



Pest Management for Retail Greenhouses and Garden Centers

Introduction

Successful pest management is more challenging for retail growers compared to wholesale producers for many reasons. Due to the seasonal nature of the business, there is continual employee turnover from year to year. New employees may have limited knowledge of the potential insect, disease and cultural problems to look for on incoming shipments and existing plant inventory. It is difficult for employees with multiple responsibilities to find the time to inspect plant shipments when they arrive. Retailers purchase plants from many different suppliers, making it difficult to track down potential sources of insects or diseases without careful record keeping.

To be competitive, retail growers offer a wide range of plant material; vegetable and herb bedding plants, specialty annuals & perennials, tropicals plus small & tree fruits. Very few products are labeled for use on all these crops. For example, only a limited number of pesticides are labeled for use on edible crops compared to ornamentals due to the requirement for crop tolerances and days to harvest on edible crops.

Plants of different ages are often placed together, increasing the likelihood of pests moving from older plants to younger plants. Foliage plants may be held in retail greenhouses from season to season, increasing the chances that mealybugs, scale insects, viruses and other long-term problems become established.

Retail operations are open to the public 7 days a week, making it difficult to apply pesticide treatments. Plants in bloom or with tender growth are more susceptible to spray injury. They may be displayed with hard goods, making it necessary to move those plants outside or into a production area before spraying.

Here are some tips to help you develop a successful pest management program.

Integrated Pest Management

The basic principals of successful integrated pest management (IPM) for production greenhouses can be applied to retail greenhouses. These principals include:

- Inspecting incoming plants
- Regular, consistent monitoring or scouting
- Sound cultural practices
- Accurate identification of insects, diseases and cultural issues
- Prompt, timely pest management decision-making
- Good communication between everyone involving in this decision-making

process including employee or scouts or consultants, pesticide applicators, managers, owners etc.

Inspecting incoming plants

Inspecting incoming plants is the **most important method** to prevent problems from developing in retail operations. In the spring, inspect incoming plants for key insects, diseases, weeds and cultural problems. Inspect the entire plant – leaves, stems and roots for signs of pest activity and for general health. Roots should be white with vigorous growth – brown, decayed roots are evidence of root rot disease or root death due to overwatering or high salt levels.

Do not accept plant shipments with serious insects or diseases with wide host ranges and are difficult to treat. For example, incoming plants may be infested with resistant insects, and mites or Botrytis spores that will be more difficult to treat. Do not accept plant material infected with incurable diseases, such as viruses, or foliar nematodes. If you need confirmation, isolate a few plants showing symptoms and send them to a plant diagnostic laboratory.

Troublesome weeds such as chickweed, bittercress and liverworts may also be introduced on incoming plant material. Liverworts are branching, ribbon-like plants that lack distinct roots, stems and leaves. They reproduce by spores and vegetatively and thrive with high fertility, moisture, and humidity. Liverworts lack true roots, so allowing the media to dry between watering, helps to reduce their vigor. The use of coarse textured mulch also helps to reduce surface moisture levels. Topdressing slow release fertilizers contribute to increased fertility levels on the media surface and to their growth.

If you find isolated evidence of some insect activity, such as aphids, and decide to keep the shipment, identify an isolated, quarantine area in which to keep these infested plants. Treat immediately and hold the plants in this area until you are sure that they are healthy, salable and free of pest problems. Ask workers to enter this quarantine area at the end of the day to avoid moving pest problems throughout your garden center.

Prevention

Selecting resistant varieties can help prevent many disease and insect problems. Keep records of what varieties did well for you and your customers. Attend variety trials to see how different varieties performed in your region.

Sanitation

Remove any pet plants and weeds. Pet plants are unmarketable plants that cannot be sold. You may be asked to overwinter your customer's tender plants that may be infested with aphids, scales, whiteflies, mealybugs, spider mites,

rusts, powdery mildew etc. If you decide to provide this service, have a separate greenhouse in which to overwinter these plants.

Thoroughly clean and disinfest your greenhouses between crop cycles. This helps prevent many insect and disease problems. For more information, see UMass Extension Greenhouse Crops & Floriculture Factsheet on [Cleaning and Disinfecting the Greenhouse](#).

Weeds can be a source of infestations of aphids, mites, whiteflies, and other pests as well as diseases. They also present an unprofessional image. Regular removal of weeds before they go to seed is needed in and around the greenhouses and retail areas. For more information, see the UConn Greenhouse IPM Factsheet on [Greenhouse Weed Control](#).

Monitoring

Have a weekly, monitoring program in place to detect problems early. The use of sticky cards, random plant inspections, and indicator plants are the basis of a monitoring program. Indicator plants are those plants more likely to become pest infested; for example, lemon verbena may become infested with two-spotted spider mites. Train all employees to look for potential problems – even while they are watering.

Sticky Cards

Sticky cards are used to trap winged insects including western flower thrips, whiteflies, aphids, fungus gnats, leaf miners and shore flies. Change and check cards weekly to detect early infestations and better track population trends. Sticky cards may be more difficult to use in retail areas – unless you let your customers know why you are using the cards. It is also helpful to place the cards on separate stakes, so they are not moved with the plant when it is sold.

For more information on using sticky cards and for color pictures to help identify the insects caught on the cards, see, “[Using Sticky Cards to Monitor for Insects](#)” and PowerPoint presentation “[Identifying Some Pest and Beneficial Insects on Your Sticky Cards](#)”.

Plant Inspection

Have your staff do plant inspections when watering or grooming plants. Random plant inspections are needed to look for diseases, two-spotted spider mites, immature stages of whiteflies and thrips, scale insects, and mealybugs. Many greenhouse insects and mites are small, so additional magnification is often helpful.

Record keeping

Keeping good records of the information obtained from sticky card counts, and plant inspections helps you make appropriate pest management decisions. Keep track of approximate pest numbers (estimates based upon your tolerance levels), and their location. An estimation of plant root health and overall plant health is also important. Keeping accurate records of monitoring efforts helps you determine if pest numbers are increasing or decreasing, whether a treatment was effective, or if it needs to be repeated and how extensive a problem is.

Proper Diagnosis

Accurate diagnosis is needed to determine if the cause of the problem is a disease (fungal or bacterial), an insect or mite, or nutritional disorder in order to make the best management decisions. Contact your local plant diagnostic laboratory for information on how to best submit samples.

Management Options

Cultural Controls

Cultural mistakes are the most common problems in retail greenhouses and outdoor yards. Retailers often rely on hand watering. New or poorly trained employees may not know how to properly water plants. Overwatering plants leads to root rots and plant death. Overwatering also leads to algae growth on the media surface that is an ideal breeding ground for fungus gnats and shore flies. Placing mildew susceptible varieties of bee balm and phlox in damp, humid areas with little air movement encourages the development of powdery mildew. Placing mite susceptible species in the hottest, driest locations of the greenhouse encourages the development of spider mite populations.

Watering late in the day encourages the development of foliar diseases. Over fertilization with high nitrogen fertilizer encourages lush, succulent growth increasing susceptibility to aphids, mealybugs, whiteflies, two-spotted spider mites, powdery mildew, botrytis blight and pythium root rots. If you are holding crops in colder than ideal temperatures, these conditions favor damping off diseases, Botrytis blight and root rot diseases.

Failure to properly groom plants to remove spent blossoms, and dead leaves is unsightly, reduces sales and encourages the development of Botrytis blight. Botrytis is a saprophyte that can grow on dead tissue as well as spent flowers. Botrytis spores are easily spread by water splash and by air currents. Clean up spent blooms before a period of cloudy, overcast weather. Treat plants before grooming to protect the rest of the crop from the Botrytis spores that will be released as you groom the plants. Water early in the day, so foliage dries rapidly to prevent favorable conditions for the development of Botrytis blight.

Proper placement of horizontal airflow fans in greenhouses helps to increase airflow, keeping leaves dry and improving plant growth.

It is difficult to control pests once they are established. Discard unsold, unmarketable plants often, so they do not serve as a reservoir for pest problems. Closely monitor any plants that are held over from year to year. The longer you keep the plants, the more likely it becomes that problems develop.

Biological Controls

As mentioned earlier, it can be difficult to time pesticide applications in a retail operation. However, there are no re-entry intervals for biological control agents! Natural enemies do not leave a spray residue but may leave evidence of their presence. Take time to educate your customers, explaining that “aphid mummies” are just the shells or exoskeletons of aphids. Even though beneficial mealybug destroyers (*Cryptolaemus montrouzieri*) larvae resemble mealybugs they are not mealybugs!

More wholesale growers are incorporating biological controls into their pest management programs. This makes it easier for retailers to continue using biological controls because of the lack of harmful pesticide residues.

Biological control agents have special handling requirements when they are delivered and released into your greenhouses. Extra effort, education and commitment are needed for biological control programs to be successful. Start in a small area, to gain experience. For many growers/retailers, beneficial nematodes and predatory mites are one of the easier ways to begin using biological controls.

Here are a few questions to ask before starting a biological control program:

- 1) Have I reviewed pesticide use for the previous year and especially the past 3 or 4 months to ensure there are no long lasting, harmful pesticide residues?
- 2) Do the incoming plants have any long-lasting pesticide residues that would adversely affect the viability and reproduction of the biological control agents? Ask your plant supplier for this information.
- 3) Check databases for more specific information on the effect of pesticides on specific natural enemies from Koppert and Biobest.
- 4) Do I know the species of pests I have had problems with?
- 5) Is there a natural enemy commercially available for the specific pest (s)?
- 6) Am I familiar with the temperature, and relative humidity requirements of the specific natural enemies? Will they be fast acting enough to be effective?

- 7) Have I selected a supplier that I am comfortable with? Do they provide adequate technical support and answer my questions?
- 8) Have I identified a responsible person within my company to handle the biological control agents when they arrive? Do I allow time for them to check their quality and release as soon as possible under the proper conditions that the biological control supplier recommends?
- 9) Do I have a “scout” to evaluate the effectiveness of the natural enemies?
- 10) Am I committed to making the program work?
- 11) Do I have an educational and marketing program to explain and promote my biological control program to my customers?

Physical Controls

If only a few plants are infested, some retailers will move the plants outside (weather permitting) to treat them or move them into a production house for treatment. Sometimes, a small infestation of aphids or spider mites can be hosed off with a forceful jet of water. Promptly remove heavily infested and diseased plants by placing them directly in a garbage bag, tying up the bag and placing the bag in the dumpster.

Chemical Controls

Here are a few questions to ask before selecting an insecticide, miticide or fungicide for treatment:

- 1) Do I need to treat? Is it cost effective?
- 2) Is it effective? How fast acting?
- 3) If I am using biological controls, are they compatible?
- 4) What is the Re-entry Interval (REI)? Is it under 12 hrs?
- 5) Will it damage blooms?
- 6) Will it leave an unsightly residue?
- 7) Will it leave an odor?
- 8) What crops and pests are listed on the label?
- 9) What is the container size?
- 10) How does it work? What is its mode of action? Is it in a different chemical class than other products that I have on hand?
- 11) What is the labeled rate? Can it be used in small quantities? 1 gal? 25 gal?

Carefully read labels for information on plant safety, consult current recommendation guides, and talk to company technical representatives and other growers before treating plants in bloom or close to sale. If unsure, spot treat one or two plants and observe for any symptoms of plant damage or unsightly residues, before treating large numbers of plants.

Most products require full compliance under the Worker Protection Standards. For more information see the [EPA website](#).

Follow all resistance management guidelines that are listed on the label. Avoid tank mixes that increase the possibility of phytotoxicity and may select for insects that are resistant to both types of insecticides used in the tank mix. Follow long-term rotations, using the same insecticide for two to three generations before switching to a pesticide with a different mode of action. If possible, use pesticides with non-specific modes of action, such as insecticide soaps or horticultural oils, selective feeding blockers, insect growth regulators and microbial organisms. However, it is still important to rotate pesticides with broad modes of action, as certain insect pests have become resistant to both insect growth regulators and microbials (*Bacillus thuringiensis* subsp. *kurstaki*). Insecticides are also grouped by their mode of action and each group is assigned an IRAC code.

Resistance management is also important when applying fungicides. Fungicides are classified as systemic or protectant (contact). Fungicides are also grouped by their mode of action and each group is assigned a FRAC code. Systemic fungicides are very specific in their mode of action, so it requires very little change in fungus populations for resistance to develop. When selecting fungicides, it is important to incorporate protectant fungicides with a low risk for developing resistance into your rotational schedule.

Pesticide Application Methods

Pesticide application methods will depend upon the size of the greenhouse, and whether there is a separate production area. For small operations, hand-pump hydraulic sprayers, ranging in size from 1 to 5 gallons are often used. Spray coverage may not be as uniform as desired when using a small sprayer, especially if the pressure changes. A battery powered backpack sprayer is often helpful.

Total and timed release (TR) aerosols contain an insecticide or fungicide plus propellant to disperse the pesticide when released. They require no special equipment and can be used to treat small and large greenhouses. Several insecticides or combinations of insecticides are available, as well as fungicides. Research at Ohio State University regarding TR aerosols demonstrated that pesticides were deposited on the upper and lower leaf surfaces at a 60% upper to 40% lower ratio. With dense plant canopies, lack of adequate coverage to the lower leaf surface is of concern especially when targeting pest life stages found on the lower leaves.

For many retail growers, a small 12 to 25 gallon hydraulic sprayer on a cart, with a long hose that can be rolled up, may provide more uniform application, better coverage and ease of use.

Diagnostic Laboratories in Connecticut

UConn Plant Diagnostic Laboratory

1380 Storrs Road, Unit 4115

Storrs, CT 06269-4115

Phone: (860)486-6271

<http://plant.lab.uconn.edu/>

The CT Agricultural Experiment Station

The Plant Disease Information Office (PDIO)

Department of Plant Pathology and Ecology

The Connecticut Agricultural Experiment Station

123 Huntington Street, P. O. Box 1106

New Haven, CT 06504

Phone: (203) 974-8601

Toll-Free Phone Number Outside New Haven Area: 1-877-855-2237

<https://portal.ct.gov/CAES/PDIO/PDIO-Home/PDIO-Home>

Inquiry Office Windsor

The Connecticut Agricultural Experiment Station

Valley Laboratory

153 Cook Hill Road, P.O. Box 248

Windsor, CT 06095

Phone: (860) 683-4977

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