Grower 101:

Managing Spores And Sanitation

Many spore misconceptions exist among growers: The best protection from spore-related problems is to learn the facts and exercise good sanitation practices.

By Robert Larose

Today's growers should beware. They are up against a lethal, unseen enemy that has existed for thousands of years. This enemy can travel through water, land or air at alarming speeds. Its survival skills are unparalleled, and it does not discriminate who it targets. This grower enemy is a spore.

Growers need to take spore precautions for their plants. At any growers' meeting on disease control, there will be a discussion of life cycles of fungal diseases and how spores germinate into disease organisms. The discussion involves general statements that disease spores are everywhere, and it is inevitable that the diseases they propagate can strike at any time.

For many plant diseases, the life cycles most often start with the germination of dormant spores. These pathogens include but are not limited to Botrytis, rusts, and powdery and downey mildews. Other non-pathogens equally problematic to growers are algae, mosses, liverworts and other bryophytes.

Know Your Spore Lore

Most growers think of spores as seeds and fungi as plants. Spores are not seeds. A seed contains a small form of a plant and food to nourish it all wrapped in a hard shell; it is made of many cells. Most spores are single cells protected by a cell wall. Some spores are made of several cells, but the largest spore is still smaller than the most minuscule seed.

To clear up another misconception, there is no microscopic fungus inside a spore. A spore is a resting structure, meaning there is little or no metabolism inside. It is a true form of suspended animation. A spore contains all the chemicals needed to create a fungal organism. When conditions are right, the spore starts to grow and creates a web-like mycelium, and the fungus becomes an individual.

Spores are resistant to heat, radiation, chemicals and desiccation. The defense mechanisms enabling this resistance include the dehydration of the protoplast and the production of special proteins that protect spores' DNA. Spores are capable of detecting their environment and can germinate and return to the vegetative state in favorable conditions.

This before-and-after-cleaning view of a bench shows how important it is to regularly treat and sanitize your benches. They can harbor debris, resting spores, insect larvae and algae that provide matter for disease cycling. (Photos: BioSafe Systems LLC)

The secret to a spore's survival is its cell wall. Incredibly tough, it is designed to survive the harshest environments. With these features, spores can survive for a very long time and then germinate when conditions for growth are right.

Spores have also learned how to travel smart, so they can procreate in as many places as possible: They can move hundreds of miles on wind currents, in water and on the bodies of insects. They can also be deposited in the feces of all types of animals and birds.

In 1935, the weather balloon Explorer II was released at an altitude of 71,395 ft. It contained a spore-trapping device that was set to close once the balloon reached 36,000 ft. Only five living spores were recovered, but think of the conditions the spores faced at the elevations between 36,000 and 71,000 ft.! The air is very thin at that altitude, and the temperatures are below freezing. Explorer II also measured wind speed. At the elevations where the spores were detected, winds were measured at 40-60 miles per hour. If winds were constant at those elevations, it was calculated that fungal spores in the jet stream could be carried 8,400 miles in a week.

Understanding The Situation

Many growers believe that disease is an inevitable event since traditional fungicides are not effective at killing dormant spores; fungicides are actually designed to suppress, inhibit, subdue and at best kill the fungal organisms once they have developed from resting spores.

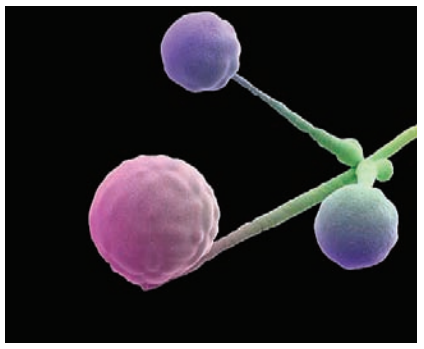
In the past, the only solutions were to repeatedly apply preventive fungicides or intensively scout plants and begin treatments at the first sign of disease. However, by the time the symptoms show up, the disease can be well established within the plants and result in severe losses.

Sanitation agents that have no effect on dormant spores include chlorine solutions less than 5 percent, quaternary compounds, alcohol, iodine and phenol solutions. The chemicals that do have sporicidal activity are generally phytotoxic to plant material or are carcinogenic to humans, such as formaldehyde and formaline.

To complicate matters, using chemicals that only control disease outbreaks while leaving spores actually encourages more disease. Once the active organism "feels" it is under attack, it reverts to survival mode: It produces more spores to ensure that before it dies it will guarantee its overall survival by producing spores for future disease outbreaks. The result of traditional chemistry having no effect on resting spores dictates that growers live with the fact that disease epidemics are inevitable and lurking in their greenhouses.

Practice Good Sanitation

Good sanitation practices are one of the few standards university pathologists and industry consultants agree on. The first step in a disease-prevention program and the basis of any long-



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term strategy has to be an aggressive sanitation program. Get debris out of the greenhouse and use sanitation agents to treat floors, olds pots and equipment.

One approach to disease control uses high-level sporicides capable of killing fungal organisms, active or inactive, on the plant tissue or in the growing environment. There are sporicides capable of sanitizing both plant tissue and the growing environment. Activated peroxygen chemistry, when formulated with stabilizers and buffering agents, allows growers to aggressively sanitize both their plants and growing environments. This allows growers to continually reduce populations of dormant spores and active disease organisms while the crops are growing.

Past practices only allowed sanitation to occur before and after crops were in the greenhouse because there were dangers and concerns of phytotoxicity. This new class of chemistry has an immediate effect on the resting spores as well as active adult microorganisms. The new approach is to aggressively sanitize the inanimate surfaces within the growing environment and the plants themselves.

As a preventive measure, you can also treat and sanitize all plant material coming into the growing environment, including all seeds and cuttings. Treating irrigation water and using direction injection of chemicals in all propagation houses prevents all forms of bacteria and fungal diseases such as Botrytis, Erwinia, Phythium, Phytophora, Peudomonas and Xanthomonas.

Further, it is important to regularly treat under bench areas. These have always been problem areas for growers and can harbor debris, resting spores, insect larvae and algae that provide matter for disease cycling.

The bottom line is there are many ways to control disease, and it is important for you to find some that work for your greenhouse. Aggressive sanitation practices that reduce overall populations of resting spores, disease organisms and insect larvae will reduce and control the overall disease potential. Growers can also attack spores before any symptoms appear. If you keep a close eye on sanitation and understand the facts, spores truly will be the unseen enemy: unseen in greenhouses and unseen in crops. GPN

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