans of 0.748 to 0.827 inches (19 to 21 mm), a forewing length 0.35 to 0.43 inches (9 to 11 mm), and are 0.35 to 0.47 inches (9 to 12 mm) long (Fig.1). Dorsally, the forewings are grayish brown with two yellowish-white transverse lines, the outer line with a finger-like projection directed towards the apex of the wing. Males have a long, slender abdomen.

BIOLOGY: The developmental time from egg to adult is 47 days at 68°F (20°C). The eggs may be laid anywhere on a plant, in the upper layer of nearby soil, or even nearby structures, but are most commonly laid on the underside of leaves close to the veins. The eggs hatch in 8 to 10 days. The caterpillars are adapted to moist conditions and can tolerate high humid, even waterlogged conditions, and may be found on aquatic plants and in salt marshes. They prefer to live in concealed and protected locations in and around a plant. In densely planted crops, they may be found feeding on any part of a plant. Adults emerge in one to two weeks and may live for one to two weeks. They are not tolerant of cold and do not hibernate. In greenhouses, *D. fovealis* can breed continuously, and may be capable of doing so in southern Florida. Females lay up to 200 eggs in small batches of 3 to 10 eggs, laid in a roof tile-fashion. Adults fly mainly at night, although they are easily disturbed during the day. They tend to rest with the forewings flattened against the surface, covering the hind wings, and bent backwards at a 45 degree angle. Males hold their long, slender abdomen upturned almost at right angles. They are reported as good fliers.

HOSTS: Larvae are polyphagous, with hosts recorded from 38 plant families. The hosts include a wide range of commercially-grown field crops and ornamental plants, and they can be pests of aquatic plants in greenhouses. The most reported host species is pepper (*Capsicum annuum*, Solanaceae). Other reported host species are: poinsettia (*Poinsettia pulcherrima*, Euphorbiaceae) and croton (*Codiaeum* spp., Euphorbiaceae); kalanchoe (*Kalanchoe* spp., Crassulaceae); azalea (*Rhododendron* spp. , Ericaceae); Transvaal Daisy (*Gerbera* sp., Asteraceae); impatiens (*Impatiens* spp., Balsaminaceae); begonia (*Begonia* spp., Begoniaceae,); geranium (*Pelargonium* spp., Geraniaceae); elderberry (*Sambucus* sp., Adoxaceae); coleus (*Plectranthus scutellarioides*, Lamiaceae); elm (*Ulmus* spp., Ulmaceae); mondo grass (*Ophiopogon* spp., Ruscaceae); water-trumpet (*Cryptocoryne* spp., Araceae); and maize (*Zea mays*, Poaceae).

ECONOMIC IMPORTANCE: The European pepper moth is capable of year-round reproduction in South Florida and in greenhouses, and could become established throughout the entire state. In cooler climates, such as Europe and Canada,

the moth is primarily a greenhouse pest. The larvae can feed on all plant parts, and can infest species from 38 host-plant families, including several important food crop and ornamental species, such as pepper, poinsettias, begonias, impatiens and corn. The larvae are difficult to detect due to their habit of hiding in protected locations, such as tunnels in stems, inside the fruits, within silken webbing on leaves, under soil debris and beneath or inside plant pots.

DISTRIBUTION: The European pepper moth is native to the Mediterranean region and the Canary Islands, but is now established in many countries in Europe, the Middle East and Africa. In North America, the moth was first discovered in 2004 in California, but was thought to have been eradicated. A second North American population was discovered infesting greenhouses in 2005 in southern Ontario, Canada. A survey for *D. fovealis* following a find in California early July, 2010, revealed that it was present in more than 10 counties in Southern and Central California, and is therefore considered established. A subsequent survey in other western states revealed that it occurred in Arizona, Colorado, Oklahoma and Texas. The moth was first found in the southeastern US when collected outside a wholesale nursery in Georgia in September 2010.

FLORIDA DISTRIBUTION: Alachua, Charlotte, Highlands, Hillsborough, Palm Beach, Polk and Orange counties, Florida. Surveys in Florida for *D. fovealis* were started in late September 2010 by the Florida Cooperative Agriculture Pest Survey (CAPS) program. As evidenced by the numerous interceptions from US ports of entry on various plant species, this moth could have entered Florida via international trade. However, it is more likely that it entered from other infested states through the movement of propagative or non-propagative plant material, including fresh fruit and vegetables, herbs and cut flowers. Within Florida, it could be spread easily via the transport of infested plants, soil or other nursery and greenhouse materials. Since the moths are good fliers, they could also extend their range within the state by flight.

DETECTION:

Symptoms: The European pepper moth can be detected by looking for the insect in any of its stages, although they are usually concealed. They may be more easily detected by the presence of damage such as webbing in leaves or soil surface, frass, or feeding holes on leaves, fruits, flowers, flower buds or stems (Fig. 3). For containerized plants, the canopy, the roots at the bottom of the pots, the first centimeter of soil and debris, and under the pots need to be examined.

Monitoring techniques: Infestations may be detected by visual inspections (eggs, larvae, cocoons or adults) and by trapping using delta traps baited with pheromones of *D. fovealis*.

CONTROL:

Cultural practices: Sanitation is important, primarily consisting of the removal of plant refuse from all production areas. Also, use of drier growth medium such as peat-perlite, instead of peat alone, is recommended.

Biological control inside greenhouses: *Bacillus thuringiensis* (BT) may be useful as a larvicide. A study of *D. fovealis* infestations in greenhouses in the Netherlands demonstrated that the most effective bio-control agent is the soil dwelling predatory mite *Stratiolaelaps miles* (Berlese) (Acari: Mesostigmata: Laelapidae), which can be purchased commercially in the United States. These mites are well adapted to moist conditions and are already used against other greenhouse pests. The predatory beetle *Atheta coriaria* (Kraatz) (Staphylinidae) is an effective predator of eggs and first instar larvae, and is also available commercially in the US.

Chemical control: In greenhouses, insecticide applications will be needed to help prevent the establishment of this pest moth. However, control may be difficult to achieve in cases where *D. fovealis* is established because of the habit of boring inside plant stems and fruits which may protect the larva from the effects of contact broad-spectrum insecticides. For additional information regarding chemical controls, please contact your local county extension office http://solutionsforyourlife.ufl.edu/map/index.html.

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Figure 1. Adult *Duponchelia fovealis* moth. Arrow points to the undulating white line in the forewing that is distinctive to the European pepper moth.
Photograph credit: Robin Barfoot, image located at: http://ukmoths.org.uk/show.php?bf=1403a

Figure 2. Larva of *Duponchelia fovealis*.
Photograph credit: Henk Stigter, Plant Protection Service, National Reference Centre, The Netherlands

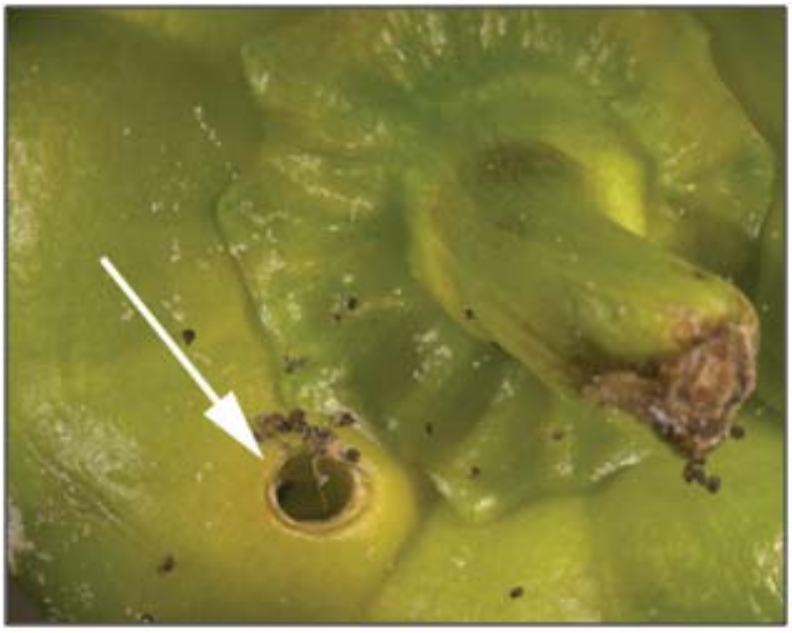

Figure 3. Damage on pepper by larva of *Duponchelia fovealis*. Arrow points to the larval emergence hole in the fruit.
Photograph credit: Marja van der Straten, Plant Protection Service, National Reference Centre, The Netherlands