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# Biofungicides have multiple applications

By Susan G. Mason

As biological fungicides become more available, more cost-effective, easier to handle and better understood, their use is expected to increase.

In the tradition-steeped greenhouse industry, where evolution is much more common than revolution, biological fungicides have made remarkably quick inroads. Whereas 10 years ago only a handful of greenhouse growers knew about — much less used — biological fungicides, today these products are widely applied and accepted.

## Naturally occurring organisms

Biological fungicides contain naturally occurring beneficial microorganisms that combat certain plant pathogens. Depending on the biofungicide and the method of application, these products can combat soil-borne root pathogens such as *Pythium*, *Phytophthora*, *Fusarium*, *Rhizoctonia*, *Thielaviopsis* and *Verticillium*, or foliar diseases/pathogens such as powdery mildew, bacterial spot, *Botrytis*, *Sclerotinia* and *Alternaria*.

Rhizome-inhabiting biofungicides for root diseases are applied as a dry granular formulation or as a liquid drench. They have been on the U.S. market for more than 10 years. Biofungicides

that are U.S. EPA labeled for foliar diseases have been available for about eight years.

Most biofungicides are either bacteria- or fungi-based. Bacteria-based biofungicides include products that contain patented strains of bacteria such as *Bacillus subtilis* and *Streptomyces lydicus*. Common brand names of bacterially based biofungicides include Rhapsody AS (*Bacillus subtilis* QST 713), Companion (*Bacillus subtilis* GB03) and Actinovate SP (*Streptomyces lydicus* strain WYEC 108). Fungus-based biofungicides include products that contain *Trichoderma* and *Gliocladium virens*. Trade names include PlantShield HC and RootShield Granules (*Trichoderma harzianum* strain T-22).

## Control methods

The beneficial bacteria or fungi in biofungicides work by combating pathogens in multiple ways, primarily through competition, predation and the production of antibodies.

**Competition.** When used as a soil drench or when applied as a granular in the growing



Poinsettias grown at Dan Schantz Farm and Greenhouses were drenched with Companion biological fungicide. No chemical fungicides were applied.

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medium, a biofungicide introduces thousands of beneficial microbes to the root zone. These beneficial microbes compete with disease-producing pathogens by crowding them out. The beneficial microbes take up spaces in the medium and compete with pathogens for food sources. When applied as a foliar spray, a similar crowding-out effect takes place.

**Predation.** Beneficial microbes can prey on pathogens by disrupting the cell-wall formation of pathogenic microbes, causing the pathogens to desiccate and die.

**Production of antibiotics.** Many biofungicides produce antibiotics, enzymes or other toxins that can disable or kill pathogenic microbes.

### Biofungicide advantages

The advantages of biological fungicides are numerous. When correctly used as part of a disease-management program, they can cut production costs by reducing outlays on chemical fungicides.

Most biofungicides have low or zero restricted-entry intervals and are safe and nontoxic for workers. They are generally less phytotoxic than chemicals. They are not harmful to beneficial insects, and pathogens cannot develop resistance to their unique modes of action.

### An ounce of prevention

In regards to biological fungicides, the adage "an ounce of prevention is worth a pound of cure" is particularly apt. Growers and researchers stress that applying biofungicides at the earliest stages of plant development is key to their effectiveness.

Timing is critical because biofungicides are essentially preventive. They work best when they are present before a disease organism gains a foothold. For soil-borne pathogens, that typically means drenching with a liquid or incorporating a granular formulation into the growing medium either prior to planting, at seed germination or at sticking vegetative cuttings.

For foliar diseases this means both spraying early and being vigilant when environmental conditions are conducive to disease.

In cases where a pathogen is present and symptoms are visible, many growers will tank mix a biological fungicide with a chemical fungicide to give the pathogen a knock-out punch. Most biofungicides are compatible

with chemical controls and can be tank-mixed with traditional fungicides, insecticides and foliar-applied micronutrients. Read product labels before mixing and application.

According to David Warman, business manager for turf and ornamental products at AgraQuest Inc., mixing a biofungicide with a chemical fungicide can create a synergistic effect. He said mixing lower rates of Rhapsody with lower rates of a strobilurin such as Heritage, Cygnus or Compass 0, provides greater disease control than from using either product alone. Used in this way, application of a biological fungicide can allow a grower to reduce the amount of traditional chemicals.

Biofungicides can also be used in rotation with chemical fungicides. Since biological fungicides don't appear to have the potential to cause resistance, rotation with traditional chemicals can play an important role in an environmentally sound disease-resistance-management program.

### Growers see positive results

The beneficial fungicidal and growth effects of biofungicides were showcased at the Penn State Extension's Southeast Pennsylvania Poinsettia and Pansy Trials in November 2006. Dan Schantz Farm and Greenhouses in Zionsville, Pa., produced 776,000 poinsettias treated with Companion. Paul Hardiman, Schantz's head grower, said the poinsettias were drenched with Companion once every three weeks, starting immediately after callous formation. No chemical fungicide drenches were used.

Warren Jordan, owner of Jordan's Greenhouse, in Fort Collins, Colo., used Premier Horticulture's Pro-Mix with Biofungicide for some of his 2006 poinsettia crop. Jordan also grew a control crop in a standard growing mix. He said that the poinsettia cuttings grown in the Pro-Mix with Biofungicide got off to a faster start and finished better than the poinsettias grown in the regular mix.

Jordan said he liked the ease of using a medium premixed with a biofungicide (*Bacillus subtilis* MB1600), and he plans to expand use of the mix on his 2007 poinsettia crop. This past year, Jordan treated all of his poinsettias to a normal rotation of chemical fungicides, but he said he expects to reduce his chemical applications next year.

Bobby Deibel, general manager of Deibel's Greenhouses in Crestwood, Ky., started using Sun Gro's Sunshine LA4 growing mix pre-blended with RootShield Granules for his poinsettias several years ago. He said he achieved his goal of reducing the incidence of root rot, but was so impressed by the vigor of the poinsettias grown in the mix that he now uses the pre-blended mix for all of his annuals.

Like Deibel, other growers have said that the growth stimulatory effects of biofungicides are more apparent in some crops. In addition to poinsettias, pansies, lilies, dianthus, geraniums, impatiens and gerbera respond particularly well to biofungicides.

Jeff Lewis, head grower at Riverview Flower Farm Inc. in Wimauma, Fla., has been using biofungicides in the company's 60 acres of greenhouses for years and he said he is pleased with the results.

Lewis relies on either a granular biofungicide (RootShield Granules or Actino-Iron) incorporated into growing mixes before planting or as a liquid drench. He said that incorporating a biofungicide helps to develop a strong root system. He also said that early applications of biofungicides reduce labor costs. "In the long run it saves me from having to come in later on in the growth cycle with frequent applications of chemical fungicides," Lewis said.

Because of Florida's "vicious environment" and year-round growing season, Lewis applies traditional chemicals on occasion. However, by using a biofungicide spray, he has to apply chemicals less often.

"Biofungicides can be introduced into the chemical rotation without any added burden," he said. "And I'm all for products that are safer and less toxic for myself, for other workers and for the environment."

◆ **For more:** Agra Quest, Inc., 1530 Drew Ave., Davis, CA 95616; (800) 962-8980; [www.agraquest.com](http://www.agraquest.com). Growth Products Ltd., P.O. Box 1252, White Plains, NY 10602, (800) 648-7626; [www.growthproducts.com](http://www.growthproducts.com). Dan Schantz Form & Greenhouses, 8025 Spinners town Road, Zionsville, PA 18092; (800) 451-3064; [www.dan-schantz.com](http://www.dan-schantz.com). Jordan's Greenhouse, 900 N. Taft Hill Road, Fort Collins, CO 80521; (970) 482-4471. Deibel's Greenhouses, 6810 W Highway 146, Crestwood, KY 40014; (502) 241-4459. Riverview Flower Farm Inc., 5363 Bonita Drive, Wimauma, FL 33598; (813) 677-8878; [www.floridafriendlyplants.com](http://www.floridafriendlyplants.com).

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