Basics Of Monitoring: Scouting For **Pathogens & Pests**

Borrow greenhouse monitoring concepts from this series to produce quality plants on time for every season.

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PATHOGENS, insects and other pests can seriously impact greenhouse production and reduce profitability. In this fourth article in the Basics of Monitoring series, we provide concepts and tactics to help you develop a comprehensive greenhouse pest and pathogen scouting program.

Scouting is a vital part of any integrated pest management (IPM) program and involves systematically moving through the greenhouse looking for pathogens and pests. It estimates their abundance, and then uses this information to make management decisions. This information helps growers determine if, when and where treatment is needed, what options are available and whether or not they are economically viable.

Setting The Stage For Good IPM

Immediately begin scouting new plants (plugs or liners) and cuttings as soon as they arrive. Incoming rooted or bare root plant material should always be quarantined in order to prevent the introduction of pests from other facilities. Remember, when you bring in a pest you are also potentially bringing in pesticide- and fungicide-resistant populations.

Once rooted cuttings and seedlings have been transplanted, start a regular program of inspecting your plants for vigor, uniformity and pests on a weekly basis. A system for recording what you see should be created. Preprinted plastic cards that identify the crop and have room for making notes with a permanent marker can be a useful monitoring tool (Figure 1).

Figure 1. Preprinted plastic cards can be used to make crop-specific notes (i.e. PGRs, insecticides, fungicides, etc.).

Assess the uniformity of your crops in each section of your greenhouse. If portions of the greenhouse have plants that appear stunted or show reduced vigor, you must be sure to inspect these areas more closely to identify the source of the problem (Figure 2a and b). Be sure to identify the affected area with a flag so you can determine if it is spreading and record the proportion of the crop that appears to be affected.

Place sticky cards in each greenhouse section to monitor the winged stage of flying insects. Put the cards no higher than

Figure 2a

Figure 2b

Thoroughly inspect the roots and shoots of crops that appear stunted or that show reduced vigor to identify the source of the problem.

2 inches above the canopy (Figure 3) to attract what might be flying in the crop. Count, circle the insect with a permanent marker and record the trapped insects weekly. Remember that sticky cards should be replaced periodically.

In areas where the crop appears normal, select a set number of plants at random for examination.

When scouting for pathogens, examine roots of any abnormal areas to determine if damping off or root or crown rot may be playing a role in the plant's failure to establish. Fungus gnats and shore flies indicate the possibility of root rot. Inspect lower leaves and stems for botrytis, and all foliage for discoloration or distortion.

Scouting Tools

Some tools you'll needed for scouting are:

- A hand lens, specifically a 10x or 15x magnifier for inspecting plant material
- A knife for cutting into stems or root tissue (disinfect the knife with rubbing alcohol between plants)
- A bucket to examine roots
- White index cards for sampling mites
- Containers for samples and a permanent marker to label bags with location information
- A notebook with record-keeping sheets. Plastic sheet protectors can be used.
- A digital camera for documentation
- Monitoring cards to monitor the winged stage of flying insects

Finding Insects & Pests

When scouting for pests, be sure to check the axils of leaves and branches, the young foliage, the underside of leaves and the inside of flowers. In order to coax insects out of flowers, place your open mouth near the flower and blow slowly. Carbon dioxide stimulates pest movement, which will allow you to observe them.

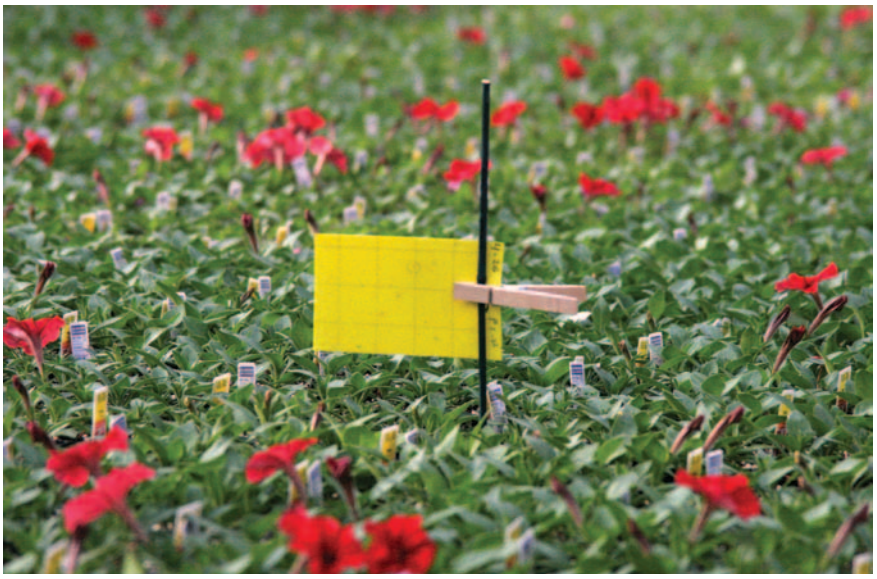

Figure 3. Sticky cards should be placed 2 inches above the canopy in each greenhouse section to monitor the winged stage of flying insects.

Two spotted spider mites. Tap the upper and lower portions of plants over a white index card to knock mites onto the card where they can be seen with a hand lens. Count the number of mites that fall on the card from each plant. If mites are found, inspect leaves to determine the life stages present. Do not rely on webbing as an indicator of spider mites. Extensive webbing is a sign of a serious infestation.

Thrips. Adult thrips fly and can be monitored using sticky cards. Inspect cards weekly and consider treatment when more than 10 adults are found per card in a week. Tap leaves and flowers to look for thrips on both symptomatic and asymptomatic plants. Slowly blow into flowers to detect the presence of adults.

Whitefly. Whiteflies can be monitored using sticky cards, but they can also be seen flying out of plants when a hand is brushed over the plant canopy. Stages of whitefly can be seen on the undersides of leaves. This can be useful for identifying whiteflies to species. Chlorotic and bleached stems, leaves and bracts in poinsettia are an indication of a large whitefly population (Figure 4). They can also excrete honeydew, which can make plants unsightly, sticky or covered with black sooty mold.

Figure 4. Often, a sign of a large whitefly population directly feeding on a poinsettia crop is chlorotic and bleached stems, leaves and bracts.

Aphids. Under the correct conditions aphid populations can increase rapidly. They can generally be found in large numbers feeding on young growth. The whitish castings from aphid molts are often a good indicator aphids are present. Aphids can have wings, so you may find one on a sticky card. Similar to whiteflies, aphids excrete sugars that promote mold growth and attract ants.

Fungus gnats. Fungus gnats can be found on sticky cards. Fungus gnat larvae can transmit disease and will tunnel into tender shoot stems from the ground up. Fungus gnats' pupae damage plants when they feed on roots. Put 1-inch-diameter potato slices on the soil surface and wait 24 hours to monitor larval populations.

Shore flies. Shore flies feed on algae that grow on the surface of the soil or greenhouse floor. Adults, attracted to sticky cards, can be a real nuisance when abundant on plants.

Finding Diseases

When scouting for diseases, pay special attention to the disease-prone areas of your greenhouse, such as uneven low spots that accumulate standing water or areas near evaporative cooling pads with increased humidity. Unlike insects, the explosive nature of plant disease means most diseases are best managed before symptoms are observed.

Pythium and Phytophthora root and stem rots. Visually examine roots noting color (most, but not all healthy plant roots are white to cream). Check cortex for

"sloughing off." Look for crown cankers if Phytophthora is suspected. Inspect for fungus gnats and shore flies as they can transmit pythium. Be sure to obtain a correct diagnosis, as many fungicides labeled for Phytophthora are not necessarily effective against pythium.

Rhizoctonia damping-off, root rot, stem canker and web blight. Monitor flats and pots for damping off, especially near walkways. Artemesia and poinsettia are good indicator plants. Web blight may occur when plants are placed close together during humid, warm conditions. Examine seedlings regularly, looking for spots or lesions on stems or leaves before seedlings collapse. Look for cobweb-like fungal growths (web blight). Inspect for fungus gnats that can move these fungi to healthy plants.

***Botrytis* blight.** Examine new growth, cuttings or flowers for soft, tan to brown dead areas, and gray fungal growth. Pay extra attention to crowded areas. Check incoming plants and cuttings. Monitor for blight, dieback and presence of fuzzy gray to brown spores.

Powdery mildew. Areas with poor air circulation, high humidity or drafty places with more temperature fluctuations between day and night require closer monitoring. Look for white powdery growth on upper leaf surfaces of begonia, chrysanthemum, dahlia, lilac, monarda, phlox, snapdragon, rose, veronica and zinnia.

Downy mildew. Monitor closely in areas with poor air circulation, high humidity or under heavy propagation misting. Symptoms of this disease vary with host and pathogen. Check lower leaf surfaces. Angular lesions are often mistaken for bacterial foliar disease. Look for the telltale sign of sporulation on the underside of leaves.

Impatiens necrotic spot (INSV) and tomato spotted wilt virus (TSWS). Monitor foliage and flowers. Vectored by thrips, these problems are on the rise due to problems with insecticide resistant populations of thrips. By the time ring spots or necrotic spots appear, the plant is already infected and should be discarded so as to not serve as a reservoir to infect other plants!

Avoiding Pests

The most effective method to deal with insects and pathogens is to avoid introducing them into or spreading them inside your greenhouse. Try to avoid wearing light blue or yellow clothing, as many pests are attracted to these colors. Areas of high pathogen or pest populations should be scouted at the end of your scouting sessions, not at the beginning, so pests and pathogens can't hitch a ride to other areas of the greenhouse. **GG**

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