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## Sanitation success

Greenhouse sanitation basics and coronavirus response can help keep your plants and people safe and healthy.

Jolene Hansen



Ask any grower. Proper greenhouse sanitation is one of the most important things you can do for the plants you grow and the people who tend them. Yet, ask those same growers how the greenhouse industry rates overall, and you'll likely hear "room for improvement" quite a bit.

With the arrival of SARS-CoV-2, the coronavirus that causes COVID-19, sanitation at your growing operation is now more important than ever. Not surprisingly, an effective response encompasses greenhouse basics as well as COVID-specific keys.

This look at sanitation best practices — for plants and people — can help your operation succeed.

**Putting greenhouse sanitation in perspective** University of Kentucky's extension specialist in plant pathology, associate professor Nicole Gauthier, suggests that coronavirus concerns can help growers see greenhouse disease and sanitation fundamentals in a new light.

"We can take the same approaches for greenhouse disease — also spread by touch and spread by airborne particles — that we take for our personal health," Gauthier says. "You're never too clean, especially in a greenhouse. So, we can use those practices that we've learned from COVID and apply those scenarios in our greenhouses as well."

Muhammad Shahid, University of New Hampshire Extension associate professor and state greenhouse and nursery production specialist, agrees. "It's not only about COVID. We are just becoming more focused," he says. As growers reach out for information and sanitation training, coronavirus is a driving factor. But the battle for a clean, healthy operation starts with greenhouse sanitation fundamentals.



The ongoing coronavirus pandemic has made proper greenhouse sanitation practices more important. Photo courtesy of Nicole Gautheir

**Revisiting simple greenhouse sanitation basics** With greenhouse disease management and sanitation, like many things in this industry, Gauthier and Shahid emphasize that small things add up. "Sometimes [growers] don't realize things that are so simple can have such a large impact," Gauthier says. "It's easy to underestimate the importance of the little steps in sanitation, but the little steps are cumulative and they make huge impacts."

Shahid adds that growers often confuse cleaning with sanitizing and stop short. "A grower may say 'I removed all the leaves. I cleaned my benches. I removed my plant debris.' He thinks he is sanitized. But cleaning [alone] is not sanitizing. Cleaning is the first step; then there is disinfection. We need to kill all the germs and fungi and bacteria and pathogens."



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Consider the following greenhouse sanitation best practices to revisit and put to work in your operation:

Maximize blocking benefits. Gauthier encourages growers of all sizes to use sections or blocks extensively. "Separate your shipments. Separate cultivars. Separate species. Use as many blocks as possible," she says. If a pathogen gets introduced, through a shipment or something internal, blocking helps contain it. And, Gauthier points out, it's much less disheartening to rogue a small area.

Quarantine anything questionable. While a dedicated "plant hospital" area may be easier for large nurseries, Gauthier urges small growers to quarantine, too. "Quarantine new plants when they come in," she says. "If something is not looking good, but you're not sure if it's diseased yet, quarantine it. Get it away from other plants while you wait for a diagnosis."

Discard unhealthy plants and residue. For greenhouse growers, Shahid points out that time and space is money. "Don't keep any plants that you will not sell," he says. "They should be immediately removed because they could be sources of different pathogens and insects." And do not overlook substrate particles, which can aid the spread of pathogens throughout your facility.

Don't reuse soil or containers. Gauthier states it simply: "Don't reuse soil. Don't reuse containers — unless they're disinfected and scrubbed clean."

Get rid of the weeds. "Weeds can be a source of as well as hiding places for insects, especially whiteflies and thrips," Shahid says. "Even though symptoms may not yet be visible, they could prove drastic for your crop in the future."



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Remove all algae. Algae's pervasive nature makes removal a sanitation necessity. "Any symptoms of algae on your water hoses — on your mulching material, on your walls, wherever it may be — should be very clearly removed," Shahid says. "Algae in your facility can serve as a vector of disease."

Empty greenhouses completely between crops. Gauthier advises growers to avoid overlapping crops. "Fallow your greenhouse. Empty it completely, disinfest, and then reintroduce a new crop," she says. "Overlapping crops creates the bridge between a previous infection and a new one."

Scrub. Scrub. That means reaching benches, carts, wheels of carts, trowels, shoes, tools, surfaces and more. "Scrubbing isn't as sexy as the latest, greatest new fungicide. But a high level of inoculum or pathogen particles will overload any fungicide and even the best products cannot be effective if they're overloaded by pathogen propagules in the space," Gauthier says.

Don't overlook irrigation lines. "When we fallow and disinfest, that includes flushing your irrigation lines and all your hoses and breaker nozzles," Gauthier says. Shahid believes contaminated irrigation lines are a main force behind the spread of greenhouse disease. "Your irrigation system must be properly cleaned out," he says. "Use clean water to irrigate your crops, and never put your irrigation tools on the floor. If the floor is contaminated, then it's going to contaminate your irrigation tools and then it's going to spread through your whole facility."

Educate every level. Your sanitation program is only as strong as your weakest link. Gauthier notes that educational seminars are often packed with greenhouse "upper echelon" only. "We only see the greenhouse manager or we see the supervisors, but what we need are the people who touch those plants every day," she says. One uninformed temporary staff member can leave your entire program at risk, so educate everyone, at every level.

Be on guard for broken links. The simplest act can lead to a sanitation breakdown. For example, you may sanitize the greenhouse perfectly — then someone brings in a dirty wheelbarrow. Gauthier says another common break occurs when greenhouses overwinter plants for family or friends. "We see so many of these foster plants that come into our greenhouses over the winter. Something so simple can really introduce a problem when you're not paying attention," she says.

Don't wait for disease. Gauthier reminds growers: "With plant disease, once infection occurs, we can't cure it. We can suppress. At that point, we're using fungicides to protect healthy tissue. So sometimes we shouldn't wait." If you have a susceptible crop, a

history of disease in a house, or an outbreak in a nearby house, she advises being proactive with your fungicide program.

Shahid suggests keeping others in mind when it comes to greenhouse disease management and sanitation protocols — not unlike the reasoning behind face masks and social distancing. "It's not just for your facility," he says. "Visitors could come from other facilities and diseases in your greenhouse could be communicated through their

feet and hands to other facilities outside yours."



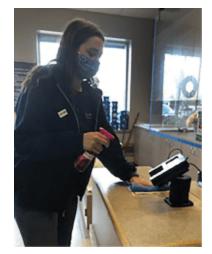
Dead plants, diseased plants, algae and weeds are just some of the items growers should clear from their greenhouses in order to maintain a safe growing space. Photo courtesy of Nicole Gauthier

## Staying clean, healthy and COVID-compliant

Greenhouse sanitation fundamentals represent a necessary starting point for fighting COVID-19. Rosa Raudales, assistant professor and greenhouse extension specialist at the University of Connecticut, clarifies that sanitation basics can't be skipped. Steps such as removal of organic debris prior to disinfection are essential to successful surface sanitation against SARS-CoV-2.

Shahid works extensively with growers navigating coronavirus compliance and working to keep staff healthy and facilities COVID-free. While he sees many growers well-trained and excelling at sanitation, others aren't — but he's quick to say growers aren't reluctant; they just need more training on what to do.

Extension educators and agents have become prime resources for accurate, timely information on best practices for preventing and managing coronavirus infections in your growing operation. USDA.gov, EPA.gov, state extension websites, and sites such as e-GRO.org (http://e-gro.org/index.php) (Electronic Grower Resources Online) are excellent sources for videos, seminars and fact sheets.



These COVID-related sanitation and compliance tips can also help: Look to the EPA for chemical guidance — with a hand from extension. The most common question Shahid fields about COVID-19 sanitation is about which chemicals to use. The Environmental Protection Agency (EPA) list of surface disinfectants for use against SARS-CoV-2 contains nearly

500 EPA-registered products. Extension

educators can help you find and focus on the most effective products for you.

Follow EPA directions and keep records. Once you've selected an EPAapproved and listed product, Raudales emphasizes the importance of following EPA disinfection directions for use against SARS-CoV-2. Remember to keep records and include them in your safety operation procedures.

Do not use COVID surface sanitizers near plants or in irrigation systems. Raudales stresses that some surface sanitizers may be toxic to plants. Plus, application rates for coronavirus surface disinfection exceed levels plants can tolerate.

Extend sanitizer contact time, when possible. Raudales reports that EPA-listed contact times for approved SARS-CoV-2 surface sanitizers reflect minimums needed for control. She recommends extending contact time to increase the product efficacy, if possible in your operation.

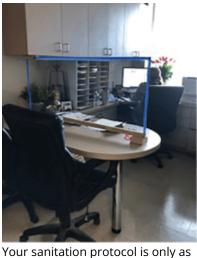
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Alternate products, if desired, but don't mix. As with all chemicals, Raudales warns against mixing products, unless specified on all product labels involved. Unapproved mixtures and unexpected reactions can yield toxic results. Alternating surface sanitizers at approved intervals is fine.

Educate with videos. You may think you have masks, hand washing and



social distancing down, but videos on how to wear masks and other PPE, wash hands and stay socially distant can illuminate where you're wrong. Shahid recommends using visual training tools to educate and reinforce best practices for these basic coronavirus precautions. This holds for applying chemicals and sanitizing surfaces as well.

Practice what you learn. Followthrough is critical. "Remind people this is a different time. You need more focus on cleaning — cleaning your

Your sanitation protocol is only as strong as your weakest link so make sure that everyone on your staff is educated and on board for your entire program.

hands especially," Shahid says. "And practice social distancing everywhere. In your propagation area, your shipping area and your packing area — everywhere." Consider taking employee temperatures at the beginning and end of shifts.

Increase your cleaning frequency. Extra effort counts. Shahid advises increasing cleaning frequency of "touch places," such as equipment and door handles, to keep your workplace clean and hygienic. "If you're cleaning one time a day, then increase your cleaning frequency to two or three times a day," he says.

Embrace alternative means of communication. Take steps to minimize face-to-face contact and go virtual instead. Shahid recommends broadening avenues of communication with tools such as private social media groups, video conference calls and communication apps for mobile phones. "These could be very helpful for effective communication with employees and customers," he says.

Explore ways to sell — while social distancing. You may be used to face-to-face sales, but there are other ways to sell plants and honor social distancing. Shahid suggests using online ordering, limiting the number of customers or visitors on site, and setting individual appointments for pickups. Knowing how many people your facility can accommodate with proper social distancing is essential, especially if you have a retail garden center segment.



A key part of a COVID-compliant safety plan is proper signage and offering employees the tools they need to stay safe. Photo courtesy of Ray Weigand's Nursery cash and credit card purchases. Online payment networks offer touchless options. These include online or advance credit card payments, as well as services such as PayPal, Venmo and CashApp, Google Pay and Apple Pay.

Expand touchless payment options. Shahid explains that many people are

coronavirus through hand-to-hand

concerned about spreading

Take touchless interactions further. Shahid says many growers are moving to touch-free systems

throughout their facilities, including touchless doors, water faucets, water fountains and paper towel dispensers. All these advances eliminate would-be touch points for pathogen spread.

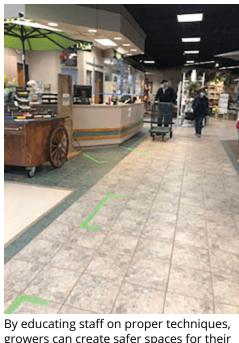
Innovate at break time. For small growers with tiny breakrooms, social distancing at lunch and break times is still possible. "In this COVID scenario, we don't have to do the 12:00 to 1:00 p.m. breaks. We can do shorter breaks and we can be wiser," Shahid says. "If I'm a grower in this situation with 10 employees, I can divide into smaller groups and do three at a time instead."

Plan, prioritize and designate responsibility — before infection hits. Shahid recommends having remote work plans in place, including communication plans between managers and staff, and designating next-in-line employees to step in if people in key positions fall ill. "If you have infection at your farm, you should know who the next person is to have that responsibility or assignment. And be sure to notify that person beforehand," he says.

Cultivate confidence. Staff need to have confidence they can stay home if they're not feeling well and not worry that their job is at stake. "Gain the confidence of your staff. This means there should be no attendance compulsion," Shahid says. "Look also at your responsibility to your healthy staff members. If someone gets sick, separate them from others."

Looking toward post-COVID sanitation practices

While media reports show some Americans dismissing COVID precautions, Shahid is hearing the opposite from growers he works with one-onone. "They say, 'We've had a lot of modification in our production systems in terms of cleaning, sanitation, disinfection and our sale points. We think that these things should have been done before COVID.' They say these are very useful, not only due to COVID, but due to their own health and their workers' health," he says.



growers can create safer spaces for their workers and for customers in a retail greenhouse setting. Photo courtesy of Ray Weigand's Nursery

Gauthier encourages growers to develop relationships with their extension educators or extension agents and take sanitation seriously, from greenhouses basics to COVID and what comes next.

"I want to encourage everyone to take some time to look through their SOPs and find ways to improve their sanitation," she says. "Think about every leaf, every old debris, every soil particle, every mechanically transmitted cell, everywhere hands touch. Make improvements and continue to make improvements. It's nothing revolutionary. It's just being clean."

The author is a Minnesota-based freelance writer specializing in the horticulture industry. Reach her at jolene@jolenehansen.com.

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