

DUPONCHELIA FOVEALIS, A RECENT PEST INTRODUCTION TO THE U.S. AND A SIGNIFICANT PEST FOR ORNAMENTAL PLANT PRODUCTION



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Introduction

Duponchelia fovealis Zeller (Lepidoptera: Pyralidae) originates in the Mediterranean area and is a significant pest of agricultural crops including peppers, squash, tomatoes, corn, etc. The moth is not native to the U.S., and the Animal Plant Health Inspection Service (APHIS) of the USDA considered it an actionable pest. Once identified in California, the state originally assigned it an 'A' rating, which meant that when found, there would have to be action taken to eliminate the risk of spreading the insect. A detection of *Duponchelia fovealis* in Canada in July 2010, and a trace-back lead to a grower in San Diego County California. This detection triggered an extensive trace forward survey to determine the extent of the invasion in California and other states. During the months of September and October 2010, APHIS and State Departments of Agriculture confirmed the presence of *Duponchelia fovealis* in portions of twelve additional states including; Alabama, Arizona, Colorado, Florida, Georgia, Mississippi, North Carolina, Oklahoma, Oregon, South Carolina, Texas, and Washington. Survey data to date confirmed the presence of *Duponchelia fovealis* in 16 counties in California. Confirmed host plants in San Diego County include: begonia, echeveria, gerbera, several varieties of Kalanchoe, and poinsettia. The list will most certainly grow.

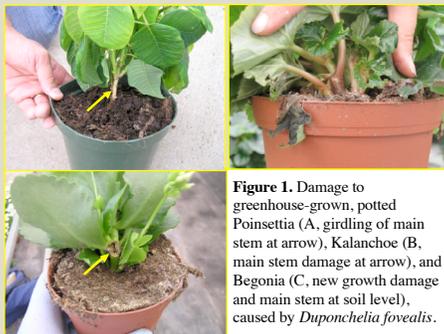


Figure 1. Damage to greenhouse-grown, potted Poinsettia (A, girdling of main stem at arrow), Kalanchoe (B, main stem damage at arrow), and Begonia (C, new growth damage and main stem at soil level), caused by *Duponchelia fovealis*.

Damage

Duponchelia causes severe damage to main stems (Figure 1) and the lower leaves and tissues that are adjacent to the potting soil. They tend to create webbed tunnels (Figure 2) and protective coverings and often feed below the soil line in soft plant media.

HOST PLANTS

Host plants include plants in about 38 plant families and include field-grown vegetables and ornamentals, greenhouse-grown ornamentals and herbs, and tree and vine hosts. A summary of ornamental host plants from the literature include *alternanthera*, *daisy* (*Belis* spp.), *cineraria*, *gerbera*, *impatiens*, *begonia*, *elderberry*, *chenopodium*, *Kalanchoe*, *azalea*, *croton*, *poinsettia*, *geranium* (*pelargonium*), *customa*, *lilyturf*, *cuphia*, *coleus*, *mint*, *malva*, *calathea*, *oxalis*, *loosestrife*, *limonium*, *cyclamen*, *portulaca*, *rannunculus*, *rosa*, *bouvardia*, *heuchera*, *bacopa* (*aquatic*), *capsicum*, and *elm*.

Summaries of agricultural plants that are attacked include *celery*, *peppers*, *cucumbers*, *tomatoes*, *maize*, *pomegranate*, and *certain herbs*.

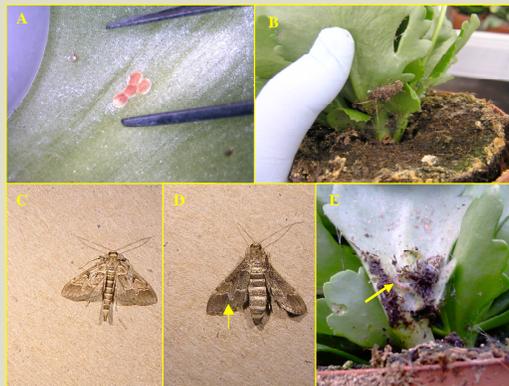


Figure 2. Stages of *Duponchelia fovealis*. A - Four eggs laid at the base of a Kalanchoe leaf. B - Pupal stage in a cocoon made from soil particles and attached to the lower surface of a Kalanchoe leaf. Pupae were also found on the bottom of pots and at the soil line along the pot edges. C - Male. D - Female. Arrow indicates a diagnostic feature of the wing pattern. E - larva (arrow) feeding on the lower surface of a Kalanchoe leaf and well protected from pesticides since the leaf was lying on the soil surface. The larva is wrapped in webbing and surrounded by frass and soil particles.

Life History

Development from egg to adult is as long as 47 days at 68°F but will be much shorter in our warmer climates and especially in greenhouses. The adult life span is from 1-2 weeks, and a female can lay up to a total of 200 eggs, singly or in small batches. Eggs are small 0.5 x 0.7mm (Figure 2A), whitish to green in color and darken to a reddish color as they age. Adult forewings (19-21 mm wingspan) are grey to brown with distinctive markings. The lowest lines on the outer wing have a tooth-like notch facing backward (Figure 2D, arrow). Males have a longer slender abdomen (Figure 2C) than females. Larvae are creamy white to brown with a dark head capsule (Figure 2E), and they have lines of distinct dark spots along the abdomen. Larvae mature in about four weeks.

Mature larvae create a cocoon composed of webbing and soil particles (Figure 2B) and they pupate inside. The cocoon is usually attached to the undersides of leaves or the edge of the pot, and they take about 1-2 weeks to hatch. The number of generations per year is variable, but is certain to be multiple generations in southern California, and we are likely to have multiple year-round generations in greenhouse production.

Table 1. Efficacy of selected insecticides applied to *Duponchelia fovealis* infested Kalanchoe in 4-inch pots. Sixty new pots were selected for each assessment, and the percentage of pots with live infestations of caterpillars was recorded.

Treatment Application	Pre-treatment live/60 pnts (%)	24hour post-trt (%)	72 hour post-trt (%)	% Reduction 72hrs
Bifenthrin	8 (13.3)	2 (3.3)	4 (6.7)	50.0
Bifenthrin+Orthene	10 (16.7)	5 (8.3)	3 (5.0)	70.0
Emamectin	7 (11.7)	7 (11.7)	4 (6.7)	42.9
Lambda-cyhalothrin	8 (13.3)	7 (11.7)	7 (11.7)	12.5
Chlorantraniliprole	7 (11.7)	9 (15.0)	5 (8.3)	28.6
Spinosad	7 (11.7)	5 (8.3)	6 (10.0)	14.3
Orthene	8 (13.3)	5 (8.3)	4 (6.7)	50.0
LTC	9 (15.0)	6 (10.0)	12 (20.0)	-33.3

Percent reductions are the percent of change from the pretreatment count. Bigger numbers are better. Negative numbers indicate an increase in the number of plants infested from the pre-treatment count. Products and rates tested are for experimental purposes only and may not be registered for use. It is your responsibility to make sure you are using registered products and rates for control purposes.

Monitoring

There are good reports of monitoring techniques that include the use of a pheromone in Delta traps, Funnel traps, and Water traps. Pheromone lures for *Duponchelia fovealis* are available from Koppert Biological Systems (<http://www.koppert.com/products/monitoring/products-monitoring/detail/pherodis-2/>). A good description of the trapping techniques used in the Netherlands can be downloaded at documents.plant.wur.nl/wurglas/C_bestwatertrap.pdf.

Table 2. Efficacy of selected pesticides against *Duponchelia fovealis* on potted verbena. Spray applications were made by turning the pots on their sides and applying the pesticides to the caterpillar on the roots and bottoms of the pots. Drench applications were made using label instructions for application to a 6-inch pot. Numbers are the average number of live larvae per pot.

Treatment/Form.	Rate/100 gal	Appl. Method	Nov 16 Pre-Trt	Nov 16	Nov 17	Nov 18	Nov 19
Accephate TT&O	8 oz	Drench	4.0a	2.8ab	0.8b	0.7cd	
Bifenthrin Pro	23.85 oz	Drench	4.0a	3.8a	3.5a	3.2a	
Dinotefuran 20SG	15.5 oz	Drench	4.0a	2.3ab	2.2a	2.2abc	
Emamectin + Dyne-amic	4.8 oz + 80 oz	Spray	4.0a	2.8ab	2.7a	1.8abc	
Accephate	8 oz	Spray	4.0a	1.7b	1.2b	0.3d	
Bifenthrin (8.8%) + Abamectin (1.3%)	21 oz	Spray	4.2a	2.3ab	2.0ab	1.5bcd	
Check	***	Spray	4.2a	4.2a	3.7a	3.2ab	

Means followed by different letters are significantly different. LSD (p=0.05).

Control

The following trials were conducted on heavily infested potted plants from cooperating growers. The first trial was on a heavily infested group of greenhouse-grown Kalanchoe. The plants were mature and flowering, and the vast majority of the plants contained larvae or evidence of an infestation. They were potted in Latvian peat in 4-inch pots. The majority of the larvae were in late stages, and we observed that about 2% of the plants contained pupae. Very few plants contained more than one larva. The larvae were exceptionally well protected under leaves, in webbing, and between leaf and soil surface. Therefore, foliar applications were made using backpack sprayer and a large droplet size at the highest recommended rate on the label, and an effort was made to get the soil surface and main stem wet with the treatment application.

The presence of live larvae per plant was assessed at 24 and 72 hours after application. Sixty plants were selected at random as a pre-treatment count and different set of 60 plants were selected for each of the two post-treatment assessments. The percent reduction in the number of larvae per treatment was determined (Table 1). Bifenthrin, Orthene, and Bifenthrin+Orthene tank mix caused a 50-75% reduction in the mean number of live larvae per treatment.

The second trial was conducted on heavily infested potted verbena in an outdoor nursery environment. There were numerous larvae on the bottom of the pots infesting the roots that were protruding from the drainage holes. Some applications of pesticides were made by tipping the plants on their sides and applying using a backpack sprayer to increase coverage, and some plants were drenched from above.

Survivorship was observed for three days after treatment applications. Accephate performed well as both a spray and a drench against this pest. Other products did not cause significant mortality compared to the control under the conditions of this trial.