BALLTECH ON DEMAND™

TECH TIP: PATHOGEN TEST KITS

A critical part of disease management is proper identification of the causal agent, and failing to correctly ID pathogens when early symptoms first appear frequently leads to longer crops times to clean up the issue and/or increased losses.

Some diseases have characteristic symptoms and can be identified based on these, especially when you've had previous experience with the disease in question. However, early symptoms for many diseases are often much less distinct and can be mistaken for abiotic disorders like mineral nutrient deficiencies or other factors. If you have a pathologist on staff or an in-house diagnostic lab—that's great, but most of you don't have either. Without these, high accuracy when diagnosing early symptoms of suspected bacterial or viral disease is virtually impossible beyond saying, "Based on my Google image search, it looks like it could be X, Y or Z." So, what can you use to quickly check for suspected bacterial and viral pathogens? *Test kits!*

What's a Pathogen Test Kit?

Test kits are typically made up a couple of components, including a pouch containing a buffer solution and test strips that are kept separately until the test is performed. In general, test kits for bacterial and viral pathogens work pretty much the same way. You take some symptomatic plant tissue, mash it up in the buffer solution pouch, and submerge the tip of the test strip in the solution. As the strip wicks the mashed-up plant "juice" plus buffer solution through itself, an indicator in the strip reacts with the solution. If the pathogen that the kit is designed to test for is present, the strip will indicate a positive result. The technical term for this kind of test is a lateral flow assay.

Why Keep Pathogen Test Kits On-hand?

Since the naked eye cannot see bacteria or viral particles, test kits are pretty much the only way most of you can home in on exactly which pathogen you're dealing with. The alternative is to send plant samples off to a lab equipped with similar, higher-resolution diagnostic tools, but this can be time consuming and costly, depending on the lab. In the meantime, while you wait to hear testing results, the pathogen could be spreading further through your crops and cause more damage because you weren't able to react sooner. If you had a test kit on-hand, however, this would give you a much better idea of how to appropriately manage your disease risk when you first saw symptoms, and potentially head it off sooner.

Important Things to Know About Test Kits

While test strip kits can be powerful tools for early disease detection, there are a few important things to know before using them.

- Results from test strips are not the be-all, end-all of whether a disease is present. They are strong indicators of the presence of specific pathogens, but follow-up testing in a lab setting should always be done to confirm which is present.
- Some test strip kits test positive for multiple different pathogens. For example, Tobacco Mosaic Virus (TMV) test kits react with over a dozen tobamoviruses, and additional testing is often needed to confirm exactly which one is causing disease.
- Though test strip kits are pretty darn accurate, they're not infallible. False positives can occur, hence why follow-up testing in a lab is strongly encouraged. The best way to reduce the risk of false positives is to follow the kit instructions exactly as they are written and ensure they are properly stored until used.
- Only test symptomatic plants. Blindly testing healthy crops is a waste of your money (test kits typically run about $10 to $15 per kit) and false positives could cause you to overreact and throw away plants unnecessarily.
- *Test strip kits have an expiration date.* Shelf life of these kits is often more than long enough to carry you through a given year, but plan on doing a refresh on any unused test kits from one year to the next. Also, when you buy these kits, be sure to check the expiration date and contact your supplier if they sent kits that will expire really soon.
- Because test strip kits are perishable, make sure you have an appropriate place to store them before use. Typical refrigerator temperatures—36 to 46 F (2–8 C) are suitable but make sure they don't get colder or hotter than this before you're ready to use them.

When in doubt, reach out to a Ball Seed technical expert. If you're ever uncertain of how to execute test kit instructions or interpret the results, reach out to your supplier or your favorite diagnostician. Again, nothing is worse than a false- or murky-positive test result, but a second opinion from an expert can help prevent overreaction or at the very least help you rest a little easier at night.

Which Kind of Test Strip Kit(s) Should You Have?

There are TONS of test kits for different viruses and bacterial pathogens, so it's easy to get overwhelmed when deciding which ones to keep handy. I often suggest that growers maintain a supply of test kits for viruses or bacterial pathogens that they have dealt with in the past—especially when they have had the same disease issue over multiple consecutive years. Here are some other considerations if you are unsure as to which will be most worth your while:

Get a few kits that test for pathogens on crops with known disease risks. For example, let's say you grow zinnias in spring/summer or flowering cabbage and kale in fall. Both crops have known seedborne disease risks it would be wise to have a few *Xanthomonas spp.* test kits available.

If you have dealt with tospoviruses (like tomato spotted wilt virus; TSWV) or other insect-transmitted viruses, it would be wise to have test kits for these viruses at the ready. Plants in the landscape around your greenhouse can serve as viral reservoirs from one year to the next, and incoming pests can pick up the virus before entering your crops. Until you can fully eradicate viral reservoirs, keep a few test kits handy to help catch early symptoms. In this case, early virus detection can also serve as an indicator to ramp-up control measures for the virus' insect vector and help reduce year-over-year losses.

Even if you don't tangle with viruses often, it is still wise to have a few test kits around just in case. Rather than getting individual test kits for common viruses, you can buy combination kits like Agdia's ImmunoComb®, which tests for multiple groups of common viruses simultaneously, including Cucumber Mosaic Virus (CMV), Impatiens Necrotic Spot Virus (INSV), TSWV and Tobacco Mosaic Virus (TMV).