Sanitation's Place In An IPM Program

Do you discard plant material and growing debris into refuse containers and forget about it? According to University of Illinois researchers, this "out-of-sight, out-of-mind" philosophy could lead to continual insect and mite problems.

By Brian Hogendorp and Raymond Cloyd

Refuse container (32-gal.) and lid with the assembly combination designed to hold a 3x5-inch yellow sticky card to the underside of the lid. (Photo: Raymond Cloyd)

Cultural control is often recommended as a strategy to avoid insect, mite and disease problems. Cultural control involves properly implementing irrigation and fertility practices and sanitation, including timely weed, plant and growing medium debris removal. Removing plant debris can eliminate or reduce conidia and vegetative hyphae, which are inoculum sources for many plant pathogens.

Disposing infected plant material into covered containers may reduce the concentration of airborne conidia. For example, plant debris placed in uncovered containers may allow fungi such as Botrytis to sporulate, releasing spores that can infect crops. It is generally recommended to avoid keeping refuse containers in greenhouses, but because of convenience, they are very common. If containers are present, it is important to keep them covered to prevent spores from developing on plant debris and re-infecting the main crop via air currents. Insect pests completing development on debris may also migrate onto the main crop. This is likely for the adult stages of insects such as western flower thrips, fungus gnats, shoreflies, leafminers and whiteflies.

We recently conducted a study to evaluate the quantity and types of insect pests emerging from plant and growing medium debris when it is discarded in greenhouse refuse containers.

Materials And Methods

This study was conducted in two greenhouses at Danville Gardens, Danville, Ill., and two greenhouses (Plant Sciences Facility and Turner Hall Facility) at the University of Illinois, Urbana, Ill. These greenhouses were selected based on the diversity of plant material grown and their production level. Danville Gardens is a wholesale and retail facility, and the University of Illinois greenhouses are primarily used for research, teaching and collection activities.

All refuse collected was assumed to be general greenhouse debris. The employees responsible for each greenhouse were instructed to treat the selected refuse containers as regular containers to avoid disrupting any routine disposal habits. Greenhouse debris was collected weekly for 28 weeks from May until November 2005.

Eight 32-gal. containers with tight-sealing lids were used — two containers per greenhouse — and a medium binder clip was attached to the underside of the lid so a 3x5-inch yellow sticky card could be secured to it (see photo, left).

Greenhouse	Plant types
1. Danville Gardens Greenhouse #1 Danville, Ill	Geranium Petunia Chrysanthemum Wild cabbage
2. Danville Gardens Greenhouse #2 Danville, Ill.	Geranium Poinsettia Chrysanthemum Verbena
3. Plant Sciences Facility Urbana, Ill.	Coleus *Hedera helix* Creeping fig Arrowhead vine
4. Turner Hall Urbana, Ill.	Coleus Lantana Ipomoea *Monarda didyma*

Figure 1. Plant types recovered consistently, based on prevalence, from the 32-gal. refuse containers in four greenhouses from May through November 2005.

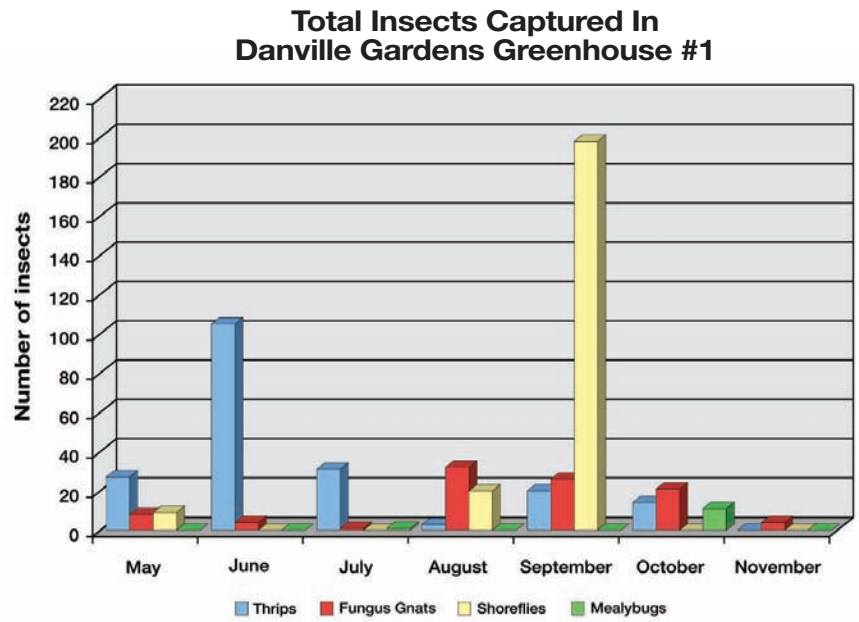

Figure 2. Total number of insects captured per month from May through November 2005 in the first greenhouse located at Danville Gardens.

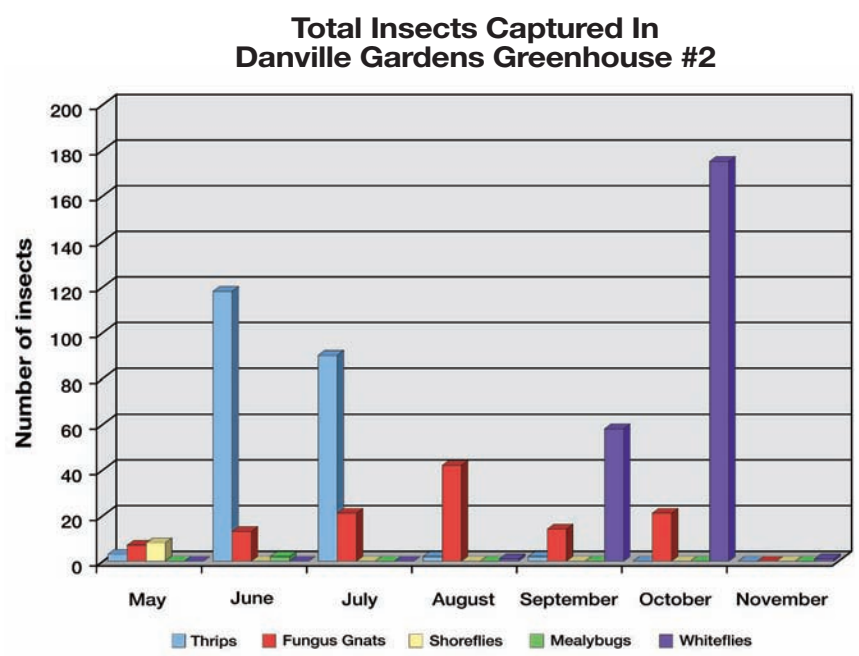

Figure 3. Total number of insects captured per month from May through November 2005 in the second greenhouse at Danville Gardens.

A label was affixed to the side of each container indicating only plant material and growing medium debris could be placed in it. Additionally, the containers were labeled so they would not be accidentally emptied. The week and a refuse container code were handwritten on the back of each yellow sticky card to correctly identify the container and card.

Each week, the yellow sticky cards and black plastic refuse bags were collected and replaced with new cards and bags. The used sticky cards were stored for later evaluation. Insects captured on the yellow sticky cards were identified, at least to type, and the total number of each type was determined using a dissecting microscope.

After the yellow sticky card was replaced, the bag was removed, sealed and returned to the Plant Sciences Facility. The refuse bags were replaced every week during the 28-week period. Each bag was labeled, based on the refuse container code and the designated week, to ensure proper coordination with the appropriate yellow sticky card. The material in each bag was partitioned and quantified (based on percent), and plant material debris was identified.

Data was compiled based on refuse container, week and greenhouse. The quantity and type of insects present on the yellow sticky cards were coupled with the corresponding greenhouse debris present in each container.

Results

The primary crops retrieved from the refuse containers, based on prevalence, in all four greenhouses are shown in Figure 1, page 38. The

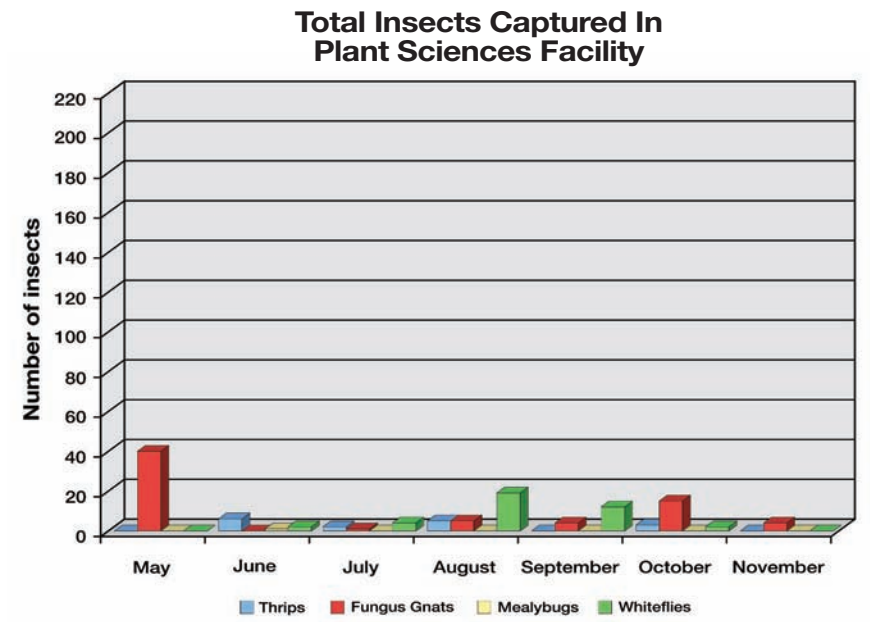

Figure 4. Total number of insects captured per month from May through November 2005 in the greenhouse located in the Plant Sciences Facility.

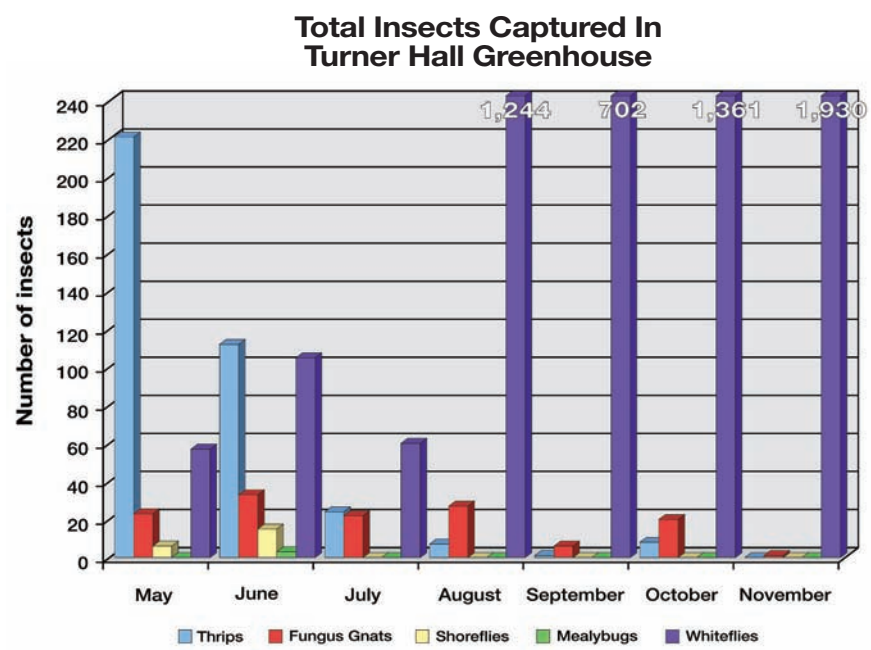

Figure 5. Total number of insects captured per month from May through November 2005 in the Turner Hall greenhouse.

number of insect pests on the yellow sticky cards varied among the locations. The types of insects recovered on the cards were consistent among the four greenhouses with western flower thrips, whiteflies and fungus gnats typically recovered each week (see Figures 2-5, top left and above).

The percent of discarded growing medium varied widely depending on the greenhouse and month. As such, we could not demonstrate any relationship between the volume of growing medium recovered from the refuse containers and abundance of adult fungus gnats. The numbers of each insect type were an accurate assessment of what was present in the refuse containers since the tight-sealing lids prevented insects from escaping.

Thrip counts on the yellow sticky cards for June and July in the second greenhouse at Danville Gardens are likely due to the plant material recovered including chrysanthemum and impatiens, which are both susceptible to western flower thrips. The percent of adult thrips captured on the yellow sticky cards was 73-97 percent while the percent of chrysanthemum and impatiens plant debris present in the refuse containers was 15-65 percent.

The whitefly counts on the yellow sticky cards in October in the second greenhouse at Danville Gardens is probably due to the presence of plant material such as poinsettia, which is highly susceptible to whiteflies. In fact, when the percentage of poinsettia debris in the refuse containers was 100 percent, the percent of whiteflies captured was greater than 98 percent.

The reason for the low numbers of insects recovered in the refuse ➧

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containers in the Plant Sciences Facility, compared to the other greenhouses, is this greenhouse primarily contains foliage plants for collections such as dieffenbachia, anthurium, creeping fig, English ivy and arrowhead vine, which may be less susceptible to these specific pests.

The high adult whitefly counts on the yellow sticky cards from August to November in the Turner Hall Facility were related to the plant types disposed of during that period. We found lantana, monarda, verbena, zinnia, sage and fuchsia debris heavily infested with the egg, nymph, pupa and adult stages of whitefly. Although the percentage of each plant type was low, the percentage of whiteflies captured on the yellow sticky cards was 96 percent or greater. This indicates that a small amount of susceptible plant material when disposed of can harbor large numbers of insect pests. In fact, all the plant types mentioned above are highly susceptible to whiteflies. In the absence of tight-sealing lids covering refuse containers, these whitefly adults may have migrated onto crops present in the greenhouse.

The high numbers of adult thrips captured in the Turner Hall greenhouse in May is likely due to the plant debris, which included chrysanthemum and calendula. The chrysanthemum debris comprised 50 percent whereas calendula was only 5 percent of the total plant material in the containers. Despite this, the amount of adult western flower thrips was 80 percent or more of the total number of insects captured. However, these plant types were disposed of while in bloom and had opened yellow flowers with adult western flower thrips.

Adult whitefly counts on the sticky cards for June in the Turner Hall greenhouse are likely associated with the discarded plant material debris. We recovered hibiscus plants, which was 80 percent of the discarded plant material, infested with whitefly nymphs, pupae and adults. Eighty percent of the captured insects were adult whiteflies. Hibiscus is very susceptible to many species of whiteflies.

Applying The Results

If growers fail to place tight-sealing lids on refuse containers or do not remove plant and growing medium debris from the greenhouse before it desiccates or decomposes, then any insect pests may potentially leave the debris and migrate onto the main crop. For example, as plant material debris desiccates, western flower thrips adults are likely to abandon the dry plant debris and locate the main crop, possibly vectoring viruses such as impatiens necrotic spot virus.

Insect pests in refuse containers typically escape insecticide sprays and can migrate onto the main crop after spray residues dry. If these pests are captured on yellow sticky cards, then greenhouse producers may perceive inadequate control from the insecticide application. Additionally, insects migrating from refuse containers to the main crop may overwhelm and thus reduce the effectiveness of natural enemies.

Certain adult insects may attach themselves to greenhouse employees as they walk by open refuse containers wearing yellow-colored clothing, which is attractive to some insect pests. This may inadvertently distribute these pests among greenhouses, thus initiating new infestations in previously pest-free areas.

Conclusion

The results of this study demonstrate the importance of removing plant and growing medium debris from greenhouses or at least placing it in refuse containers with tight-sealing lids to avoid problems with insect pests. Sanitation is an important component of any pest management program in preventing or reducing insect infestations by removing breeding and hibernating sites. In fact, proper disposal of waste and plant debris is one of the most effective ways of controlling many insects. However, sanitation must be used in conjunction with alternative management strategies including insecticides or natural enemies to minimize problems with plant-feeding insects in greenhouses. GPN

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