Covid-19 has dominated much of 2020 already. It’s added to the headaches of the spring crunch and caused problems as growers try to ship out a perishable product with a limited shelf life and a critical time frame for consumer purchasing. It’s caused disease problems, too — especially Botrytis — as growers try to keep stock ready for shipping on benches already scheduled to receive the next cycle of plants. In the meantime, there are always the usual lineup of pathogens and pests to monitor and manage: whiteflies, thrips, aphids and mites, Pythium, Rhizoctonia, and the aforementioned Botrytis. And the environmental ones, too: Cold, heat, humidity, and even hurricanes. This 2020 installment of the BASF Plant Health Series takes a trip to several areas of the U.S. to find out what growers are dealing with this year and how they are handling them.
The Meaning of Plant Health

by Caren Schmidt, Ph.D.

As I write this, we are nearly three months into the pandemic and our new way of life. While the uncertainty has led to great challenges, our industry has been a beacon of hope in many ways. I have not been able to visit growers in person, but I have been to the retail garden centers in my community and have seen this hope. Many health and well-being benefits of ornamental plants and bringing nature into the home and workplace have been well documented. Those benefits have seemed ever so important this Spring. Consumers fled to retail garden centers to reap the rewards of ornamental and edible plants and to find some sense of normal amidst the chaos. In many cases, it was the first foray into gardening.

The uncertainty of the pandemic, though, caused great disorder for nursery and greenhouse growers not knowing what the demand for their products would be. In many cases, growers have had to hold plants longer before shipping. Further, labor challenges affected growers due to the new sanitation and distancing requirements. However, growers have always been resilient and innovative when dealing with uncertainty. In a normal year, they must deal with the uncertainties of weather that challenges them in different ways from year to year.

Enter Plant Health. To me, plant health refers to the benefits elucidated by Intrinsic® brand fungicides beyond disease control. As Pioneers of Plant Health, Intrinsic® brand fungicides (Pageant®, Orkestra® and Empress®) provide solutions to growers to weather many storms. Offering the power to control diseases, increase growth efficiency and withstand stress, these are foundational tools to manage through various environmental and pest-related conditions, uncertainties of demand due to the pandemic requiring holding plants longer and ultimately protecting during shipping and handling at retail garden centers. Beyond plant health attributed to the use of Intrinsic brand fungicides, the term “plant health” can have a broader connotation. To many, it means getting plants grown to the perfect stage, shipped without loss and into retail garden centers looking the best they can for eager consumers. They consider many other factors like managing insect pests and managing all the cultural requirements to produce a healthy plant. Ultimately, plant health has many meanings to various people.

“The offering the power to control diseases, increase growth efficiency and withstand stress, Intrinsic® brand fungicides are foundational tools to manage through various environmental and pest-related conditions, uncertainties of demand due to the pandemic requiring holding plants longer, and ultimately protecting during shipping and handling at retail garden centers.”

BASF maintains its proud sponsorship of the Greenhouse Grower special series on Plant Health. We invite you to join us in this edition and learn more about how various growers and extension specialists across the country deploy various growing techniques to achieve the highest levels of plant health in their ornamental crops. While differences arise in various geographies, in many cases a bug is a bug and diseases are diseases, from region to region. Management efforts transcend geographies and growers are savvy in their utilization of tools, including biological, cultural and chemical solutions. BASF is proud to be an integral part of many pest control solutions and proud to help serve as a beacon of hope to communities.

Dr. Caren Schmidt is Ornamentals Regional Sales Manager at BASF.

Growing Strong:

Plant Health Update

Growers and Extension Specialists offer insight on how they’re managing this year’s pest and disease pressures.

by Kristen Hampshire

Growers in North America face many of the same pest and disease pressures. But how they manage them can vary depending on the region. We took a virtual trip to several areas to ask growers how they are dealing with plant health issues in their neck of the woods.

Heat and Humidity Challenge Southeast Growers

Heat, rain, drought, and hurricanes are environmental variables that growers face in the Southeast. Add extreme humidity to the mix and you’ve got a recipe for disease. “If we have a really dry period and then the rains come in, you start to see more disease because the plants were so stressed from drought,” says Terri Bates at Bates Sons & Daughters, Lake Placid, FL.

The third-generation family-owned-and-operated caladium business finished planting its 2021 crop in early May, which was 10 days behind schedule due to heavy rainfall this spring.

Caladiums are susceptible to Pythium and Fusarium. To prevent Pythium, Bates and her team add a biofungicide to the heat tank before moving bulbs to cooler water, which also includes a biofungicide. In the processing and cutting area, Bates opts for a biofungicide along with pecan flour, which prevents cuttings from sticking together.

“Getting the fungicide in the dust and on the cut surface helps fight disease,” she says.

If the weather shifts to a pattern of “too hot,” then Bates sprays BASF’s Pageant® Intrinsic® brand fungicide. “That has stopped us from having to use more systemic fungicides,” she says. “The first year I used it, I saw a remarkable difference in yield, up to 25 percent more, especially in my white caladiums. That is significant.” Bates thinks they have Pythium beat now. “But I’m not going to stop using [the product] because I don’t want to see the problem come back,” she says.

As for Fusarium, Bates says it usually presents several weeks after harvest. “We’ll find it on bulbs in the warehouse,” she says. Last year, she used BASF’s Trinity® fungicide in the fields and sprayed bulbs while they were being washed, after harvest. “It really helped,” she says.

A mix of biologicals and traditional chemistries has helped manage tough diseases that can wipe out a crop. This year, Bates is concerned about hurricane predictions, and since they grow in a peat bog that is below sea level and near a lake, a serious tropical storm can cause dikes to break and swamp the grounds. In 2017, Bates Sons & Daughters lost 20 percent of its crop to hurricanes. This year, Bates says, “I think I have the applications under control. I just don’t want to see drought and hurricanes. I hope they are ‘fish storms’ that stay out to sea.”

An expanded selling window and faster crop turnover are just two of the benefits Hoffman Nursery in Rougemont, NC, is realizing from an investment in a gutter-connect greenhouse that is passively cooled.

“It’s a big step up from the cold frames that we had been growing in for years,” says Bill Hall, head grower at Hoffman.

Hoffman Nursery is a wholesale grower of ornamental grasses, brushes and sedges. In the humid region where the 30-year-old business operates, turf diseases (due to the crop) like gray leaf spot are an issue when humidity creeps up past 83 per-

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Biological Controls
of Common Greenhouse Pests

Accurate identification of the pest is the first step towards control. Here’s a quick reference guide to common greenhouse pests and the biological controls to consider for solutions.

Fungus Gnat
(Bradysia spp.)

**BIOCONTROL SOLUTION**
- Atheta coriaria (Rove Beetle)
- Stratiolaelaps scimitus
- Steinernema feltiae
- Microbials
  - Bacillus thuringiensis subsp. israelensis

Western Flower Thrips
(Frankliniella occidentalis)

**BIOCONTROL SOLUTION**
- Neoseiulus cucumeris
- Amblyseius swirskii
- Orius insidiosus
- Daletia coriaria
- Stratiolaelaps scimitus
- Steinemema feltiae
- Microbials
  - Beauveriana bassiana
  - Isaria fumosorosea

Aphid

**BIOLOGICAL SOLUTION**
- Aphidius spp.
- Chrysoperla spp.
- Adalia bipunctata
- Aphidoletes aphidimyza

**Microbials**
- Beauveria bassiana (may require tank mixing)
- Isaria fumosorosea

Shorefly
(Scatella stagnalis)

**BIOLOGICAL SOLUTION**
- Atheta coriaria
- Microbials
  - Steinemema carpocapsae
Mealybug

BIOLOGICAL SOLUTION
Cryptolaemus montrouzieri
Chrysoperla spp.
Anagyrus pseudococcus (citrus mealybug only)

Two-Spotted Spider Mite
Tetranychus urticae

BIOLOGICAL SOLUTION
Phytoseiulus persimilis
Amblyseius californicus
Neoseiulus fallacis
Amblyseius andersonii
Galendromus occidentalis
Feltiella acarisuga

Sweet Potato Whitefly
(Bemisia tabaci)

BIOLOGICAL SOLUTION
Eretmocerus eremicus
Amblyseius swirskii
Delphastus
Microbials
Beauveria bassiana
Isaria furmosorosea

Greenhouse Whitefly
(Trialeurodes vaporariorum)

BIOLOGICAL SOLUTION
Encarsia formosa
Amblyseius swirskii
Delphastus
Microbials
Beauveria bassiana
Isaria furmosorosea

Broad Mite
Polyphagotarsonemus latus

BIOLOGICAL SOLUTION
Neoseiulus cucumeris
Amblyseius swirskii
Amblyseius californicus

Photos: courtesy of BASF except for:
Broadmite: David B. Langston, University of Georgia, Bugwood.org; shorefly: Whitney Craneshaw, Colorado State University, Bugwood.org;

cent. “We know when it’s coming and we try to take steps to actively get ahead of it,” Hall says.

Disease prevention and control programs at Hoffman Nursery are largely traditional chemistry. The greatest challenge with using biological controls like beneficial insects is the greenhouse’s structure—roof and side-wall openings that passively cool the space can also serve as an escape route for beneficial predators.

Another disease-prevention innovation the nursery is working on now: A water ozone generator to complement its copper ionization system to help ward off Pythium. “Hopefully we’ll see some good results,” Hall says.

**Cold Spring Leads to Botrytis Problems**

A combination of biological controls and traditional chemistry helps D.S. Cole Growers in Loudon, NH, control its biggest pest problems: mites, aphids, and western flower thrips. Owner Doug Cole shares that mite control is nearly 100 percent biological, while thrips are treated with nematodes followed with sprays as needed. “We haven’t found a biological that works for us on aphids, and we struggle with white flies on our poinsettia crop,” he says. “Mealybugs have been brutal this year. We grow a lot of foliage plants, and they like to follow those.”

The nursery produces finished, potted plants with more than 1,000 line items in propagation, heavily focused on spring crops. In its region, cold winters with low light levels and hot summers create extremes for the greenhouses. But with the double panes in its glass houses, “we feel our heat bill is not the biggest problem,” Cole shares, noting that the nursery is investing in technologies to improve efficiency like Dutch rolling benches and robotics for handling pots to reduce labor costs.

Across the board in the Northeast, Botrytis blight is an issue following a cold spring, during which many growers had to hold back crops until they could be sold due to coronavirus limitations. This also led to problems with boron and phosphorous deficiency, reports Margery Daughtrey, Senior Extension Associate at Cornell University.

Impatiens suffered from necrotic spot virus, and tomato spotted wilt virus was seen on leucanthemum. White mold on cleome and powdery mildew on calibrachoa were also issues. “The notable pest problem was broad mite infestation on New Guinea impatiens, which has been a constant irritation for a number of years now,” Daughtrey says.

Fungicides protect plants against Botrytis blight, while white mold is being dealt with by discarding affected material and not re-using containers, Daughtrey says. Growers who realize they have powdery mildew are rotating strobilurin-containing products like Pageant Intrinsic brand fungicide into their programs.

Growers must pay close attention to thrips populations in early spring. “It’s essential to put up fresh yellow sticky cards and watch them,” Daughtrey says.

**Supplemental Light Helps Midwest Growers Fight Diseases and Pests**

Overcast skies and cooler temperatures are ideal conditions for fungus gnats and mealybugs, and since plants are not moving out of greenhouses as quickly due to coronavirus delays, greenhouses are more crowded than usual, says Raymond Cloyd, Extension Specialist at Kansas State University.

In general, Midwest growers grapple with aphids and western flower thrips. “With slower movement of plant material, the aphids, thrips and other insects — even mites — have a lot of plant material to feed upon,” he says. With crowding also comes Botrytis.

“Our hope is that producers and growers continue to rely on sanitation practices and hygiene, because that will help them reduce the potential for insect and mite pests, along with pathogens,” Cloyd says. A bright spot Cloyd shares: “Some growers have said that with online ordering and carry out, they are not doing so badly.”

At Raker-Roberta’s Young Plants in Litchfield, MI, low light levels play a factor in disease and pest pressures, especially in early spring—LED and HID lighting helps, says Casey Stanton, production manager. “With poinsettias, we always watch for white flies,” he says, noting that the nursery leans toward conventional chemistries for this pest.

To control western flower thrips populations, the nursery tank-mixes nematodes with traditional chemistries and releases Swirski mite.

As a preventative measure, the staff dips cuttings in a rosemary oil-based biopesticide. “That helps prevent broad mites and aphids, so we do not introduce those to our propagation area,” Stanton says.

Kristen Hampshire is a contributing writer for Meister Media Worldwide, publisher of Greenhouse Grower magazine.

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Knowledge is Key with Beneficials

Know your pest, know your predator, and know your pesticide.

By Robin Sikberg
Custom Content Editor, Meister Media Worldwide

W ith most of Greenhouse Grower’s Top 100 using at least one form of biological controls in their operations, it’s safe to say biologicals are an important part of plant health. Suzanne Wainwright-Evans, owner of Buglady Consulting, has 25 years of experience working with growers on how to fit biocontrols into their IPM programs. Because beneficial insects require more planning and training to use them properly than conventional chemical programs, Wainwright’s job involves helping growers understand their lifecycles, how and when to apply them, and what chemicals can be used along with them. I asked her about common mistakes growers make and what trends she sees.

RS: Why do you think, after a slow start, beneficial insects and other biocontrols are now much more common?

SW: It’s been an upward curve for several years. For me, it really started with spider mites (Tetranychus spp.) having resistance issues with miticides. That’s when people started getting really interested in predatory mites. Then we started moving into biocontrol for western flower thrips, (Frankliniella occidentalis), again because of resistance issues. Biocontrols also had the additional benefit of being able to control all life stages of western flower thrips. Much later, the next big wave was the concern over neonics and their possible effect on pollinators.

RS: What are some of the challenges for growers who want to get into more than, for example, beneficial nematodes that work for some species of thrips that can be sprayed on the soil?

SW: I would say the main thing is, you can’t just dabble in bio. You have to do your homework. If you use chemicals in rotation, they have to be chemicals that truly are compatible with your beneficials. If you don’t, you’re kind of straddling bio and pesticides and getting the benefit of neither. If you’re told a particular product is safe for beneficials, ask for specifics. Ask if they tested different life stages. Ask for the research. There are free resources available from biocontrol suppliers, but if you want to go more in depth, an excellent resource is the IOBC* [International Organisation for Biological and Integrated Control]. You pay $100 per year, but get access to a lot of good, accurate information, along with a massive database of pesticide compatibility information.

RS: What are the most commonly used biocontrols in ornamental production right now?

SW: Number one is predatory mites. Pound for pound, Neoseiulus cucumeris, which targets some thrips species and broad mites, is probably the most-used predatory mite here in the U.S. After that, nematodes [Steinernema feltiae] are something that is used quite heavily for western flower thrips, onion thrips, and fungus gnats control. Even conventional growers use nematodes in their programs. Then I would say more growers are getting into using the aphid parasitoids for battling potato aphids, green peach aphids etc. in conjunction with some of the softer pesticides out there. Parasitoids are a fast-growing category right now due to all the aphid issues in greenhouse production.

One reason for this is there is an advantage to using parasitoids in hanging baskets. Spraying baskets is really challenging. The parasitoids just fly up there, and they don’t need a big aphid population. They’ll often find a problem before you even know you have one.

RS: If you’re on a bio program but your pest numbers are going up, what can you do for a knockdown without harming your beneficials?

SW: Many of the newer pesticides being developed now are have quite specific targets, as opposed to the older, broad-spectrum insecticides that just wiped out everything. BASF has Ventigra® insecticide, which targets aphids and whiteflies. If you need to do a fast knockdown before shipping, for instance, and don’t have time for beneficials to work, you could do a knockdown spray with Ventigra because it will have minimum impact on your bio program. And, additionally, it is proven to be soft on pollinators. It’s very, very targeted.

I think Sultan® miticide is another really good example of what I call “designer pesticides,” because it is very specific on spider mites. Sultan kills two-spotted mites but has no effect on broad mites or russet mites. If you have an outbreak of two-spotted spider mite on your crop, and you’ve already released [Phytoseiulus persimilis], you can do a spot spray with Sultan, knock down the two-spotted and have almost zero impact on the persimilis. A lot of companies like BASF realize that integration with biocontrols extends the life of all of their products, because it reduces insect resistance. And growers are being more careful, as well.

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Now Available: Free Insect Identification and Treatment Poster

To help growers identify pests and learn how to control them in an IPM program, Suzanne Wainwright-Evans and BASF collaborated on a poster. With 33 closeup images of greenhouse pests followed by charts on how to best use solutions for control and reduce buildup of insect resistance, it’s an excellent, easy reference. Sign up for your FREE poster at http://m.pss.basf.com/lp/LP95

*https://www.iobc-wprs.org/expert_groups/01_wg_beneficial_organisms.html
A Legacy of Innovation and Efficiency

For more than a decade, our Intrinsic® brand fungicides have broken new ground in our industry. Powered by innovative chemistries, these products have become pioneers of broad-spectrum disease control, growth efficiency and most importantly — results. At a time when resources may be limited, growers need effective and powerful solutions they can trust. With BASF and Intrinsic brand fungicides on your side, you'll have both.

Visit betterplants.bASF.us/intrinsIC to learn more about Intrinsic brand fungicides.