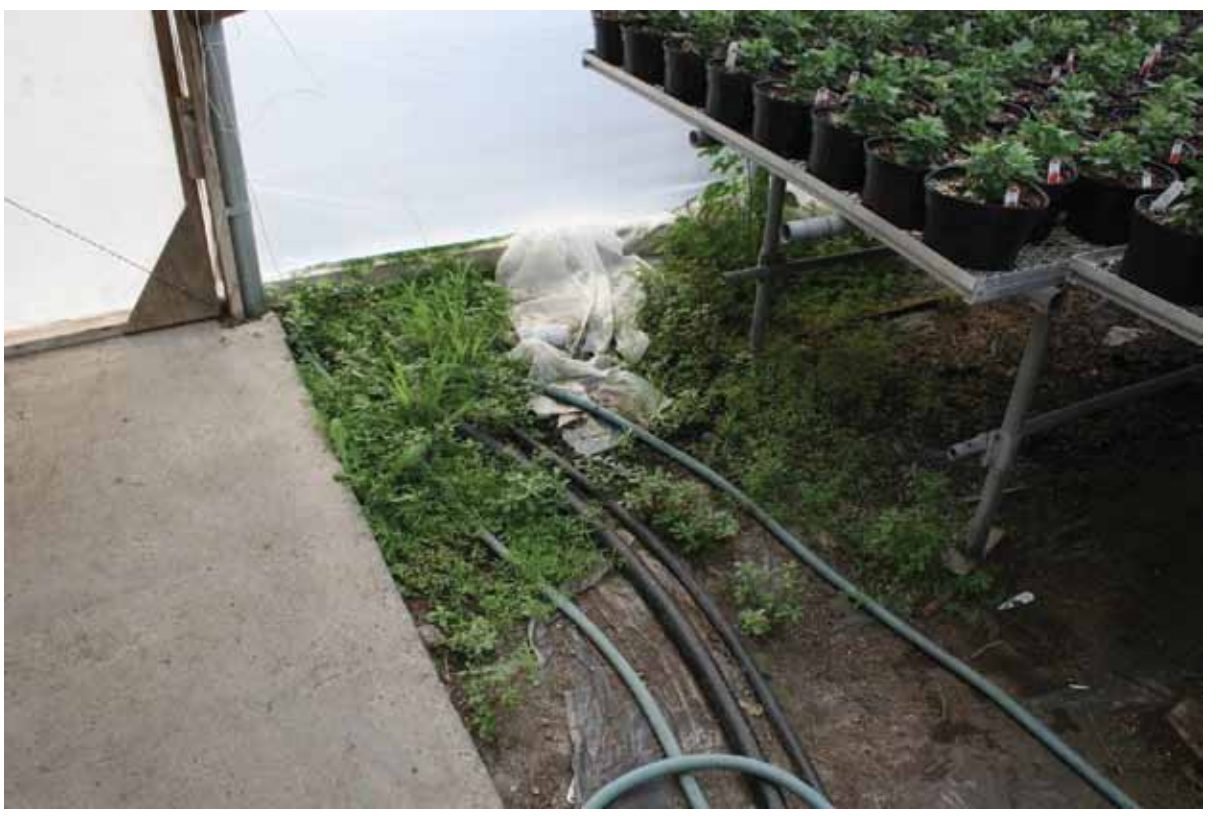
ARE YOU PRACTICING PROACTIVE PEST CONTROL?

SANITATION IS THE FIRST DEFENSE AGAINST KEEPING PESTS OUT OF THE GREENHOUSE AND MINIMIZING INSECT AND MITE INFESTATIONS.

By David Kuack

What are you doing to keep pests out of your greenhouses? Kansas State University professor and extension entomologist Raymond Cloyd says sanitation is the first line of defense in plant production and pest management.

"Pest management and plant protection are less than 5 percent of the overall cost of crop production," Cloyd says. "As a result, a lot of things related to pest and disease control are dealt with from a reactive standpoint. Implementing sanitation practices can substantially reduce insect, mite and disease problems."



One of the primary sanitation practices is removing weeds and plant debris from both in and around the greenhouse. (Photos by Raymond Cloyd, Kansas State University.)

Starting Pest-Free

Cloyd says it's easy to tell growers to inspect and quarantine plant material they are bringing in from the outside. But having the space to do that is a whole other issue.

"Growers may not have the facility space or the time to place incoming plant material into a separate greenhouse or bay and look for insects," he says. "When growers receive new plant material, I recommend that they put it into a greenhouse bay and put up yellow sticky cards or do random visual monitoring to make sure the plants are healthy and don't have any pest problems. Growers need to scrutinize the plant material very carefully."

Cloyd says it is also helpful if the growers know the potential pests of the crops they are receiving.

"What pest growers should be looking for depends on the plant material being brought in, like fungus gnats and whitefly on poinsettias, and mealybugs and thrips on coleus" he says. "Aphids and thrips would be the insects to be cognitive of early in the spring. Spider mites might be something to be looking for during the summer because they like hot, dry conditions. Furthermore, young plant material may be more prone to harboring fungus gnats.

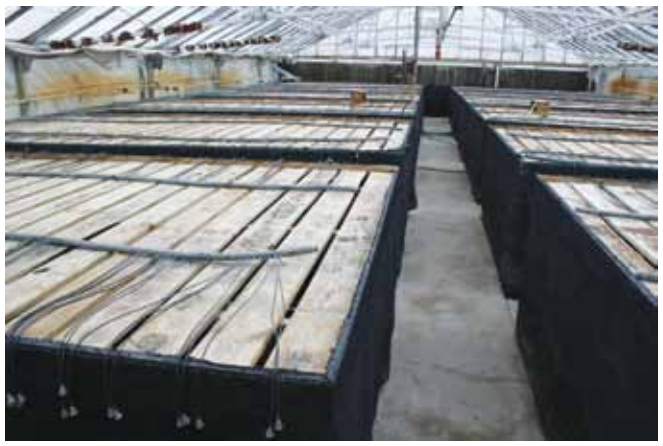
"It depends on the crop being grown, the season and how the plants are being brought in. If growers are bringing in a multitude of crops, they should be considering any of the primary insect and mite pests that may be a problem."

Scouting, Monitoring for Pests

Cloyd says growers should be scouting their crops at least once a week.

"This includes using yellow sticky cards to capture winged individuals and visual inspections to detect insects that are non-winged and mites," he

Many weeds are hosts of diseases that some insects can vector.



Middle: Power washing floors and benches to remove algae should be done between crops or if greenhouses are not going to be used for a period of time.
Bottom: Cellulose evaporative pads used for cooling should be cleaned occasionally to prevent the buildup of algae.

says. "Growers can base their efforts on the type of crop and the potential insects and mites that a crop may get. It would be best to have one person devoted to doing the scouting. The information collected can be used to determine whether or not some type of management strategy needs to be implemented such as applying a pesticide or releasing biologicals.

"Growers who are not scouting at least once a week have no clue as to what is going on. Scouting helps growers be more proactive and at least avoid outbreaks from occurring, which may alleviate any crop losses."

While most growers probably aren't going to scout empty greenhouses, Cloyd says if the houses have dirt floors consisting of soil, it is a good proactive strategy to use yellow sticky cards to determine if thrips, fungus gnats or shore flies are residing in these areas.

"Scouting is similar to vehicle maintenance," he says. "When you have an empty greenhouse, even during the winter, if you have gravel or floors consisting of soil, you should be checking regularly to make sure there are no minor localized infestations. There may be some level of insect activity, but the cooler winter temperatures and shorter day lengths should reduce their activity and reproductive capacity."

Cloyd says although hot or freezing temperatures may help eliminate the adult stages of insects, the pupae stages are very resilient.

"The air temperature may be 120° F, but the soil temperature will likely be less than that," he says. "High temperatures may be helpful in killing weeds and adult flying insects and may prevent other insects from coming into the greenhouse. But those high temperatures won't be 100 percent effective in ridding the greenhouse of all pests depending on the mite or insect pest. In the pupal stage the insect waits until conditions get better. Once a grower starts to bring crops into a greenhouse and initiates watering, this may result in insects emerging from the soil."

Eliminate Weeds

Cloyd says one of the primary sanitation practices is removing weeds and debris from both in and around the greenhouses.

"This should be done in order to eliminate sites for insects to reside. Also, many weeds are hosts for diseases, including impatiens necrotic spot virus and tomato spotted wilt virus that are vectored by western flower thrips. Removing growing media debris is also important because this is where the pupae of fungus gnats and western flower thrips can hide."

Cloyd says there are some herbicides that can be used around greenhouses, but he recommends no herbicide treatments should be made in a greenhouse when a crop is in production.

"There is the potential for phytotoxicty issues when spraying an herbicide inside a greenhouse with crops present," he says. "It is an enclosed environment and volatilization can be an issue. Most of the herbicides that can be used legally are post-emergent herbicides. This means weeds have to be present and growing before they can be killed."

Cloyd says once a post-emergent herbicide has been applied, it usually takes about a week for it to dissipate.

"Within a week of applying a post-emergent herbicide there should be minimal concerns with volatility," he says. "However, this depends on the weather. For example, if days are sunny that will increase the likelihood of volatility, which indirectly reduces the longevity of the herbicide. On the other hand, if days are overcast, there is less likelihood of volatility. A grower can make an herbicide application in an empty greenhouse and then bring crops in after there is minimal chance for volatility."

Cloyd says growers need to pay particular attention when applying herbicides in greenhouses because of the possibility of condensation forming on the inside surface of the glazing.

"In quonset houses condensation may build up on the glazing and overhead structure," he says. "This moisture

may drip down on the main crop. If an herbicide has not completely volatilized, then there can be issues with phytotoxicity."

Herbicide applications made outside the greenhouse should be done on calm days to avoid any drift caused by the wind.

"For outside applications, fans and vents should be closed along with any other openings to prevent the indirect movement of the herbicide being carried into the greenhouse," he says. "If a greenhouse is empty, drift is not an issue. If crops are in the greenhouse, then drift is something to be concerned about."

Cloyd says growers not using their greenhouses for a few months between crops should consider applying an herbicide inside the greenhouse.

"If the grower is not going to be bringing any plant material into a greenhouse for an extended period, this is a good time to spray an herbicide or to physically remove the weeds," he says. "A grower needs to kill any weeds before they go to seed. Some weed species are very prolific in the amount of seed they produce. Even if weeds have been killed by an herbicide, if they are allowed to produce seeds that fall onto the ground once a grower brings in a crop and starts to water again, there is a good chance the weed seeds are going to germinate. Weeds can serve as a source of insects and possibly diseases."

Algae Control

Power washing floors and benches to remove algae should be done between crops or if greenhouses are not going to be used for a period of time.

"These are the first lines of defense — keeping things clean from a hygiene standpoint. High-pressure water sprays are especially effective in dislodging algae, especially if it is dried out because it can be more difficult to remove," Cloyd says. "Disinfectants and algaecides like ZeroTol, Physan and Green-Shield can also be used to remove algae. Removing algae, which is a great harborage for fungus gnats and shore flies, can help to eliminate these insects."

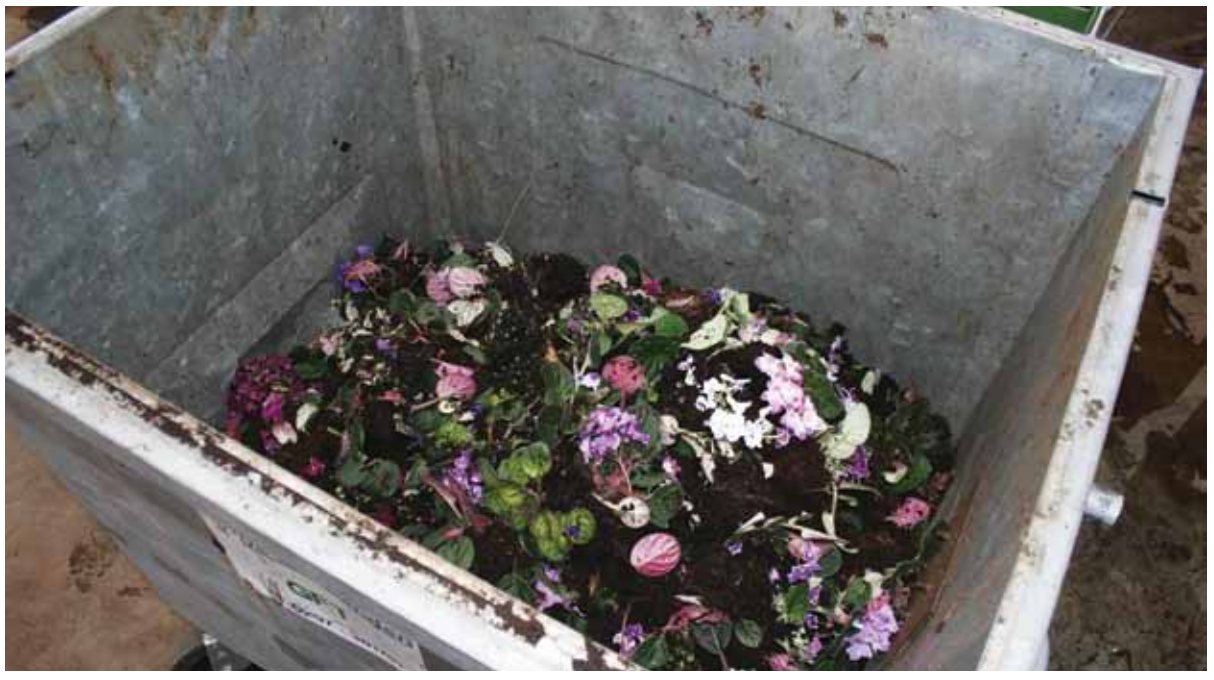
Cloyd also advises growers who are using cellulose evaporative pads for cooling to clean them occasionally to prevent the buildup of algae and other debris.

"At times I suggest that growers apply limestone or dolomitic limestone to gravel or soil in aisles or under benches and then water it in," he says. "Dolomitic limestone, hydrated lime or limestone raises the soil pH so algae cannot grow. Reducing or eliminating the algae helps to avoid problems with shore flies and fungus gnats."

Discarding Debris

Cloyd says any debris that is going to be discarded should be put into rubber or metal trash containers with tight sealing lids.

"Don't leave the containers open and remove them immediately," he says. "Also, in the afternoon when



Top: Debris that is going to be discarded should be put into rubber or metal trash containers with tight sealing lids. Studies have shown that adult insects will fly off of debris and get caught on yellow sticky cards.
Middle: When employees are cleaning up they should discard "old" plant material and growing medium debris from the greenhouse.
Bottom: Compost piles should be located as far away from the greenhouse as possible and should not be placed on the windward side of the greenhouse.

employees are cleaning up, it is recommended to have them remove the debris from the greenhouse. We have done studies showing that insects will fly off of plant debris and can be captured on yellow sticky cards."

Cloyd also advises growers not to locate compost piles on the windward side of the greenhouse.

"The wind can carry winged insect pests, weed seeds and disease pathogens back into the greenhouse," he says. "The pile should also be placed as far away from the greenhouse as possible. Unfortunately, I know growers who place dumpsters and compost piles near greenhouse openings.

"Also, rotate the compost. If it is just a debris pile then you definitely want to place it as far away from the greenhouse as possible because it is not generating sufficient heat to kill pests or disease organisms."

Excluding Pests with Screening

Cloyd says for growers located in areas where insects may migrate from field or vegetable crops, insect screening can be beneficial in keeping pests out of greenhouses.

"I wish more growers would install insect screening because it does alleviate problems with insects migrating into greenhouses," he says. "It is particularly effective if a grower is using biological controls. The screening helps to prevent influxes of pests coming in and making it difficult for the biologicals to regulate pests already there.

"There is a cost issue and not every grower is going to be able to install insect screening. Also, some greenhouse structures are not designed for installing insect screening. For those that are, it is a worthwhile investment. A grower may not see the benefit initially, but in the long term it is going to save the grower money."

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