

# Hydroponic Information

## Product Specifications

Hydroponic production has become a popular alternative form of commercial food production. Even though the growing media is without organic matter and in an enclosed environment, many of the same diseases and pests that occur in field production can present a challenge.

### ROCKWOOL, FOAM, COCO PEAT, SOILLESS BAGS (PEAT, VERMICULITE, PERLITE), NFT (NUTRIENT FILM TECHNIQUE) AND EBB AND FLOW

#### Root Diseases

RootShield® WP (*Trichoderma harzianum* strain T-22) and RootShield PLUS<sup>+</sup> WP (*Trichoderma harzianum* strain T-22 + *Trichoderma virens* strain G-41) have been successfully used in various types of hydroponic systems, for preventative control of *Pythium*, *Fusarium*, *Rhizoctonia*, *Thielaviopsis*, and *Cylindrocladium*. In addition to disease control, RootShield/RootShield PLUS<sup>+</sup> may provide enhanced root and shoot development and aid in the uptake of nutrients by the root system. RootShield WP has a 0-hour REI, while RootShield PLUS<sup>+</sup> has a 4-hour REI. Both have a 0-day PHI and are OMRI listed.

APPLICATION SETUP NOTE 1: RootShield WP and RootShield PLUS<sup>+</sup> WP will pass through watering system filters with screen openings 155-mesh or larger opening. If a sand filter is in use, the product **must** be injected downstream of the filter to prevent the sand filter from removing the T-22 and G-41 spores.

Do not remove filters from your system. If your system is designed for, or over-engineered with, 200 mesh filter screens, it is necessary to replace them with 120 – 155 mesh filter screens. Contact your drip irrigation supplier or the manufacturer for the proper filter size.

Product	Seeding   Drench seed cubes just prior to planting	Transplanting or Setting Out Dip the tray of rooted transplants	Established Plants   Reapply at an 8-10-week Interval*
RootShield	5-6 oz/100 gal (0.5- 0.6 teaspoons/1 gal)	0.25 oz/5 gallons (0.5 teaspoon/1 gal)	5-6 oz/100 gal (0.5- 0.6 teaspoons/1 gal)
RootShield PLUS <sup>+</sup>	8 oz/ 100 gal (1 teaspoon/1 gal)	0.4 oz/5 gallons (1 teaspoon/1 gal)	8 oz/100 gal (1 teaspoon/1 gal)

\*More frequent applications can be made if disease pressure significantly increases due to environmental stress.

APPLICATION SETUP NOTE 2: RootShield/RootShield PLUS<sup>+</sup> Granules can be mixed into the top-dressing medium.

Product	Rate
RootShield Granules	1-1.5 lb/cu yd (2-3 tablespoons/cu ft)
RootShield PLUS <sup>+</sup> Granules	1.5-2.0 lb/cu yd (3-3.5 tablespoons/cu ft)

#### COMPATIBILITY:

The active ingredients in RootShield /RootShield PLUS<sup>+</sup> are compatible with many fertilizers, insecticides, algacides, disinfectants and most commonly used fungicides. See the RootShield & RootShield PLUS<sup>+</sup> Compatibility Sheets.

## FOLIAR DISEASE CONTROL

### BotryStop<sup>™</sup> | OMRI Listed

BotryStop is a biofungicide used for the preventative control of *Botrytis* diseases. The active component, *Ulocladium oudemansii* U3 strain, is a non-pathogenic saprophytic fungus that aggressively competes for the same physical space as the plant pathogens, thus preventing crop damage. BotryStop is non-invasive and causes no harm to live plant tissue. With this mechanism of action, it is highly unlikely that resistance to BotryStop will develop.

#### **BotryStop Rates:**

Foliar Spray: 2–4 lb per 50 – 100 gal water per acre. The most commonly used rate is 3 lb/acre.

- Use sufficient water volume to provide good coverage, wetting and saturation of the plant.
- Fill tank halfway, begin agitation, add desired amount of BotryStop and then add a compatible non-ionic surfactant for proper product wetting and spreading. Refer to the “BotryStop Compatibility Sheet” for product compatibility.
- Use spray mixture immediately. Do not allow spray mixture to stand overnight or for prolonged periods.
- Begin applications when conditions are conducive to disease development and repeat on 7 to 10 day intervals as needed.

#### Storage and Shelf Life:

- Product must be stored refrigerated. Do not freeze. During storage, keep the bag closed, with excess air removed and away from non-compatible products.
- Under proper storage conditions, shelf life is 12 months
- 4-hour REI, 0-day PHI

### CEASE<sup>®</sup> | OMRI Listed

CEASE (*Bacillus subtilis* QST strain 713) is a dependable preventative biological fungicide and bactericide to add to a program for enclosed space production (greenhouse). It can be applied to foliage or soil for control of a broad spectrum of diseases. CEASE is compatible in a tank mix with MilStop for foliar applications.

#### **CEASE Rates:**

- CEASE can be applied in as often as 3-day intervals. It is recommended to spray at 7-day intervals for prevention when conditions are optimum for disease. For downy mildew, CEASE should be used as part of an overall control program for prevention. Under conditions conducive to downy mildew, CEASE applications should be increased to twice a week. While the rate range for CEASE is from 2–8 qt/100 gal, the most commonly used rate is 4 qt.
- Tank mix with MilStop: CEASE/MilStop tank mixes have shown excellent control of *Botrytis*, powdery mildew and other foliar diseases. Use MilStop at 1.25 lb/100 gal plus CEASE at 2 qt/100 gal/acre (preventative), increasing the rate to 3 lb/100 gal MilStop plus 6 qt/100 gal CEASE for curative control of powdery mildew.
- 4-hour REI, 0-day PHI.

**MilStop**<sup>®</sup> | OMRI Listed

MilStop (potassium bicarbonate) is a broad-spectrum foliar fungicide that can prevent powdery mildew, *Botrytis*, and other foliar diseases. MilStop is an excellent tank mix partner with CEASE for greenhouse crops to increase disease prevention effectiveness.

**MilStop Rates:**

- Rates can be as low as 1.25 lb/100 gal for preventative applications. Apply weekly during periods of high disease potential. Use up to 3 lb/100 gal for curative applications to eradicate *Botrytis*.
- Tank mix with CEASE: CEASE/MilStop tank mixes have shown excellent control of *Botrytis* and other foliar diseases. Use MilStop at 1.25 lb/100 gal plus CEASE at 2 qt/100 gal (preventative), increasing the rate to 3 lb/100 gal MilStop plus 6 qt/100 gal/acre CEASE for curative control of powdery mildew.
- 1-hour REI, 0-day PHI (4-hour REI when mixed with CEASE).

**INSECT CONTROL****BotaniGard**<sup>®</sup> / **Mycotrol**<sup>®</sup>

BotaniGard, or for organic use, Mycotrol (WSDA Certified Organic), can be utilized in rotations or tank mixes for production. This effective biological insecticide, containing *Beauveria bassiana* strain GHA, is used to control aphids, thrips, whiteflies, and other soft-bodied insects. BotaniGard 22WP or Mycotrol WPO (WSDA Certified Organic) for organic use, are also reliable options for enclosed space production, such as greenhouses.

**BotaniGard ES/Mycotrol ESO Rates:**

- Enclosed space production (greenhouse and high tunnel) foliar spray: At first detection of target pest, apply ½ – 2 qt/100 gal of water. Spray to wet, but avoid runoff. Repeat application at 5-10-day intervals. Shorten interval to 3-5-days when populations are high, especially with aphids and whiteflies. Repeat applications for as long as pest pressure persists. It is not recommended that BotaniGard ES or Mycotrol ESO be used on greenhouse-grown tomatoes.
- 4-hour REI, 0-day PHI.

**BotaniGard 22WP/Mycotrol WPO Rates:**

- Enclosed space production (greenhouse) foliar spray: at first detection of target pest, apply ½–1 lb/100 gal of water per acre. Spray to wet, but avoid runoff. Repeat applications at 5–10-day intervals. Shorten interval to 3–5 days when populations are high, especially with aphids and whiteflies. Repeat applications for as long as pest pressure persists.
- Transplant dip: 1.5 oz suspended in 5 gal of water [or 6 oz/ 20 gal]. (NOTE: Do not use BotaniGard ES or Mycotrol ESO for dipping.) Maintain agitation of the dip suspension. Submerge for 30 seconds. Transplants or the whole plug tray can be dipped, if desired. Change out dip solution as it is used up or becomes difficult to use because of fouling with organic matter. Can be tank mixed with ON-Gard<sup>®</sup> and RootShield *PLUS*<sup>+</sup> WP.
- 4-hour REI, 0-day PHI.

**Tank mix or rotation with Molt-X:**

- Both BotaniGard/Mycotrol formulations can be tank mixed with Molt-X as an effective combination on the labeled pests. Use the recommended rates of BotaniGard/Mycotrol indicated above and add Molt-X at 4 fl oz/100 gal. When tank mixing, include Molt-X in every other application.
- In rotation, use the 8–10 fl oz rate of Molt-X, 5–7-days after a BotaniGard/Mycotrol application.

**BotaniGard<sup>®</sup> MAXX**

BotaniGard MAXX is a unique combination product containing natural pyrethrins and *Beauveria bassiana* strain GHA. This combination represents the latest generation of biorationals for insect control. The dual active ingredient formulation offers both synergy and multiple modes of action that work to kill damaging insect and mite pests. BotaniGard MAXX is an excellent rotation partner with BotaniGard. When insect pressure is high, use BotaniGard MAXX for quick knockdown, then follow up with typical BotaniGard use.

**BotaniGard MAXX Rates:**

- Enclosed space production:
  - Whiteflies, Aphids, Thrips, and other labeled pests: ½-1 qt of BotaniGard MAXX/100 gal spray volume depending on insect population and foliage density.
  - **DO NOT WET PLANTS TO POINT OF RUNOFF OR DRIP.**
- Apply BotaniGard MAXX at 5–10-day intervals. High insect populations, especially aphids and whiteflies, may require application at 2–5-day intervals.
- 12-hour REI, 0-day PHI.

**Molt-X<sup>®</sup> | OMRI Listed**

As an insect growth regulator, Molt-X (azadirachtin) slows or disrupts the development process which can increase insect susceptibility to either a tank mix partner or the next rotated insecticide(s).

**Molt-X Rates:**

- 8–10 fl oz/100 gal/acre. Maintain tank solution pH between 5.5–6.5. Repeat application for as long as pest pressure persists.
- When tank-mixing Molt-X reduce rate to 4 – 5 fl oz/100 gal.
- 4-hour REI, 0-day PHI.

**SuffOil-X<sup>®</sup> | OMRI Listed (SUFFOIL-X IS NOT LABELED FOR USE ON HERBS)**

SuffOil-X (mineral oil) provides a different mode of action to provide knock down activity to control aphids, spider mites, whiteflies, thrips and other pests. This light summer oil will suffocate the insects resulting in a rapid response. SuffOil-X makes an excellent rotational partner with BotaniGard and Molt-X.

**SuffOil-X Rates:**

- Apply as a foliar spray at 1–2 gal/100 gal (1–2%). If reducing water volume per acre, keep concentration at 1–2%. Repeat as often as needed, but keep interval one week apart. No limit to the number of applications. Repeat application for as long as pest pressure persists
- 4-hour REI, 0-day PHI.

## PLANT NUTRITION

### ON-Gard® 5-0-0 | OMRI Listed

ON-Gard is an innovative complement to your current fertilizer program. It is 100% plant-derived, 100% water soluble, and consistent in composition. ON-Gard also provides a broad array of plant-based amino acids for increased plant health.

#### **ON-Gard Rates:**

- Transplant dip: ON-Gard can be used alone or combined with RootShield *PLUS*<sup>+</sup>. Use 0.25% v/v (1.6 fl oz/5 gal) as a dip solution.
- Foliar spray or through drip irrigation: Use ON-Gard at 0.25–0.5% v/v (1–2 qt/100 gal) as a foliar spray during production or mixed with fertilizers run through a drip system.
- ON-Gard is tank mixable with most crop inputs. Test (jar test) to ensure physical compatibility.

Refer to product labels for complete application details. Additional technical information is available on our website ([www.bioworksinc.com](http://www.bioworksinc.com)) or from your BioWorks technical sales representative. Always read and follow label instructions.