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Biology and Management of the Florida Fern Caterpillar

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The Florida fern caterpillar, *Callopistria floridensis* (Guenée), has been associated with the production of leatherleaf fern, *Rumohra adiantiformis* (Forst.) Ching, since the inception of the industry in Florida. One of the earliest records of this insect is a description in 1852 of a moth collected in Florida. This insect, which is considered a tropical species, is apparently a specialist, feeding principally on ferns. The Florida fern caterpillar has been known to be relatively easy to control with insecticides. However, based on reports from growers, episodes of resistance apparently have occurred at times over the last 20 years. These episodes of resistance most likely resulted from the continued use of a limited number of insecticides, especially of the insecticide group known as pyrethroids: fenvalerate, used in the early 80s but no longer available, and permethrin. Another possible factor contributing to the development of resistance is the expansion of the leatherleaf industry and the scaling up of production. The resulting monocultures create conditions that increase the likelihood of resistance problems developing when resistance management strategies are not incorporated into pest management programs.

The minimum resistance management program involves reducing the overall usage of insecticides and rotating different classes of insecticides to further reduce the use of any one active ingredient. Currently, growers are depending heavily on diflubenzuron (Adept™, Dimilin®) to effectively control the Florida fern caterpillar. *Bacillus thuringiensis* (*Bt*)-based products, such as DiPel® 2X, Javelin® and XenTari™, would be suitable alternatives for rotation with diflubenzuron to delay the possible onset of resistance to either active ingredient. Reducing the use of insecticides without increasing risk of insect damage comes from regular and methodical observation of the crop, commonly referred to as scouting. Development of any scouting program is contingent on knowledge of the biology of the insect.

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The following describes the appearance of life stages, development time, feeding habits and other behavior of the Florida fern caterpillar.

Development. The Florida fern caterpillar has four life stages: egg, larva (caterpillar), pupa (resting stage) in a cocoon, and adult (moth). How long it takes an insect to go through these stages is dependent on temperature. Roughly, the development time is cut in half every 10°F (5.6°C) above 50°F (10°C). Below 50°F, development is very slow, taking several months to go from egg to adult. At 70°F (21°C), the time from egg to adult is about 60 days. At its fastest, approaching 85°F (30°C), the total time from egg to adult is about 30 days. It is estimated there are 5-6 generations per year in central Florida.

Egg. Between 200 and 600 eggs are laid by a single female. Eggs are laid singly and attached to the underside of young leaves and on the fiddleheads. They take 5 to 7 days to hatch at 70°F (21°C). Eggs are round with a diameter of about 0.02 inch (0.5 mm), slightly flattened, and are covered with a net-like ribbing. They are translucent white to pale green when freshly laid, acquiring brown markings and becoming yellowish-green as they age.

Caterpillar. The caterpillar goes through 5–6 stages, getting larger and eating more with each stage. A full-grown caterpillar is about 1½ inches (3.8 cm) long. Larval development takes around 36 – 42 days at 70°F (21°C). The amount of leaf area consumed by the last two caterpillar stages can comprise more than 80% of the total leaf area consumed by the caterpillar. The caterpillar has several color phases. Caterpillars are glassy green until about the third stage, at which time they begin to develop one of about five color types and can differ dramatically in appearance. The color types range from totally green, green with a white band and a black band running the length of the body, as previously described but with black spots on top, brown to velvet black, and brown to velvet black with a white band running the length of the body. Caterpillars tend to feed higher on the plants at night and under low-light conditions during the day than during brighter daylight conditions. Caterpillars blend in very well with the foliage, and may rest along the midrib of the frond making them very difficult to see.

Pupa. When the caterpillars are done feeding, they move to the ground where they spend several days preparing their cocoon in which they pupate. The pupa is shiny mahogany-brown. It is rarely seen since it is usually inside the cocoon. The cocoon is covered with debris, such as leaves and soil, making it very difficult to find. At 70°F (21°C), the pupal stage lasts about 18 days.

Adult. The moth is brown and has a wingspan of about 1 C inches (2.9 cm). It is typical of many moths in this group, with the front wing having various shades of brown with lighter, wavy lines. A distinctive character is a dark reddish-brown to chocolate-brown triangular patch about the middle and on the leading edge of the forewing. The sides of the triangle not along the leading edge of the wing are set off with lighter lines. There is also a similar but less distinct triangle closer to the tip of the wing. The hind wings are a light uniform brown color, edged with a narrow, lighter band. The moths fly at night and are strong flyers. They have been collected every month of the year in Florida.

Note. The beet armyworm (*Spodoptera exigua* (Hubner)) is a similar species with different color phases in the larval stage. This is worth mentioning because the beet armyworm can be a pest in tree "fern" (*Asparagus virgatus* Bak.) and is apparently being mistaken for the Florida fern caterpillar in tree "fern". There are no apparent records of the Florida fern caterpillar feeding on tree "fern". This is significant in that, diflubenzuron, which is very effective on the Florida fern caterpillar, may not be as effective at controlling the beet armyworm. The beet armyworm is not known to feed on leatherleaf fern. See *Cut Foliage Research Note* RH-97-A (Pesticides labeled for use in commercial ornamental asparagus production in Florida) for products that can be used to control caterpillars on tree "fern".

Management recommendations. Since much of the insecticide is applied through the irrigation system (chemigation), and many insecticides are not labeled for chemigation, the number of insecticides available for control of the Florida fern caterpillar by chemigation is rather limited (see Table 1). NOTE: Unless it is explicitly stated on the label, an insecticide cannot be applied by chemigation. Also note that all formulations of the same active ingredient may not be labeled for chemigation - **READ THE LABEL!**

Table 1. Examples of insecticides labeled for use on leatherleaf fern.

Insecticide classification	Common name	Trade names
Carbamates	carbaryl	Carbaryl*, Sevin®*
Chlorinated hydrocarbons	endosulfan	Endosulfan, Phaser®, Thiodan®
Growth regulators	diflubenzuron	Adept™**, Dimilin®**
Microbials	*Bacillus thuringiensis*	DiPel® 2X***, Javelin®, XenTari™**
Organophosphates	chlorpyrifos	DuraGuard™, Dursban™
Pyrethoids	bifenthrin	Talstar®
	lambda-cyhalothrin	Topcide™
	permethrin	Ambush®**, Astro™**, Pounce®**
Spinosyns	spinosad	Conserve™ SC

* Some formulations labeled for chemigation.
** Labeled for chemigation.
*** Labeled for chemigation only in Florida.

As previously mentioned, an important factor to consider in the management of the Florida fern caterpillar is the potential for insecticide resistance. Since the potential for development of resistance exists for any insecticide, reliance on one active ingredient or

class of insecticides is greatly discouraged. Therefore, the use of any one active ingredient or class of insecticide should be minimized whenever possible. The potential for the development of resistance makes scouting to monitor the effectiveness of insecticide applications a prudent practice for all insecticides. The best strategy for using insecticides and delaying the onset of resistance is to use insecticides only when necessary and to alternate among the classes of insecticides that are available for use on leatherleaf fern. One possible strategy would be rotating among *Bacillus thuringiensis*, diflubenzuron, and spinosad for the Florida fern caterpillar, and using chlorpyrifos, endosulfan, carbaryl, or a pyrethroid as needed for other pests (see Table 2).

Table 2. Recommended prioritized choices for insecticides in leatherleaf fern.

	Florida fern caterpillar	**leafhoppers**	**grasshoppers**	**fern borer**
Bacillus thuringiensis, diflubenzuron, spinosad	1st (rotate among these)			
chlorpyrifos	2nd	1st	1st	
carbaryl	3rd	3rd	2nd	
pyrethroids	4th	4th		
endosulfan	5th	2nd		1st

These tables can be used to help make decisions on what insecticides to use for control of insects in leatherleaf fern. Recommendations are strictly guidelines that are based on current knowledge and experience, and are subject to change with more research and experience. The choices were prioritized based on compatibility with an insecticide resistance management strategy for the Florida fern caterpillar and the potential for the presence of multiple pests.

Note: Mention of a commercial or proprietary product or chemical does not constitute a recommendation or warranty of the product by the authors or the University of Florida, Institute of Food and Agricultural Sciences, nor does it imply its approval to the exclusion of other products that may also be suitable. Chemicals should be applied according to label instructions and safety equipment required on the label and by federal or state law should be employed. Users should avoid the use of chemicals under conditions that could lead to ground water contamination. Pesticide registrations may change so it is the responsibility of the user to ascertain if a pesticide is labeled for an intended use.