GROWERTALKS

Cover Story

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The Doctors Are In

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Photography by Osvaldo Cuevas

You've been feeling kind of "off" lately.

Last week, everything seemed fine. But a day or two ago you started feeling icky, showing signs of illness and now you know you're definitely sick. But you don't know what you have—all you know is you want to know what it is and how to get rid of it.

Dr. Sladana Bec, plant pathologist for Ball Helix, looking at a sample through the microscope.

So what do you do? You go to the doctor so he/she can help diagnose what's wrong and figure out how to treat it so you can get better.

With plants, it's a similar situation: One week everything in the greenhouse is looking great and you're already planning on when to ship them out; the next, you've got a bunch of sick plants and whatever they have is spreading. You may have an idea of what it is, but need confirmation. Or maybe you have no idea and are frantic to know what the heck is going on.

So what do you do? Luckily, there's a plant doctor to call.

Diagnosing: A history

In 1998, Ball Horticultural Company established Ball Helix, a biotechnology research and science division dedicated to applying advanced technology to horticulture. For more than 25 years, it's helped the Ball breeding teams introduce new and improved plant genetics using molecular and cellular biology. But another important part of Ball Helix is a diagnostic lab, where growers can send in samples of plant material they suspect to have a disease so that it can be tested.

One of the coolers where plant samples are placed when they first arrive.

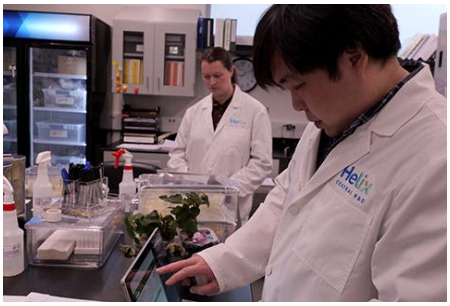
For years, the diagnostic lab located at Ball's headquarters in West Chicago was a bit of a catch-all, where the lab would just churn out diagnoses as they came in, without a system for tracking what was coming in and how it was diagnosed. But since Dr. Sladana Bec was hired as a plant pathologist to head the diagnostic lab, Ball Helix has implemented new systems and processes to better understand the problems that growers are dealing with and how much output the team was actually undertaking. For example, Sladana and her team use PClinic, a software program specifically created for the use of diagnostic labs to log and track incoming samples that need to be tested.

But the changes have gone beyond implementing new systems, said Shannon Carmody, Director of Plant Pathology for Ball Helix.

Sometimes, growers send in the entire plant to be scrutinized and tested.

"Before we had PClinic, we didn't have a system for tracking diagnostic data, how many samples or tests that were completed each year," she said. "And another thing that's different since we hired Sladana is that she's been able to really develop all of the relationships between the growers and sales reps."

Before Sladana came to Ball, she'd been working as a plant diagnostician at the University of Florida, which included testing tissue culture samples that Ball sent through a third party. Since she was already used to testing Ball products, hiring her five years ago to help lead the Ball Helix's Diagnostic Lab made sense. The timing was perfect, too, because Sladana's move to Ball coincided with the completion of a brand-new wing for Ball Helix that included a state-of-the-art testing lab with everything a plant pathologist could want.



"It's more specific and more managed, with more data retention," Sladana explained. "So they can send something in and ask, 'Do you remember I sent this last year?' And we can go back into our records and check exactly what was done."

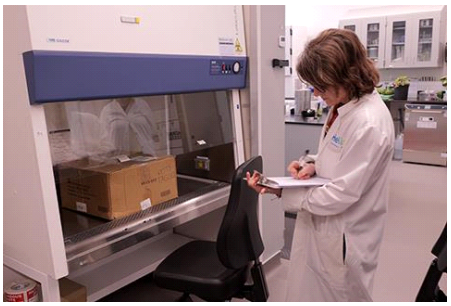
Lab scientists Kasey Shazer (background) and Benjamin Liu logging newly arrived samples.

And it's not just proprietary products that the lab will accept—as long as you buy your plants from Ball Seed, you can send in samples for diagnosis. And it's not just from growers in North America—Ball's off-shore production facilities send in their problem plants, too. And Kasey Shazer, an assistant scientist on the team, coordinates diagnostic samples with Ball's breeders.

"Diagnostics is perceived largely as a service, but it's the core backbone of making sure that the resistant products that we release are valuable and hold up in the marketplace," said Shannon.

That's a lot of sick plants to look after, especially during peak growing season. But with a good system, Sladana and her team can handle it.

Diagnosing: By the numbers



Since they started formally keeping track, Sladana and Shannon estimate that the diagnostic lab logs about 1,000 to 2,000 samples a year, with right before Mother's Day (understandably) being the busiest time of the year.

Every new arrival has to be logged and then opened in a vacuum fume hood to prevent any disease spores from escaping into the lab.

You may assume that the lab is seeing the same plants with the same diseases all the time, but not so. Sometimes, they run into a unique situation. Sladana gave an example of one of Ball's European partners having an issue at one of their production farms in Africa. They were struggling to diagnose the problem, so they sent some samples over to the lab at Ball.

"You will always see something new, which is good and bad," said Sladana.

I asked why it's good and bad, and she said that sometimes there are pathogens that are either very difficult to diagnose, show up on a new crop or are totally new to them. It offers an element of excitement when finding something brand new and the process of investigating it, but then that also means that's one more the grower has to worry about.

Diagnosing: The process

There's a process that Sladana and her team follow in order to diagnose a problem. It starts with a specific form that they ask growers or Ball Seed sales reps to fill out when they send in samples. When the samples arrive (sometimes in various interesting states), the team follows certain steps to open the package, log it in, and start the testing and diagnosing process.

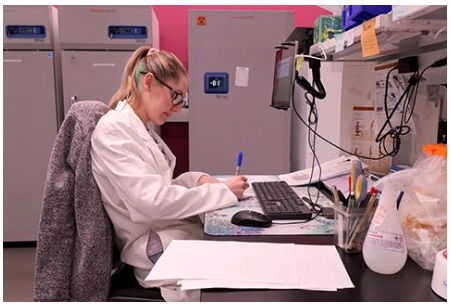
Samples arrive in all sorts of ways and in all sorts of packages.

But because Sladana and her team don't have the luxury of being everywhere at once, this is when the form really comes in handy. The information provided to the team is vital to help them come to the correct conclusion as quickly as possible.

"You have certain things that you need to know," Sladana explained. "You need to know about patterns on the plant, plant patterns in the greenhouse, the timing. Did the symptoms develop overnight or did the symptoms take time to develop? What did the symptoms look like? The more you know, the better you are at forming an hypothesis."

After this, knowledge and experience come into play. Both Sladana and Shannon have had years of training and working in labs that's helped them come to final conclusions, especially when you run into something you've never seen before.

"It's really important to understand biology and botany," said Shannon. "As much as you know about the host plant, you also have to know about the pathogens capable of causing diseases. In ornamentals there is so much diversity."



And this is why when I asked how long it takes to come to a final diagnosis, Sladana and Shannon chuckled and said, “It depends.” Depending on the amount of information they have, the type of pathogen and the knowledge they have about it, it could take anywhere from 30 minutes to three months.

Scientist Ingrida Valaitis logging data into PClinic, their diagnostic lab software.

And not every plant sample can be diagnosed—there have been times where Sladana and her team are stumped by a case. The key is to acknowledge they don’t know and to be transparent about it.

“This is when you give the data, saying, ‘This is what we know,’” said Sladana. “Sometimes you cannot tie all of the loose ends, but you can give them all of the possibilities.”

“Sometimes negative information is useful, but yeah, sometimes you just don’t get the answer to your question,” Shannon said.

This is when the difference between positive versus pathogenic comes into play, and where you ask the questions: Where is it on the scale? And how severe is it?

Thielaviopsis basicola conidia and chlamidospores seen through the microscope on a Salvia nemorosa sample.

“It’s like going to the doctor when you know something’s wrong, but you don’t know what it is,” explained Sladana. “So then you do a slew of tests. Or you know what’s wrong, so you just focus on the problem and then go from there. It’s two different schools of thought.”

“You don’t actually always need a diagnosis,” said Shannon. “It’s one of those things where the treatment might just be the same regardless of what’s causing the symptoms. A doctor is going to recommend diet and lifestyle changes for many different symptoms.”

If it’s a virus, there’s not much else to do than to scrap all of the infected plants. But if it’s bacterial, there are different approaches to treat it.

Also, like a journalist with an anonymous source, Sladana and her team do not share any information with anyone else other than the contact person who submitted the sample (unless if it’s a quarantine-required pathogen—in that case, they’re required to report it to USDA). But for most cases, confidentiality is a best practice in order to avoid panic and to build trust with the growers. Like a disease, word-of-mouth spreads and that’s not good for business.

Diagnosing: The future

One major concern that Sladana and Shannon have is helping people understand the difference between detection of a pathogen and the diagnosis of a pathogen that’s causing symptoms or disease. There have been advances in sequencing and molecular tools that can detect many pathogens, but detection doesn’t mean it’s the cause for the

symptoms.

“To find the microorganism that’s causing the problem still requires a lot of synthesis by the person who’s looking at the sample,” said Shannon.
Sladana chimed in: “Because the computer can’t analyze everything. You need the person with the knowledge to analyze that.”

And knowledge is what the Ball Helix Diagnostic team continues to gain. They partner with outside groups and organizations, in and out of the industry, to keep up with the latest information on plant diseases and advances in how to detect them. They conduct their own research and take classes. And they keep up with what’s coming down the pipeline with new technology and equipment.

“There are always improvements,” said Sladana. “So we keep abreast of those improvements and learn.” **GT**

> **Proactive vs. reactive**
> The best way to avoid having to send plant samples to the Ball Helix's Diagnostic Lab is to implement as many preventative measures and best practices as possible from beginning to end—from sanitation to scouting—so you can avoid having to send in multiple samples every season.
>
> Your trusty sales representative or one of the members of Ball Seed’s technical services team are also just a call/text/email away, so ideally, you would use the lab as a last resort or if you’re truly stumped on what’s going on.
>
> But the plant pathologists in Ball Helix understand that the process of preventing and controlling insect pests and handling disease issues is like a spoked wheel—there are multiple options, which is good because there are multiple scenarios to deal with. Even a turnover in grower staff can mess with the balance of disease prevention, regardless of whether it’s been years since you’ve had a problem.
>
> “Disease is not normal,” said Shannon. “Maybe you go two, three or four years before even noticing you’ve had a problem all along.”
> *—JZ*