



BioWorks®

ROOTSHIELD

PLUS⁺

MULTIPLE
MODES
OF ACTION

*ATTACKS
& EATS*
PATHOGENS

HOW YOU GROW MATTERS™



THE STRAIN GAME⁺

Control major diseases, promote a healthy root system

With biological products gaining market share and new products being introduced each year, users can sometimes get confused about the differences among products that contain the same species of microorganism. **The strain makes the difference.**

To start, not all biological strains are created equal. In fact, strains from the same species can vary greatly in their activity levels and overall effectiveness – and the differences can be significant. These strains can also differ greatly in their ability to survive and compete, and in modes of action they employ.

All these differences will affect a strain's impact on plant pathogens or insect pests – as well as their compatibility with host plants, growing systems, environment and other crop inputs.

Before new microbial products are brought to market, hundreds to thousands of candidate microorganisms are isolated and tested, including different strains from the same species. They are evaluated for certain criteria such as efficacy and safety, among others.

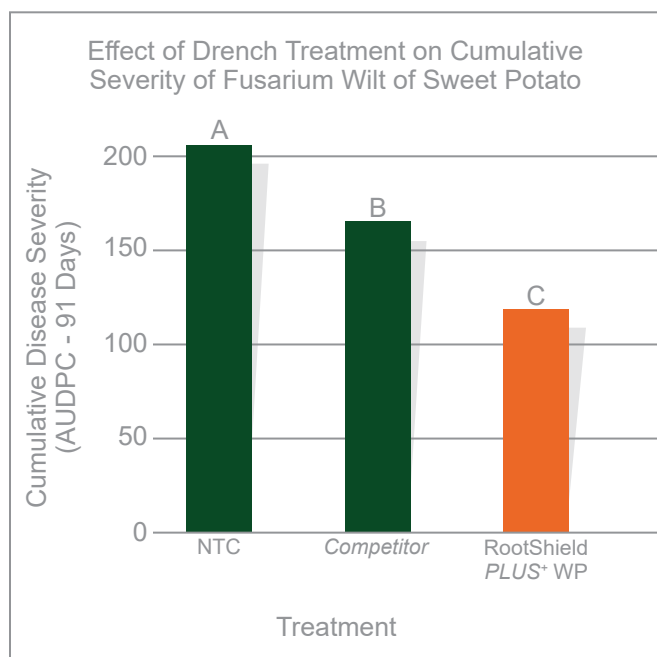
In the end, only 1 or 2 might be considered viable for registration and commercialization. It's a real "weeding out" process, you might say.

RootShield *PLUS*⁺ strains have gone through that entire process and have been selected for their ability to control a broad spectrum of soil-borne diseases under a wide range of environmental and soil conditions and cropping systems. Other products may contain *Trichoderma harzianum* or other *Trichoderma* species, but they are not the same as the strains in RootShield *PLUS*⁺.

RootShield *PLUS*⁺ has two active ingredient strains: *Trichoderma harzianum* strain T-22, and *Trichoderma virens* strain G-41. They work in concert to control major root diseases while promoting a healthier root system.

These particular strains grow on and around roots, shielding them against root-damaging fungi. They also release enzymes that dissolve the cell walls of fungal pathogens. They win on competitive exclusion (growing around the roots and outcompeting pathogens for food), mycoparasitism (seeking out and eating soil pathogens) and metabolite production (releasing metabolites that inhibit pathogen growth).

ROOTSHIELD *PLUS*⁺ TRIAL DATA SUMMARIES



CONTROL OF FUSARIUM WILT OF SWEET POTATO

Conducted by AgroSci, LLC, Palo Alto, CA - 2017

+RESULTS

- RootShield *PLUS*⁺ WP was the most effective treatment against *Fusarium oxysporum* f.sp. *batatas*

+METHODS

- RootShield *PLUS*⁺ WP (8 oz/100 gal)
- Competitor biological product (6 oz/100 gal)
- Non-treated control treatment (NTC)
- Applications of RootShield *PLUS*⁺ WP made at slip planting and at 4 and 8 weeks
- Applications of *Streptomyces* made at slip planting and at 4 and 8 weeks

EFFICACY AGAINST *PYTHIUM* ROOT ROT OF PANSIES

Conducted by AgroSci, LLC, Palo Alto, CA - 2015

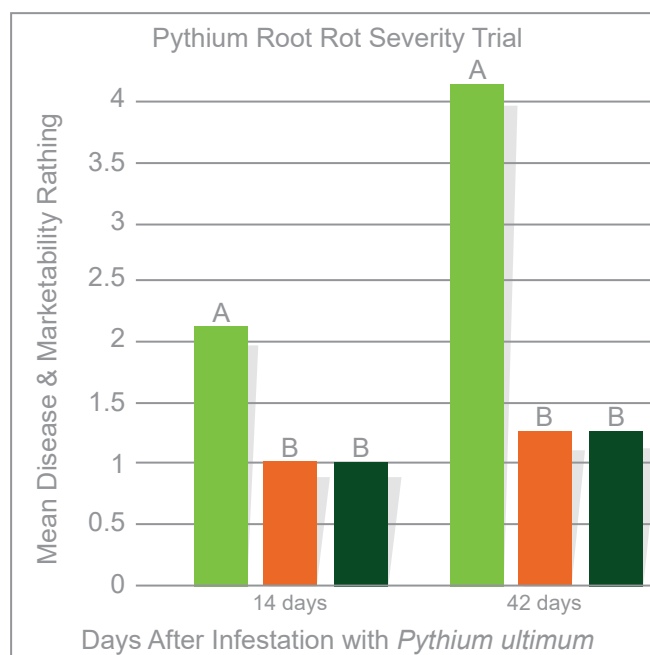
+RESULTS

- The RootShield *PLUS*⁺ treatment maintained low disease and high marketability that was statistically equal to the conventional propamocarb fungicide treatment

+METHODS

- RootShield *PLUS*⁺ G (1.5 lb/yd³)
- Propamocarb (12 fl oz/100 gal)
- Before planting, RootShield *PLUS*⁺ G was pre-incorporated
- Immediately after transplanting, designated disease control products were drenched into the pots

■ Infested Control
 ■ RootShield *PLUS*⁺ G
 ■ Propamocarb





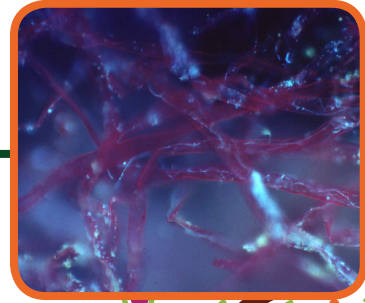
BioWorks®

ROOTSHIELD *PLUS*⁺ MODES OF ACTION

1

COMPETES WITH AND 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.



2

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.



3

HUNTS AND EATS PATHOGENIC FUNGI

RootShield *PLUS*⁺ seeks out, attacks and eats fungal pathogens.

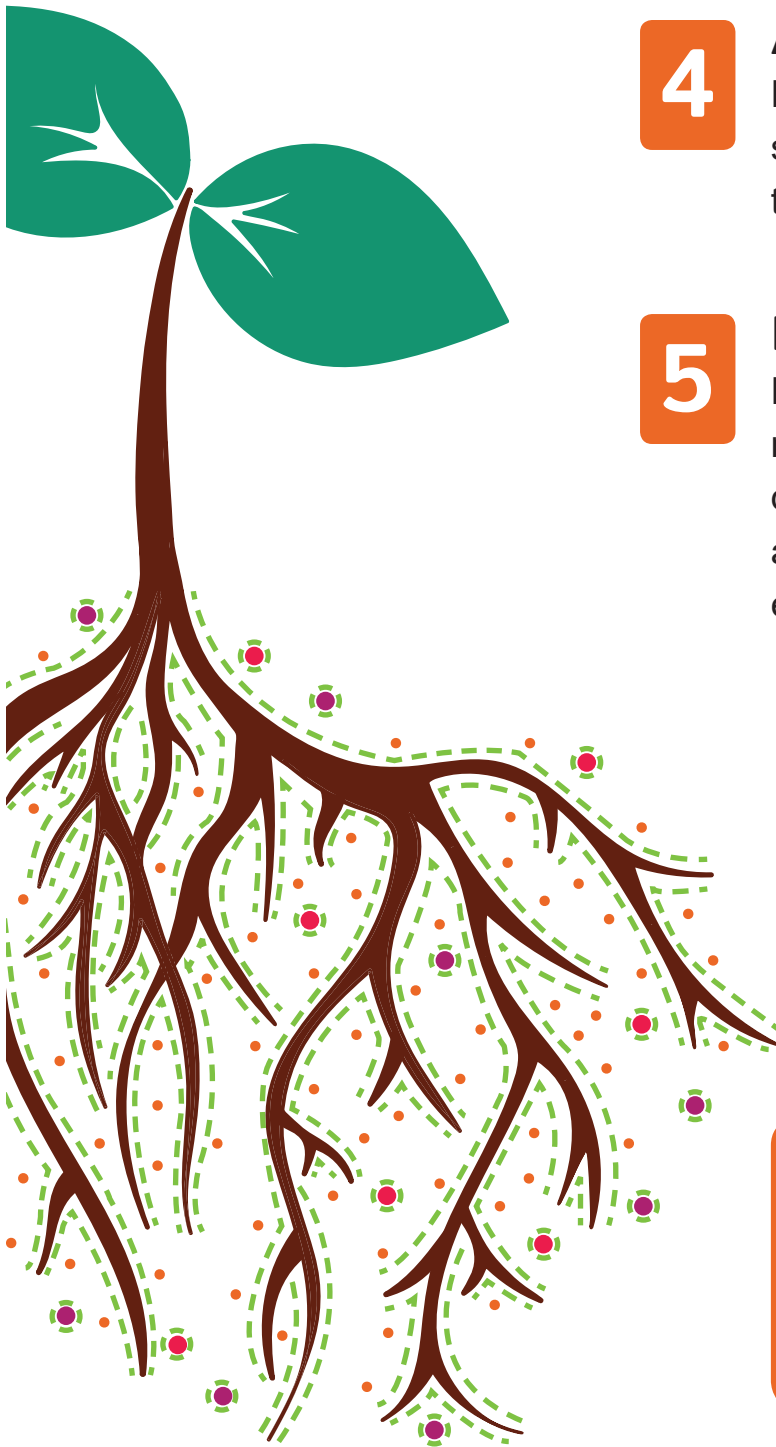
HIGHLY COMPATIBLE



Optimum activity in:

- Wide temperature ranges (48-97 °F / 9-36 °C)
- Wide pH ranges (pH 4-8)
- Hot & humid sandy soils
- Moist and sandy to wet and heavy soil conditions
- Wide range of soil types, growing media & hydroponics
- Compatible with most chemical and biological inputs





4

ANTAGONIZES PATHOGENS

RootShield *PLUS*⁺ releases anti-pathogen substances creating a zone that is inhospitable to pathogens.

5

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.

Where does it grow?

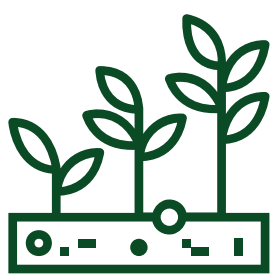
RootShield *PLUS*⁺ grows in the soil and on the roots (rhizosphere). It grows along with the roots as they expand into the soil. It can even coil around the root, securing its position.



KEY:
● Pathogens
- - RootShield *PLUS*⁺

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PROMOTES A HEALTHY ROOT SYSTEM



RootShield *PLUS*⁺:

- Increases root mass potential
- Promotes rooting and above ground plant growth
- Enhances uptake of nutrients
- Helps plants resist/overcome stresses and transplant shock
- Promotes other beneficial microorganisms in the root zone



UTILIZING **DIPS**

“Dips can significantly reduce the need for multiple applications of chemical pesticides later in the crop cycle.”

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Bringing in outside plant material also brings in unwanted pests and pathogens. Cuttings and young plant material from domestic or off-shore suppliers can contain low-level insect populations and may carry root diseases.

By using dips, many cuttings or trays can be quickly and effectively treated, resulting in the use of less overall volume of pest control product(s). For trays that appear stressed or suspect for disease, it may be desirable to apply a drench or sprench after transplanting, rather than dipping.

Effective dips can significantly reduce the need for multiple applications of chemical pesticides later in the crop cycle. The bottom line is that dipping saves money and time.

Rate for unrooted cuttings and bare-root plants	2.5 g / L 1.5 oz / 5 gal
Rate for plugs, liners or other plant material growing in a potting medium	0.6 g / L 0.4 oz / 5 gal

- Clean and disinfect the dipping tank and equipment before preparing a new dip suspension. Prepare only as much dip suspension as can be used in one day. If plant pathogens are a concern, prepare a new dip suspension regularly.
- Use cool water when making up the suspension, keep out of direct sunlight, and maintain cool water temperatures (60-70 °F / 16-21 °C) throughout the dipping.
- Do not use dip suspension for more than one day.
- Frequently agitate dip solution throughout use.
- Conduct a test by dipping a small number of plants and observe for plant damage before using dip treatment. Observe plants for 7-10 days for signs of injury. Do not use dips if there is any visible damage to test plants.
- Do not dip stressed/wilted cuttings or transplants.



ROOTSHIELD PLUS+ FEATURES, BENEFITS & RATES

RootShield PLUS+ is an EPA-registered, OMRI-listed biological fungicide that provides preventative control of major root diseases caused by: *Cylindrocladium*, *Fusarium*, *Pythium*, *Phytophthora*, *Rhizoctonia* and *Thielaviopsis*.

- *Trichoderma harzianum* strain T-22 and *Trichoderma virens* strain G-41
- Use in greenhouse, high tunnel or field on nursery crops, ornamentals, vegetables, herbs and fruits
- Excellent tool for resistance management
- Compatible with fertilizers, algaecides, insecticides, disinfectants, miticides, herbicides, growth regulators, and many fungicides
- Root assays available to test for presence and relative levels of *Trichoderma*
- Controls for up to 12 weeks
- Does not interfere with the introduction of beneficials inhabiting the soil/growing mix
- 0-hour REI, 0-day PHI
- Registered in the USA, except AK
- WP Sizes: 1 lb, 3 lb and 30 lb
G Sizes: 10 lb, 40 lb, 500 lb and 1000 lb

- WP MPS code: 3887/White
G MPS code: 3758/White
- US Patent No. 9,681,668

Application Rates

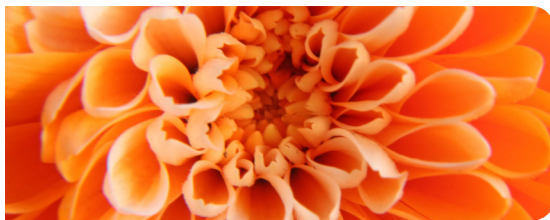
Formulation	Label Rate	Typical Rate
RootShield PLUS+ WP*	3-8 oz/100 gal	6 oz/100 gal 0.8 tsp or 0.45 g/1 gal 4 tsp or 2.25 g/5 gal

*Seeding flats up to 4" depth pots, use 50-100 gal/800 sq ft

*For pots greater than 4" or beds use 100 gal/500 sq ft

*For a 6" pot use 8 fl oz of solution

RootShield PLUS+ Granules	1-3 lb/yd ³ potting mix	1.5 lb/ yd ³ potting mix 1 oz/ ft ³ potting mix
	5-12 lb/acre in furrow	9 lb/acre



TESTIMONIALS

"On our poinsettia crop, we have seen improvements, not only with root development, but in producing a stronger, healthier plant - leading to an increase in saleable products."
- Head Grower

"There is something special about RootShield PLUS+... there are obvious indications it has long and short term value."
- Researcher

"...RootShield PLUS+ reduced or eliminated the need for chemicals."
- Head Grower

"We mix RootShield PLUS+ in everything we grow. It works hands down. I have never had any root problems."
- Owner

"We depend on RootShield PLUS+ to stop *Pythium*, damp rot and all... other bad things that can kill our seedling greenhouse tomatoes."
- Grower

"For the last 7 years I have tried to make my greenhouse as chemical free as possible. With the help of BioWorks and RootShield PLUS+ I have made it happen."
- Owner

ROOTSHIELD® PLUS⁺

Safe. Proven. Effective.



BioWorks®

Control diseases.
Promote healthy root systems.



MULTIPLE MODES OF ACTION

With two active ingredients, RootShield PLUS⁺ prevents a wide spectrum of root diseases.

For 25 years, our customers have trusted RootShield products to control diseases and promote healthy root systems – safely.

With RootShield PLUS+ you get prevention of soilborne *Phytophthora*, and improved control of hot-season *Pythium*. It also controls diseases caused by *Cylindrocladium*, *Fusarium*, *Pythium*, *Rhizoctonia* and *Thielaviopsis*.

Safer for plants, workers and the environment - RootShield PLUS+ is the right choice for organic and IPM programs.



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