

# GROWERTALKS

## Features

2/1/2024

## Using Biocontrol Agents for Disease Control

*A.R. Chase*

Biopesticides, including biological controls agents (BCAs) like bacteria and fungi, are typically OMRI-listed. They can also be extracts from a plant (like EcoSwing, Regalia and Triact 70) or the bacteria such as *Bacillus* spp. (Cease, Triathlon BA and many others). The latter has living bacteria, as well as all of the chemicals created as the bacterium was growing. By far the most challenging biopesticides to use effectively are the BCAs.

Biopesticides that aren't BCAs act more like conventional products, making them simpler to use in most cases. These kinds of biopesticides can have a narrow mode-of-action, but BCAs are more likely to provide a variety of direct and indirect effects. Direct effects would be the lipopolysaccharides created by *Bacillus* spp. that destroy bacterial and fungal cell walls. The range of effects created by some BCAs make development of resistance to them less likely than single mode-of-action conventional products. This is even less likely with BCAs since they're alive and can actually change with their environment just like the pathogens they control.

Indirect effects are those that these products trigger in the host—often referred to as SAR (systemic acquired resistance) factors. *Trichoderma* and *Bacillus* species have each been proven to trigger these plant defense responses.

The best example of how much our knowledge has improved over the past 35 years is the understanding of T-22 (one of the BCAs in RootShield PLUS+). Here's a summary of the ways that researchers (often at universities here and internationally) have discovered how the BCAs work. This summary was prepared by BioWorks Inc. (directly taken from the BioWorks website).

- **Excludes pathogens:** RootShield PLUS+ takes up space in the rhizosphere and crowds out pathogens. It not only overtakes that space, it eats nutrients as well, causing pathogens to starve.
- **Shields roots:** Not only does RootShield PLUS+ grow on the roots, it shields them from pathogens. It acts as a barrier that pathogens cannot get through.
- **Hunts and eats pathogenic fungi:** RootShield PLUS+ seeks out, attacks and eats fungal pathogens.
- **Antagonizes pathogens:** RootShield PLUS+ releases anti-pathogen substances, creating a zone that's inhospitable to pathogens.
- **Induces host resistance:** RootShield PLUS+, with its presence in the rhizosphere, signals the plant to accumulate defensive compounds, which give the plant a better defense response in subsequent encounters with

pathogens.

## What factors affect the use of BCAs?

Timing, rate and interval, disease pressure, and crop are each important to get the most out of your BCAs. Tank-mixing or alternation with conventional/synthetic fungicides, the potting medium, irrigation method and fertility regime, and finally even the exact species of the pathogen causing the disease can each make or break BCA use.

Dr. Mary Hausbeck and her team at Michigan State University performed extensive research with a few biologicals. They tested the ability of each product to control several species of *Pythium* on snapdragon and geranium. The best BCA for one species of *Pythium* on geranium was not the same as the best for another species of *Pythium* on the same crop or even the same *Pythium* species on snapdragon.

Dr. Wade Elmer has performed extensive research on *Fusarium* wilt on cyclamen. He showed that even the best conventional products should be applied preventatively for this disease. He also demonstrated that biologicals could work best when an effective conventional fungicide was applied once before inoculation followed by biologicals.

Efficacy of BCAs is dependent on water level, salinity, potting medium characteristics and, of course, conventional fungicides or bactericides. They're after all alive and they must be factored into the growing methods as much as the plant being produced. Using BCAs means understanding the needs of three living organisms: the plant, the BCA and trying to produce a crop (one of the living organisms). If the BCA requires that you actually change conditions and end up promoting the disease it won't work. Fortunately, most of the living BCAs have been formulated to work well in our growing systems without unduly favoring the plant pathogens that cause diseases.

## How do BCAs work?

The ways that RootShield PLUS+ works are detailed above. I present here some information on how the other BCAs do their jobs.

Actinovate actively colonizes roots and plant tissues. The BCA also feeds on dead plant matter and can grow along with roots and plant cells. Actinovate produces iron-scavenging siderophores and chemicals attack chitin in some fungal cell walls.

BotryStop occupies the same space and outcompetes pathogens like *Botrytis* for the nutrients available in dead and dying plant tissue.

LALSTOP K61 and LALSTOP G46 each have at least three ways they help control disease. The BCA inhibits and disrupts plant pathogens by producing chemicals that are antagonistic to them. It also vigorously grows around plant roots to deprive pathogenic fungi of space and nutrients (competition). Finally, it directly attacks, parasitizes and consumes plant pathogens.

Obtego colonizes the root system. The Obtego fungi promote competition and parasitism of plant-damaging pathogens in the soil. In return, Obtego stimulates the development of a robust root system.

There are many other BCAs not covered in this article. Those in the ever-expanding *Bacillus* group will be the focus of another article in a few months.

## Some tips on using BCAs in a conventional program

- Make sure you know what the disease is before choosing a BCA (or conventional product).
- Check the label of the BCA and make sure it includes that disease.
- Apply the BCA before disease appears.

- Do NOT use the BCA at lower-than-labeled rates.
- Follow the directions on the BCA label. It may say to apply a conventional product first.
- Reapply the product at the labeled interval. For example, RootShield PLUS+ is applied on an eight-week interval. In contrast, Obtego should be applied on a two-week interval.
- Do not mix BCAs and conventional without checking the safety with the BCA manufacturer or other authority.

## Conclusions

Effective use of BCAs is more likely to succeed now than ever before. Improvements in consistent production of the BCA, knowledge of how they work and, finally, how to merge them into an effective production program improve every year. We're even seeing new BCAs (like BotryStop) reach the market, as well as better formulations of well-known BCAs (like LALSTOP G46 and K61), which have also made use of BCAs more reliable. Try them, but make sure you do your homework first. **GT**

Table 1. Critical Information on some Biological Control Agents (BCAs).

Trade name	Organism	REI	Range of Efficacy (based on labels)	Compatibility Information
Actinovate	<i>Streptomyces lydicus</i> WYEC 108	1 hour	Alternaria, downy mildew, Fusarium, powdery mildew, Sclerotinia and Xanthomonas	Check with Novozymes
BotryStop	<i>Ulocladium oudemansii</i> (U3 Strain)	4 hours	Botrytis, Monilinia, Sclerotinia	YES
LALSTOP K61 (Mycostop)	<i>Streptomyces</i> sp. strain K61	4 hours	Fusarium, Pythium, Rhizoctonia, Sclerotinia, Thielaviopsis	YES
LALSTOP G46 (PreStop)	<i>Clonostachys rosea</i> strain J1446	4 hours	Botrytis, Fusarium, Phytophthora (as well as many others listed)	YES
Obtego	<i>Trichoderma asperellum</i> strain ICC 012 <i>Trichoderma gamsii</i> strain ICC 080	4 hours	Armillaria, Fusarium, Phytophthora, Pythium, Rhizoctonia, Rosellinia, Sclerotinia, Sclerotium, Thielaviopsis, and Verticillium	Check with SePRO
RootShield Plus	<i>Trichoderma harzianum</i> Rifai strain T-22 <i>Trichoderma virens</i> strain G-41	4 hours	Fusarium, Phytophthora, Pythium, Rhizoctonia	YES
Zio	<i>Pseudomonas chlororaphis</i> subsp. <i>aurantiaca</i> AFS009	4 hours	Botrytis, Fusarium, Phytophthora, Pythium, Rhizoctonia, Sclerotia	Check with SePRO

---

A.R. Chase is with Chase Agricultural Consulting.