ENY-353

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Caterpillars that Defoliate Trees and Shrubs[1]

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Do branches on your trees look like someone stripped the leaves off, rolled up the leaves, or spun thick silken webs together? Chances are that a moth or butterfly (order Lepidoptera) laid some eggs nearby that hatched into some very hungry caterpillars.

Damage

Defoliating caterpillars either partially or completely consume (Figure 1) the leaves or needles of their host plants, and in some cases may also feed on flowers, buds, and young shoots. Some species fold or roll leaves together with silk, and others make silken nests or tents for shelter. Others may chew holes in leaves, feed selectively between the leaf veins (skeletonizers; Figure 2), or feed on only one surface of the leaf (window feeders). Specialized feeders called “leafminers” feed between the leaf tissue layers (Figure 3). The importance of the injury depends on plant age, species, health, length of infestation, and the value (e.g., aesthetic, ecological, commercial) ascribed to the tree or shrub. Undesired gaps in the foliage, reduced growth, or death may result from several years of repeated, heavy defoliation. Complete defoliation may cause some plants to produce new leaves. If that new growth flush occurs very early or late in the growing season, it may be more susceptible to freeze injury. However, otherwise healthy and mature trees can tolerate extensive caterpillar feeding without mortality or substantial growth loss, particularly when the infestation is short-lived.

Figure 1. Yellownecked caterpillar feeding damage to locuat. Credits: E. Buss, University of Florida

Identification and Biology

Adult moths or butterflies mate, then females lay eggs singly or in masses on or near larval food plants. The eggs usually hatch after several days. The larvae move individually or in groups to feeding sites on a

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Figure 2. Example of a skeletonized leaf. Credits: E. Buss, University of Florida

plant. As they feed and grow, they molt or shed their skins several times before pupating. Some larvae pupate directly on the host plant, but others may pupate on fences, tree trunks, in the leaf litter beneath a tree, or in other hidden and undisturbed areas. The adult moth or butterfly emerges from the pupal case or cocoon after several more days, weeks, or months, depending on the species. Moths tend to fly at night, butterflies are usually active during the day, and both tend to feed on nectar and water. Adults are not damaging to plants. Some species in Florida have only one generation a year (e.g., eastern and forest tent caterpillar, hickory horned devil), whereas others may have multiple generations a year (e.g., fall webworm, oleander caterpillar, palm leaf skeletonizer). Caterpillar populations naturally fluctuate between periods of high and low abundance.

Caterpillars can be distinguished from sawfly, beetle, or fly larvae by the number and arrangement of their legs. Caterpillars, beetle larvae, and sawfly larvae have three pairs of true legs, one pair on each

Figure 3. Citrus leafminer damage is an example of a serpentine leaf mine.

thoracic segment. Sawfly larvae also have six or more pairs of fleshy leglike appendages (called prolegs) on their abdominal segments (Figure 4). Caterpillars have prolegs on some abdominal segments, but never have more than five pairs (Figure 5). Unlike sawflies, caterpillars have small hooked spines called crochets at the end of their prolegs. Beetle larvae have true legs, but lack prolegs. Fly larvae are legless.

Figure 4. A sawfly larva (Note the thoracic legs and prolegs).

Figure 5. The hickory horned devil has 3 pairs of thoracic legs, 5 pairs of prolegs, and non-stinging spines.

Monitoring

Damage can be minimized if infestations are seen while caterpillars are still young. Know which plants tend to get reinfested or are prone to certain pests. Some caterpillars feed on top, underneath, within, or along the edge of leaves, and many blend in with the plant coloration, mimic bird droppings, or encase themselves with plant debris. Look for fecal pellets (frass) on or below plants, on picnic tables, vehicles, and sidewalks. The pellets get bigger as the insects grow. A lot of pellets may indicate a large caterpillar infestation. You can also monitor for egg masses, webbing, pupal cases, cocoons, or signs of natural enemies. Avoid touching caterpillars with spines or hairs – some species can cause a burning sensation or an allergic rash on exposed skin.

Management

Knowing the insect's species and life cycle is important when trying to decide if control is needed. If the insect only has one generation a year, then it may be prudent to just wait it out until the larvae disappear (e.g., pupate).

Cultural and Physical Control

Keep plants healthy with proper irrigation and fertilization. Moths that fly at night are attracted to lights, so either turn exterior lights off or use sodium vapor instead of mercury vapor light bulbs. Prune silken tents out of branches before they get too large. Nest-feeding caterpillars tend to remain in their shelters on cool, overcast or rainy days, so pruning may be most effective at those times. Hand-pick caterpillars from plants and remove or destroy them. Look for egg masses and scrape them off into soapy water and dispose of them.

Biological Control

Predators, parasitoids, and natural disease outbreaks, in combination with environmental factors, usually return caterpillar populations to non-damaging levels. Predators include some stink bugs, assassin bugs, bigeyed bugs, damsel bugs, ground beetles, pirate bugs, spiders, and birds. Mice and other small animals feed on pupae that are on or near the ground. Eggs are often parasitized by tiny wasps, and larvae may be killed by larger wasps or tachinid flies. Some caterpillars die from diseases caused by naturally-occurring bacteria, fungi, or viruses. Those killed by viruses or bacteria may turn dark, their bodies may become limp, soft, and smelly. When those bodies rupture, more viral particles or bacterial spores are released and infect other caterpillars that eat the contaminated foliage.

Microbial Insecticides

The most environmentally-friendly treatment against young caterpillars is a commercially available pathogen, *Bacillus thuringiensis* (*Bt*) variety *kurstaki*. Other varieties or subspecies of *Bt* are not effective on caterpillars. When infected with *Bt*, young caterpillars stop feeding within a day and usually die within a few days. *Bt* is not harmful to beneficials. Applications are most effective on warm, sunny days, when caterpillars are exposed and actively feeding (the *Bt* pathogen works only by ingestion). Because of the short residual, *Bt* should be reapplied about 7-10 days later, if needed. Another commercially available microbial product that is specific to caterpillars is Conserve (active ingredient: spinosad).

Reduced-Risk Insecticides

Other products that are effective at controlling caterpillars include growth-regulating products that inhibit the caterpillar molting process, such as azadirachtin (Azatin), diflubenzuron (Dimilin) and tebufenozide (Confirm T&O). For leafminers, an insecticide that can be absorbed into the leaf tissue, such as acephate (Orthene) may be most effective. For best results, time these applications to coincide with newly hatched larvae. For insects with multiple

generations per year, target larvae during the first generation, when there is less overlapping of life stages within the population. Broad-spectrum insecticides like pyrethroids (e.g., Talstar, Tempo) or carbamates (e.g., Sevin) can be used if older larvae have been found and insect growth regulators or microbials are less effective. However, broad-spectrum insecticides will likely kill any natural enemies present, and could cause an outbreak of mites, scales, or other pests on some plants.

For More Information

Caterpillars of Ornamental Plants (SP152)
http://edis.ifas.ufl.edu/IN033.

Forest and Shade Tree Insects of Florida
Website: http://entomology.ifas.ufl.edu/foltz/eny3541.

Leafminers on ornamental plants
http://edis.ifas.ufl.edu/mg006.

Stinging and Venomous Caterpillars (SP107)
http://edis.ifas.ufl.edu/IN014.

Table 1. Insecticides labeled for non-commercial (homeowner) use against caterpillars in Florida.

Active Ingredient	Florida Registered Products	Chemical Class
Acephate	Orthene	Organophosphate
Bacillus thuringiensis K.	Green Light Bt Worm Killer	Microbial
	Green Light Dipel Dust	
Bifenthrin	Ortho Bug-B-Gon Max Lawn & Garden Insect Killer	Pyrethroid
Carbaryl	Sevin	Carbamate
Cyfluthrin	Bayer Advanced Rose & Flower Insect Killer	Pyrethroid
	Bayer Advanced Power Force Multi-Insect Killer	
	Schultz Lawn & Garden Insect Killer	
Neem Oil	Bonide Bon-Neem	Botanical
	Green Light Neem Concentrate	
Permethrin	Bonide Eight Liquid	Pyrethroid
	Ortho Bug-B-Gon Max Garden Insect Dust	
Spinosad	Bulls-Eye Bioinsecticide	Microbial

Table 2. Insecticides labeled for professional use against caterpillars in Florida.

Active Ingredient	Florida Registered Products	Chemical Class	Signal Word
Acephate	Acephate Pro 75*	Organophosphate	Caution
	Orthene Turf, Tree & Ornamental Spray*		Caution
Azadirachtin	Azatin XL	Botanical	Caution
	Azatrol EC		Caution
Bacillus thuringiensis K	Dipel	Microbial	Caution
	Thuricide		Caution
Bifenthrin	Talstar EZ, F, G, PL Granular, TalstarOne	Pyrethroid	Caution
	Onyx		Warning
	Bifenthrin Pro		Caution
Carbaryl	Sevin SL	Carbamate	Caution
	Sevin 80 WSP		Warning
Cyfluthrin	Tempo 20 WP, SC Ultra, Ultra WP/WSP	Pyrethroid	Caution
Deltamethrin	DeltaGard 5SC, Granular	Pyrethroid	Caution
Diflubenzuron	Adept	IGR	Caution
	Dimilin 25W, SC		Caution
Halofenozide	Mach 2 1.5G, SC	Microbial	Caution
Lambda-cyhalothrin	Scimitar CS, GC*	Pyrethroid	Caution
	Demand CS		Caution
Permethrin	Astro	Pyrethroid	Caution
Spinosad	Conserve SC	Microbial	Caution
Trichlorfon	Dylox 80 T&O	Organophosphate	Caution

* Restricted use pesticide