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How RootShield Works (Canada)

Root protection with *Trichoderma harzianum* strain T-22

RootShield® Technical Bulletin

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RootShield® WP, with water soluble carrier, and higher concentration formulation of RootShield Drench, is easier to use. This root biofungicide product contains dormant spores of the effective, and well proven, active ingredient *Trichoderma harzianum* strain T-22. When mixed with water at the typical application rate of 30-45 g/100 L, over 100 billion spores are applied to the growing medium in one application. There are many application options that can be utilized to get RootShield WP onto your crop: using an injector with a watering wand, overhead boom irrigation, watering tunnels, Chapin® tube system, drip tape or emitter systems, ebb and flood, sprayers, etc.

Once RootShield WP (or RootShield® Granules) is applied to the growing medium, the spores germinate within 16 – 24 hours. As the mycelium emerges from the spore it immediately starts coiling around the plant's roots and any plant pathogen propagules present. After 24 hours RootShield can not be leached from the soil mix. RootShield will grow on roots in a diversity of inorganic and organic growing media from sand, perlite, or clay, to pure peat, cocoa, bark, or rock wool. RootShield grows tightly on roots in hydroponics systems, including those utilizing the nutrient film technique where there is no medium.

In the growing medium, RootShield can tolerate a wide range of pH (4 – 8) and grow at temperatures from 9^{o} to 31^{o} C. What is important to remember is that since RootShield grows on the plant's roots, it is the pH and temperature right around the root system that is most influential. RootShield is drawn to high concentrations of root exudates, seeks out and searches for plant roots, and colonizes the root hairs, branching sites, root surface and callus tissue. It will also colonize the callus which forms on cuttings in propagation. There are two primary modes of action: (1) competitive exclusion, which means RootShield gets to the pathogen-preferred sites first and prevents diseases like *Pythium*, *Fusarium*, and *Rhizoctonia* from getting into the roots, and (2) mycoparasitism whereby RootShield encounters a pathogen mycelial strand, and secretes enzymes, including chitinases and glucanases, that dissolve the invading pathogen's cell walls.

Despite RootShield's ability to eat pathogenic fungi, it is not considered an eradicant or rescue treatment. If it is applied early, before the onset of root disease infection, it will be very effective. If root disease pressure is high or disease does get into the roots, most conventional chemicals can be applied without harming RootShield. It is compatible with most horticultural inputs such as fertilizers, algaecides, insecticides, disinfectants, insecticides, miticides, preemergence herbicides, most fungicides, and growth regulators. If any of these are tank-mixed with RootShield WP, use the mixture immediately. As an interesting side note, when the cleanliness of incoming starter plant material is unknown, RootShield WP can be tank-mixed with Subdue® Maxx, resulting in a very effective "1-2 punch." A few fungicides, most notably those with the active propiconazole, can potentially slow down initial colonization so should be applied 7 – 10 days before or after a RootShield application.

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RootShield provides other benefits to plants, and while not considered by BioWorks to be its primary selling points, are interesting. For example, researchers have documented that RootShield, like some other root biofungicides, will solubilize certain inorganic nutrients like manganese, zinc and rock phosphate. Research also indicates that RootShield may provide induced systemic resistance to certain diseases. Root growth in some cases is increased. The occurrence of these reported benefits varies with crop type and growers' cultural practices.

A RootShield application is effective for approximately 10 to 12 weeks. Due to microbial competition the RootShield concentration slowly declines to levels below which root disease prevention is considered ideal. A half-rate reapplication of RootShield WP can be made (15 – 22g/100 L) to boost RootShield levels on the plant's root system and continue effective root disease prevention for an additional 10 to 12 weeks.