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PEST ALERT

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Florida Department of Agriculture and Consumer Services, Division of Plant Industry
Adam H. Putnam, Commissioner of Agriculture

Daylily Leafminer, *Ophiomyia kwansonis* Sasakawa (Diptera: Agromyzidae), new to North America, including Florida

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INTRODUCTION: On 17 March 2011, during a certification inspection at a nursery in Apopka, Orange County, Florida, a leaf mine was found in a daylily (*Hemerocallis* sp.) (E2011-1388, L. Brown). This mine contained a pre-pupal stage (Fig. 1) of a leafminer fly (Agromyzidae). As there was no previous scientific record of agromyzid leafminers in daylilies in Florida, or elsewhere in the Americas, it was suspected to be an exotic pest. Spencer (1990) listed only a single agromyzid as infesting *Hemerocallis*, *Ophiomyia kwansonis* Sasakawa, with known distribution in Japan (Sasakawa 1961) and Taiwan (Shiao and Wu 1999). Another agromyzid, *Liriomyza hemerocallis* Iwasaki, also infests *Hemerocallis* in Japan, but its larvae are pod and seed feeders (Iwasaki 1993). The Florida-collected leafminer pre-pupa is distinctive with long, knobbed anterior spiracles and protruding posterior spiracles, each bearing numerous pores. These features are characteristic of larvae and pupae of *Ophiomyia* in general, but not of *Liriomyza*.

In late July 2011, inspection of two daylily nurseries in Apopka, including the site of the March detection, and a nursery in Alachua County, revealed that leaf mines (Figs. 2, 3) were abundant, yielding larvae and pupae. Numerous adults were also collected by sweeping. All stages have been determined as *Ophiomyia kwansonis* Sasakawa. Nearly simultaneous the discovery and identification of the fly in Florida, this pest was positively identified in Maryland (Owen Lonsdale, Canadian National Collection, personal communication).

IDENTIFICATION OF LIFE STAGES: Very detailed descriptions of larvae, pupae and adults of both sexes were provided by Sasakawa (1961).
Larva (Fig. 4) - body up to 5.5 mm long; pale yellowish; cephalopharyngeal skeleton black, anterior sclerites forming a distinct triangle, and mouthhooks with at least two clearly visible teeth; anterior spiracles prominently protruding, black, knob-shaped with 14-18 pores; posterior spiracles elevated above caudal surface, the wide apical portion bearing 23-32 spiracular openings.
Pupa (Figs. 5, 6) - 3.0-3.5 mm long; orange-brown in color, except for black anterior and posterior spiracles that protrude prominently as in larvae. Pupation takes place in the mine as reported by Sasakawa (1961) and observed here.
Adult (Figs. 7, 8) - small (body and wing lengths each 2.0-2.5 mm), but robust flies, entirely black except for red eyes and clear wings; female with a distinct, conical oviscape posteriorly. As no other known leafminers are associated with daylily, it is likely that any agromyzid fly found on daylily and fitting this general description is, in fact, *Ophiomyia kwansonis*.

HOST PLANTS: The genus *Hemerocallis* comprises approximately 22 species. Over 60,000 registered varieties of daylily have been developed by hybridizers and collectors (Petit and Peat 2008). Observations at nurseries visited to date and various Internet accounts of leaf-mining indicate that many, if not most, cultivars are susceptible to oviposition and larval mining. Sasakawa's original description (1961) listed *Hemerocallis fulva kwanso* Regel as the host in Japan.

SYMPTOMS: Female flies oviposit in the leaf blade, often at or near its tip. The diagnostic mines produced by larval feeding appear as long, prominent, whitish lines (0.5-3.0 mm wide), usually on the upper surface. As the larvae feed and change directions, they may leave parallel pale tracks. At higher densities, or after repeated infestations, mines can crisscross, circle, or zigzag. Larvae often travel to the lower leaf surface in search of fresh feeding areas. Larvae tend to pupate in mines ending near the leaf base (Fig. 9a), appearing like small, tan rice grains visible through the epidermis (Fig. 6). In higher populations, larvae and pupae can be found in mines that end almost anywhere on either leaf surface and on flower scapes as well. The progression of leaf symptoms from mines with actively feeding larvae (Figs. 3, 9a) to

decaying leaf tissue with characteristic black frass (Fig 9c) is shown in Fig. 9. Leaves can be multiply infested, typically with two or three larvae per leaf. One leaf examined on 14 August 2011 in Maryland contained four larvae and three pupae.

PHENOLOGY: In Florida, apparently continuous breeding occurs from at least March to September, representing an as yet undetermined number of generations. In Maryland, weekly collections and observations from 20 June – 17 August 2011 consistently yielded younger and full grown larvae, pupae and adults, with two major adult spikes in June and mid-August, suggesting continuous breeding and at least two generations. One full-grown larva was collected in September, 2010. In Maryland, the species may overwinter as mature larvae or pupae. In Japan, there are three generations per year, two during May – July and one during September – October (Sasakawa 1961).

ECONOMIC IMPACT: Although even severe mining does not appear to kill plants, the fact that mines will persist until leaves are removed or replaced by new growth, means that plants remain disfigured throughout the flowering season, causing major concern for display and tour garden owners. Regulatory and trade impacts are not known as yet. Presently, the European Union requires that imported daylilies be certified free of several native leaf miner species.

RISK OF SPREAD: As larvae often travel to the bases of leaves where the lack of chlorophyll makes mines nearly invisible (Fig. 10), it would be easy to unknowingly transport the immature stages, even in fans that have been trimmed to a few centimeters.

DISTRIBUTION: Japan (Sasakawa 1961), Taiwan (Shiao and Wu 1999). The first possible evidence of this insect in the U.S. is an image posted at www.bugguide.net/node/view/84826, taken 4 July 2006 in Kennebunk, Maine by V.J. Hickey. It was described as a 3 mm fly, always seen on daylily flowers. Reports of unidentified leaf miner damage began to circulate several years ago among commercial daylily growers and enthusiasts over a widespread area: Texas and North Carolina in 2008; South Carolina and Maryland in 2009; New York, Georgia and Alabama in 2010; and, Louisiana, Mississippi, Pennsylvania, Tennessee, Virginia and West Virginia in 2011. (NB: this is not a time line of colonization, merely some individual observations with reliable dates.) Florida records include Alachua, Duval, Lake, Nassau, Orange, Seminole and St. Johns counties. The fly is apparently widespread in the eastern U.S.A. (Fig. 10).

CONTROL: No formal studies have been conducted to establish reliable chemical control methods. Growers should exercise good sanitation by removing obviously mined leaves promptly and destroying them to eliminate immature stages and reduce adult populations. Maintaining nurseries and gardens fly-free may prove difficult because of the abundance of naturalized *Hemerocallis fulva*, the roadside or outhouse daylily, which can serve as a reservoir for this insect.

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Fig. 1. Prepupa of *Ophiomyia kwansonis*.
Photography credit: Gary Steck (DPI)

Fig. 2. *Ophiomyia kwansonis* leaf mines in daylily.
Photography credit: Gary Steck (DPI)

Fig. 3. *Ophiomyia kwansonis* larva in daylily leaf mine.
Photography credit: Gary Steck (DPI)

Fig. 4. Larva of *Ophiomyia kwansonis*.
Photography credit: Gary Steck (DPI)

Fig. 5. Pupae of *Ophiomyia kwansonis*.
Photography credit: Gaye Williams (Maryland Department of Agriculture)

Fig. 6. *Ophiomyia kwansonis* pupa in daylily leaf mine.
Photography credit: Gary Steck (DPI)

Fig. 7. Female *Ophiomyia kwansonis* on daylily leaf.
Photography credit: Gary Steck (DPI)

Fig. 8. Female *Ophiomyia kwansonis* ovipositing into daylily leaf.
Photography credit: Gary Steck (DPI)

Fig. 9. Progression of *Ophiomyia kwansonis* leaf mine symptoms.
Photography credit: Gary Steck (DPI)

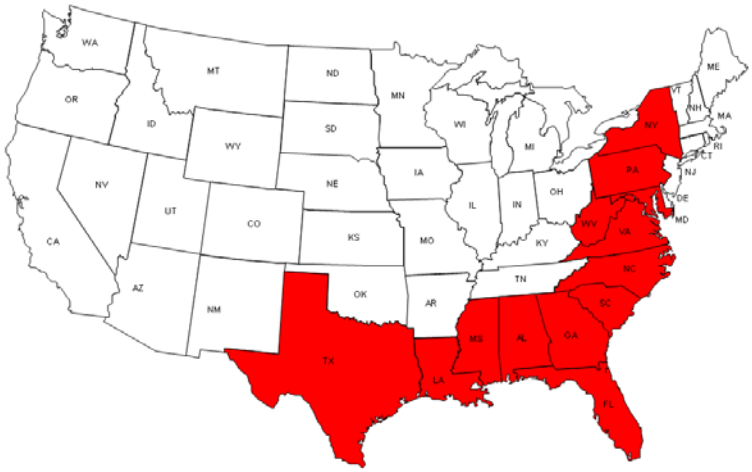

Fig. 10. Distribution of *Ophiomyia kwansonis* in the United States.