



Greenhouse TPM/IPM Weekly Report
University of Maryland Cooperative Extension
Central Maryland Research and Education Center

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September 28, 2007

**Composting Materials for the
Landscape and Nursery Industry**

October 9, 2007

Chesterfield Farms and the Big Fish Grille, Crofton
For more information: 301-596-9413

**Getting Green: Sustainable Energy
Use for the Green Industry**

November 8, 2007

Maryland State Fairgrounds, Timonium
For more information: 310-596-9413

Cutworms

We visited a greenhouse this week that was experiencing scattered dieback of their pansy crop. Symptomatic plants had a wilted, collapsed appearance often associated with root rots. We discovered that the wilting was being caused by cutworms that were completely severing the stems at the soil line. These night-flying moths lay eggs at the base of plants. The larvae feed at night (they will also emerge to feed at dusk or in cloudy weather) and coil up in the soil during the day, making them hard to detect. Substantial damage may occur before the caterpillars are detected. The larvae that we found were a dull, grayish-green color. Other hosts include: aster, carnation, chrysanthemum, dahlia, gladiolus, marigold, nasturtium, pansy, rose, violet and zinnia.

Control: Orthene (acephate), Conserve (spinosad)



Larvae curl into a C-shaped ball when disturbed

Fungus Gnats

During the rooting stage of poinsettia when moisture levels are being held high, fungus gnat larvae do a fair amount of damage. We visited a greenhouse this week that was losing poinsettia plants to fungus gnat injury. The larvae were feeding on cuttings that had been stuck directly into 6 inch pots.

Monitoring: Check your substrate using a potato wedge placed on the soil surface. Examine the potato wedge within 2 – 3 days and look for fungus gnat larvae.

Control: A soil drench of Gnatrol (usually requires 3 applications at 7 –10 day intervals) is one option. We have had good success using the entomopathogenic nematode, *Steinernema feltiae*. Several growers are using the IGR Distance as a soil drench and obtaining good control of fungus gnat larvae.



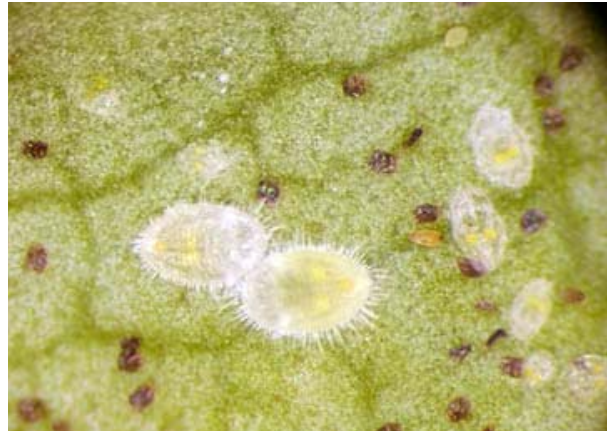
Whiteflies

One greenhouse operation had poinsettia plants that were heavily infested with whitefly. Whitefly species that are most common and cause the majority of problems to poinsettia crops include: Sweetpotato whitefly, *Bemisia tabaci* biotype B (=the silverleaf whitefly, *Bemisia argentifolii* Bellows & Perring), Sweetpotato whitefly, *B. tabaci* biotype Q, and the greenhouse whitefly, *Trialeurodes vaporariorum* (Westwood). The B biotype and Q-Biotype of *Bemisia tabaci* cannot be distinguished by field observation. The insect's DNA must be sampled to distinguish these two species or biotypes.



Damage to Plants: High populations of whiteflies can weaken plants, causing chlorotic foliage and reduced vigor. Whiteflies are plant phloem feeders (as far as is known), and they can contribute to reduced productivity by directly consuming carbohydrates and other nutrients carried in the phloem. Whiteflies, like other homopteran insects such as aphids, mealybugs, and soft scales, produce honeydew excretions that cause leaves to become sticky and shiny. The honeydew serves as a substrate for the growth of grayish-black sooty mold fungus which detracts from the plant's aesthetic value and interferes with photosynthesis. Silverleaf whiteflies have been found to be capable of transmitting plant viruses.

Identification of Whiteflies: All whitefly life stages are almost always found on the lower surfaces of leaves. Adult whiteflies are small (1 to 2 mm), white, fly-like insects, from which the pest gets its name. The white appearance of the adults comes from the wax secreted from the abdomen with which they cover their bodies. Whitefly eggs are very tiny, spindle-shaped, usually stand vertically on the leaf surface, and are attached to the leaf by a tiny pedicel, or stalk, at the base of the egg. For many species, eggs are white when first laid, turning dark gray (greenhouse whitefly) or amber-brown (silverleaf whitefly) with time. The crawler and other nymphal stages of the most common species are oval, greatly flattened, and somewhat translucent with a white, light green, or light yellow cast. The four nymphal stages are identified by their relative sizes. Length and width increase with each successive molt. The pupal stage is used to identify the different species. Greenhouse whitefly pupa is oval and has elevated sides with a fringe of wax filaments around the rim. The silverleaf whitefly pupa is dome shaped and has no fringe of wax filaments. Adult whiteflies are not used by taxonomists to distinguish between species since there can be a wide range of variation.



Typical Biology of Whiteflies: The life cycles of whitefly pests of herbaceous perennials are generally similar. Adult whiteflies are mobile, visually acute insect pests with a behavioral biology vastly different from the immature stages (nymphs). Eggs are deposited on the underside of leaves, sometimes in a circle or crescent-shaped pattern. The tiny first nymphal stage (crawler) hatches from the egg, crawls a few millimeters, and then settles down to feed. It will not move from this spot until emerging as an adult after passing through three more nymphal stages. The pupal stage (i.e., when the red eyespots of the developing adult are visible through the pupal case) lasts five days for both species. A female can begin to lay eggs from one to four days after emerging as an adult. Mating is not necessary for egg production. A female may lay up to two hundred eggs and live up to forty to forty-five days, but this depends greatly on the whitefly species and environmental conditions such as temperature and host plant.

Monitoring for Whiteflies: In propagation greenhouses, whitefly infestations can be monitored using a combination of sticky traps and foliage inspection. The older life stages are often found on older foliage; eggs and younger life stages are usually on younger leaves.

Cultural Control: The most desirable way of limiting whitefly problems is to avoid fostering them in the first place. Weeds inside and near the greenhouse or growing beds are often an important culprit in maintaining a pest population; check some of them to verify the presence of whiteflies. The first line of attack should be eliminating weeds. Next, turn over leaves on whitefly-prone plants already in the growing area or in the greenhouse. Look for eggs and sessile stages of whitefly nymphs on the undersides of leaves. Honeydew given off by large populations of whiteflies is a signal that you should look closely at plants. Check incoming susceptible plant material, especially cuttings or larger plants, by turning over leaves and examining for adults, eggs, and sessile stages of the whiteflies.

Biological Control

Pathogens: Microbial insecticides offer an alternative to traditional chemical sprays and drenches for control of whiteflies. One potential candidate that has received federal registration is an amicrobial insecticide containing the entomopathogenic fungus *Beauveria bassiana*. This fungus is a naturally occurring insect pathogen and has been found to be effective in controlling whiteflies, certain aphid species, and thrips. Two different strains—GHA (BotaniGard), and L-1 (Naturalis-L) of the fungus are commercially available. *B. bassiana* spores are formulated to mix readily in water and are applied using standard high volume spray equipment. The fungus kills insects either by direct contact from the spray treatment or through secondary contact with spores on foliage. When spores come in contact with an acceptable host, a germ tube penetrates the insect's cuticle and feeds from the host body resulting in death of the host. In most cases, it takes eight to ten fungal spores on an insect to cause fungal infection and subsequent death of the insect. The warm temperatures and relatively high humidity in greenhouses are ideal environments for using this fungal pathogen. Because fungal spores kill insects through direct contact, good spray coverage is essential for achieving adequate control.

Parasitoids: Parasitoids that have been used successfully in floral crops include tiny wasps of various species of *Encarsia* and *Eretmocerus*. These wasps attack and kill whitefly nymphs. The female wasp kills a number of immature whiteflies by puncturing the whitefly nymph with her ovipositor, killing the nymph, and feeding from the fluids that exude from the wound, a phenomenon called host feeding. Death to the whitefly can also occur when the female wasp uses her needlelike ovipositor to lay an egg within or beneath a whitefly nymph. *Encarsia* sp. prefers the third to fourth instar whiteflies. A female can lay up to two hundred eggs. The egg hatches, and the parasitoid maggot feeds on the nymph. The life span is fourteen to twenty days. The wasp's pupation occurs within the whitefly nymph. When the adult wasp emerges from the whitefly pupa, it chews a round exit hole through the cuticle at one end of the whitefly pupa. The adult lives approximately a month.



For whitefly control on short-term floral crops, these wasps are usually released weekly in inundatory quantities. Generally, the adults don't fly at temperatures below 60° F (16° C). When used this way, the wasps kill whitefly nymphs primarily by host feeding rather than parasitism, leaving behind dead whitefly nymphs that appear collapsed and dry. Wasps do not attack adult whiteflies. The adult wasps are attracted to yellow sticky cards. When releasing *Encarsia* spp. or *Eretmocerus* spp., it might be best to use the USDA station trap to monitor for adult whiteflies. Several species of whitefly parasitoids occur naturally in the U.S., and these may migrate into unsprayed growing areas and attack whiteflies. However, the degree of control provided by these parasitoids is usually insufficient for various reasons. Augmentative releases of commercially reared parasitoids are typically more effective. And if ants are present, they will defend the whiteflies from parasites to protect their honeydew source.

The cost of parasitoids might cause some growers to pause and investigate a chemical control instead. In Canada and Europe, some growers have experimented with using “banker plants,” a whitefly-susceptible plant on which a grower allows whitefly populations and their accompanying parasitoids to build up. One plant that has been used is eggplant, to which whitefly are highly attracted. Another “whitefly magnet plant” that could be used is fuschia. Growers then release *Encarsia formosa* or *Eretmocerus eremicus* near these infested plants. This creates a type of on-site insectary on which the parasitoids increase their numbers. These plants with large numbers of parasitoids are then moved in amongst the crops to which whiteflies are prone.

Encarsia Formosa: This is a very tiny wasp (0.6 mm), with a black head and thorax, a pale yellow abdomen, and clear wings. This wasp is used to control low to moderate populations of greenhouse whitefly. Females give rise to females; males are rare. Greenhouse whitefly pupae that have been parasitized by *Encarsia formosa* turn dark colored; silverleaf whitefly pupae turn amber-brown (Fig. 12-4). The adult wasps are rarely noticed and should not be a deterrent to the sale of the plants. This parasitoid is widely used for biological control of greenhouse whitefly on greenhouse vegetables and herb crops. Release rates, based on greenhouse studies, vary from three to six wasps per square foot of growing area with repeated releases at seven- to fourteen-day intervals. *Encarsia* will reproduce on many greenhouse crops once a population is established.

***Eretmocerus eremicus* (=californicus nr.) Rose and Zolnerowich:** This tiny wasp (0.8 mm) differs from *Encarsia formosa* in that the adult is entirely yellow and has green eyes and clubshaped antennae. It can be used in control of silverleaf and greenhouse whiteflies. Males have longer antennae than females. Parasitized whitefly nymphs appear beige in color. Release rates that have been tried in greenhouses for crops such as poinsettia are two to three per square foot of growing area. Repeated releases at seven- to fourteen-day intervals are often necessary.

Scouting Reports

Aphids are being seen on ornamental cabbage crops this week. They were found on the undersides of the older foliage.

Longtailed mealy bugs are showing up on ponytail palm. Longtailed mealybugs have seventeen pairs of white waxy filaments around the periphery of the body. The mature females have two tail-like projections at the rear of their bodies that are longer than the length of the body.



Elle pot follow-up:

In response to last week’s report, Brett Karp, S & G Flower & Seeds, noted that “the Elle Pot has been around a few years. S&G and Raker have been doing perennials in an Elle pot. Suntory offers annual liners in an Elle pot too. More vendors are trialing and offering the Elle pot these day's.”

**Being Greener in the Landscape and Nursery Industry –
How to Compost Green Industry Materials Seminar and Field Day**

October 9, 2007 (10:30 a.m. to 4:30 p.m.)

Location: The Big Fish Grille and Chesterfield Farms, Crofton, Maryland

TOPICS AND SPEAKERS:

Where Have We Been and Where Are We Going With Compost?

Dr. Frank Gouin, Professor Emeritus, University of Maryland

How We Make Our Compost and How We Market the Product

Marsha and Allen Boehm, Chesterfield Farms, LLC

National Pollutant Discharge Elimination System Permit Requirements

Edward Gertler, Maryland Department of the Environment

Marketing Compost/Grasscycling Services to Your Customers

Ana Arriaza and Alan Pultyniewicz, Montgomery County Government

Evaluating Compost for Use in Soil Mixes

Dr. Andrew Ristvey, Regional Specialist, Maryland Cooperative Extension

Compost Tea

Dr. Pat Millner, USDA

Hands-on Use of Field Equipment to Evaluate Compost

Benny Erez, Central Maryland Research and Education Center

Lime Stabilized Compost Pads

Randy Townsend and Pat Millner, USDA

Tour of Chesterfield Farms, LLC

Marsha and Alan Boehm

Name(s): _____

Company: _____

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You can also fax your registration with credit card info to 301-596-9632.

Please make checks payable to: University of Maryland

Send to: Composting Seminar, 11975 Homewood Road, Ellicott City, MD 21042

Cost: \$30 per person by October 3, 2007; \$40 per person after October 3, 2007 (Lunch not guaranteed)

Directions are available on-line at <http://www.agnr.umd.edu/ipmnet/crses97.htm>
by downloading the full brochure.