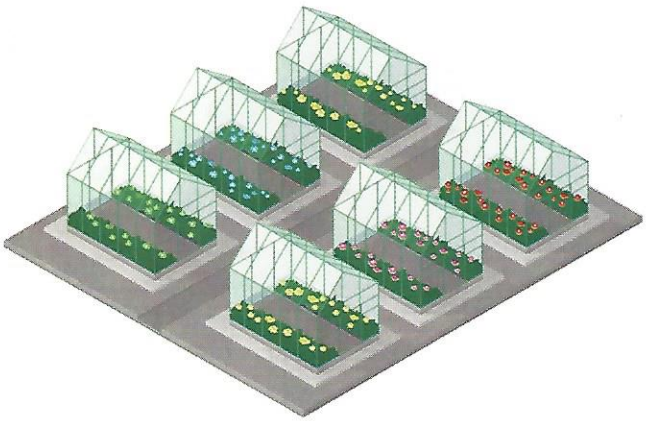
Greenhouse Sanitation: An Ounce of Prevention is Worth a Pound of Cure



ROBERT PEPPER/ISTOCK

Sanitation is one of the most oft-overlooked management strategies in a greenhouse operation. The warm, humid climate provides an ideal host for pathogens to accumulate and increase over time. Left unchecked, pathogens, which ultimately lead to disease, can significantly limit an operation's potential for profitability.

Diseases and pests are introduced into a greenhouse in many ways. Invisible to the human eye, pathogens can deftly move into a healthy operation by wind, fan, contaminated water droplets, shoes, tools and more. Throughout the course of a growing season, plant pathogens and insect pests accumulate in greenhouses.

"They can arrive with plant material, through the soil, [through] irrigation water, [or] by workers and equipment," added Francesca Peduto Hand, Ph.D., an assistant professor in the Department of Plant Pathology at Ohio State University.

In recent years, growers have leaned on fungicides and pesticides as their go-to for disease control strategies. However, establishing a culture focused on sanitation that is followed by employees of all levels is a more effective approach.

Prevention is the best method for control. Once a plant has a disease it cannot be cured. Plant diseases cannot be managed by reacting to symptoms. It can take as many as 21 days or more for visible symptoms to develop. By the time the symptoms are noticeable, it's too late to save that particular plant.

Reducing opportunities for disease begins with good sanitation practices. For the best control, proper disinfection and cleaning methods should be routinely followed throughout the entire growing season to eliminate pathogen inoculum and pest populations.

Start clean, and stay clean

Pathogens are easy to find in any greenhouse. They show up in root substrates, in potting containers, under benches and on the floors. Pathogens can hide in many places including the folds in plastic, other porous materials, on the structure rafters, on top of overhead irrigation piping and any other available nook and cranny.

It's much easier to establish and maintain a clean environment from the start rather than clean up a problem once plants are affected. "Before starting a new cropping cycle, clear the greenhouse of plant debris, soil and weeds from benches, underneath benches and all floors," Hand said.

Begin cleaning from the top of the greenhouse and work your way down to the ground level. Removing pathogens from overhead first will limit the potential for contaminating a previously cleaned area on the ground. Choose a cleaning product that is specifically labeled for greenhouse applications.

"Use a cleaning product specifically labeled for greenhouse use to remove algae, dirt and other deposits from greenhouse surfaces," she said. "Don't forget to thoroughly clean walls, internal structures and textured surfaces."

Meticulously clean benches and worktables, too. "As a reminder, these work areas should be made of nonporous materials that can be easily disinfected," Hand said.

Next, wash all containers that will be reused to remove soil particles and plant debris. "Treat any containers that will be reused with a labeled disinfectant, regardless if there was a disease present in the crop," she said.

Spores of common root pathogens, such as Pythium and Thielaviopsis, can survive in root debris or soil particles on pots, flats or other containers. "If you have a history of these diseases affecting your crops, it is recommended not to reuse them," she said.

Hand tools and any equipment can harbor diseases. These items should also be cleaned with a cleaning agent specifically labeled for greenhouse use.

During the cleaning process, remove any leaf litter or other debris, eliminate standing water and remove any weeds. Weeds in particular can provide habitat for disease-carrying insects such as thrips, aphids, mites and other pests. Weeds can also serve as a host for diseases that can affect greenhouse crops such as powdery mildew, downy mildew and other fungal and viral diseases.

Controlling weed populations is as important outside as it is inside. Unmanaged weed populations growing outside greenhouse structures can be picked up and transported inside by Mother Nature, tools, equipment and by workers.

Avoid recontamination

Once a greenhouse has been thoroughly cleaned and prepared for a new crop,

keeping it sanitized is equally important. Pathogens are easily reintroduced to a greenhouse through tools, equipment, workers and new plants.

• *Clean materials*

Only use clean pots, as well as clean rooting medium, benches and tools. Chlorine bleach can be used to disinfect pots and flats. However, it should not be used to clean walls, benches or floors. In a well-ventilated area, mix one part bleach with nine parts water and allow pots, etc., to soak for 30 minutes. Ask your supplier for recommendations of cleaning agents that can safely be used on walls and/or benches.

• *Know your vendors*

Limit your purchasing to only those vendors who are reliable sources. Inspect newly arriving plant material to avoid bringing diseases into a clean environment.

"Also, use culture-indexed cuttings and disinfected seeds and bulbs," Hand said.

• *Remove diseased plants*

In situations where a disease does appear in a crop, remove infected plants immediately and require workers to wash hands and tools after handling diseased plant material. Set up footbaths with sanitizers to eliminate the possibility of spreading pathogens into clean areas.

How do your sanitation practices measure up?

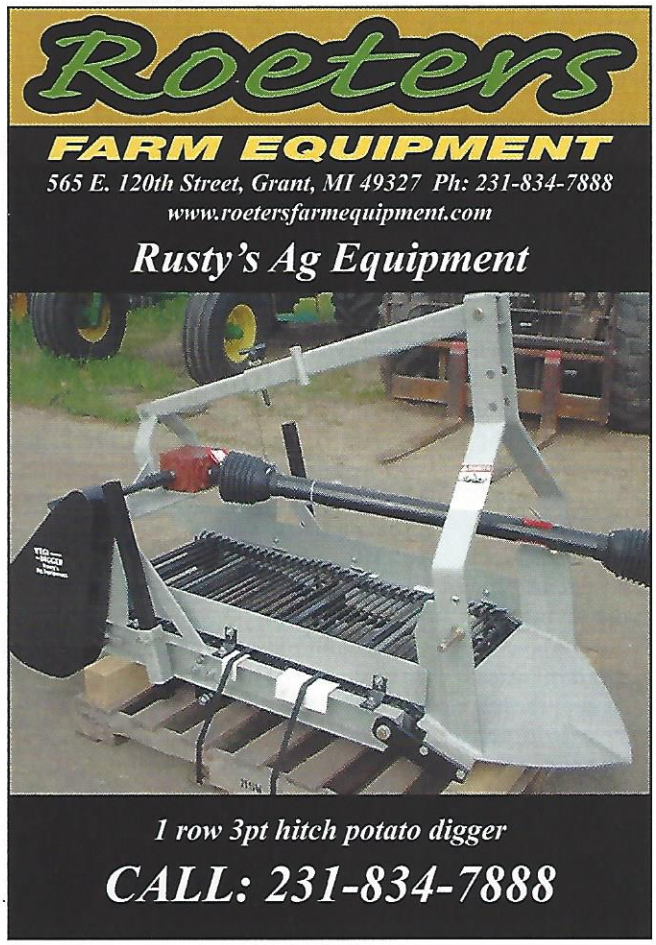
The greenhouse industry is not the only industry that has needed to develop practices to minimize risk associated with product contamination. A team of scientists from NASA developed a method for reducing the risk of foodborne illness among astronauts, which is known as the Hazard of Critical Control Points system (HACCP). (*http://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS-11-11-0986-FE*)

HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical and physical hazards from raw material production, procurement and handling, to manufacturing distribution and consumption of the finished product. (*www.fda.gov/Food/GuidanceRegulation/HACCP/*)

"A system approach using HACCP has been recently applied to disease management in the nursery industry and this approach could definitely be applied to the greenhouse industry as well," Hand said.

To learn more about this approach, Hand recommends "A Systems Approach for Management of Pests and Pathogens of Nursery Crops," by Jennifer L. Parke and Niklaus J. Grünwald. (*http://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS-11-11-0986-FE*)

Once your greenhouse has established a set of guidelines for preventing and managing pathogens, it's important to share those practices with workers. Provide regular training to educate new employees and serve as refreshers for long-term employees on the protocols for sanitation and the importance of following these guidelines.

Develop educational materials that can be posted throughout the facility. "Developing and hanging posters and other educational materials and placing them throughout the operation constantly places the best management practices (BMP) under employees' eyes," Hand said.

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