

# **FOR USE ON GRAPES FOR CONTROL OF VINE PRUNING DISEASES (ESCA) IN THE STATE OF OREGON AND WASHINGTON**

## General Information

### PRODUCT INFORMATION

Bio-Tam 2.0 is a biofungicide containing naturally occurring and selected strains of antagonistic fungi, *Trichoderma asperellum* strain ICC 012 and *Trichoderma gamsii* strain ICC 080.

Bio-Tam 2.0 is particularly useful for the prevention of attacks to the root system and collar region of susceptible crops by the following phytopathogenic fungi: *Armillaria* spp., *Fusarium* spp., *Phytophthora* spp., *Pythium* spp., *Rhizoctonia* spp., *Rosellinia* spp., *Sclerotinia* spp., *Sclerotium rolfsii*, *Thielaviopsis basicola*, and *Verticillium* spp. After application, *Trichoderma* colonize the soil and roots of the host plant and compete with plant-pathogenic fungi for space and nutrients. Moreover, the antagonists also attack the cell walls of pathogens with enzymes. Therefore, it is essential to apply Bio-Tam 2.0 before colonization of fungal pathogens occurs.

Bio-Tam 2.0 should be applied up to 7 days before planting to initiate soil colonization before the crop is planted and reapplied at planting.

For maximum effectiveness, apply to 2 or more applications of Bio-Tam 2.0.

Bio-Tam 2.0 may be applied throughout the crop production cycle in order to maintain a high colonization of the root zone.

Bio-Tam 2.0 may be applied through fertigation systems in combination with the most common fertilizers.

Bio-Tam 2.0 may be used on the crops indicated on this label.

To prepare a suspension, combine 1 pound of Bio-Tam 2.0 for every 1.25 gallons of water, and mix from time to time in order to promote the germination of conidia and obtain faster soil colonization. Subsequently, dilute the suspension in the amount of water that is stated in the Labeled Crops and Use Rates table.

Bio-Tam 2.0 is a useful tool in managing chemical fungicide resistance.

### PRECAUTIONS AND RESTRICTIONS

- Do not apply by aircraft.
- Apply Bio-Tam 2.0 when the soil temperature is at least 50°F (10°C).
- Apply Bio-Tam 2.0 to moist soil or growth media, but not to saturated or

waterlogged soil. Soil or growth media must remain moist after application of Bio-Tam 2.0 to provide adequate control of soilborne fungal diseases listed on this label.

- Bio-Tam 2.0 may be applied to sterilized or fumigated soil, but must be applied after the sterilizing agent or fumigant has dissipated.
- Bio-Tam 2.0 has no curative effect and therefore is not effective against plants infected with disease at the time of application.
- In case of applications on or to dry soils, pre-irrigate until soil is moist. Then irrigate again immediately after application.
- Bio-Tam 2.0 product life is approximately 15 months when stored as directed under the Storage and Disposal section of this label.
- Bio-Tam 2.0 is not compatible with the following fungicides: imazalil, dichloran, mancozeb, propiconazole, tebuconazole, thiram, and triflumizole. Do not tank mix with, or apply Bio-Tam 2.0 within 3 days before or after use of these products.

#### SOILBORNE/SEEDLING DISEASE CONTROL

Bio-Tam 2.0 can provide control of many soilborne diseases if applied early in the growing season or growing cycle prior to infection by disease. Specific application methods covered in this label for soilborne diseases include cutting and bare root, broadcast, in-furrow, banded, greenhouse and nursery drench, and applications made via chemigation systems applied over the row or directed towards the desirable plants crown and rooting area, either before planting, at planting, or shortly after planting and promptly watered in. Use of different application types depends on the cultural practices in the region or the specific target disease to be controlled. In some locations, one type of application may provide better disease control than the other, depending on the timing of the disease cycle. For example, seedling diseases are generally controlled by in-furrow applications, while banded applications are generally more effective against soilborne diseases that develop later in the season. Consult your local expert to get some guidance regarding application type.

## DILUTION INFORMATION

Bio-Tam 2.0 may be prepared in advance to initiate conidial germination 24-36 hours prior to treatment. To prepare a suspension, combine 1 pound of Bio-Tam 2.0 for every 1.25 gallons of water, and mix from time to time in order to promote the germination of conidia and obtain faster soil colonization. Subsequently, dilute the suspension in the amount of water that is stated in the Labeled Crops and Use Rates table.

## SPRAYER TANK CLEANOUT

### DO NOT USE CHLORINE BLEACH WITH AMMONIA

To avoid injury to desirable crops, clean all mixing and spray equipment before and immediately following applications of Bio-Tam 2.0 as follows:

1. Drain remaining spray solution from spray tank. Thoroughly rinse spray tank, boom, and hoses with clean water. Remove the nozzles, screens and any components contacting the spray solution and clean separately in a bucket containing ammonia and water. Loosen and physically remove any visible deposits.
2. Fill the tank with clean water and 1 gallon of household ammonia (minimum 3% ammonia) for every 100 gallons of water. Flush the hoses, boom, and nozzles with the cleaning solution.\*
3. Refill the spray tank back to full. Circulate the cleaning solution through the tank and hoses for at least 15 minutes. Again flush the hoses, boom, and nozzles with the cleaning solution and then drain the tank.
4. Remove the nozzles, screens and components as before and clean separately in a bucket containing ammonia and water.
5. Repeat step 2.
6. Rinse the tank, boom, and hoses with clean water.
7. The rinsate may be disposed of on-site or at an approved disposal facility.

\* If using an ammonia product that is not 3% ammonia, an equivalent amount of an alternate strength ammonia solution can be used in the clean out procedure. Carefully read and follow the individual cleaner instructions.

## INSTRUCTIONS FOR APPLICATION METHODS COVERED UNDER THIS LABEL

### CUTTINGS, BARE ROOT, CROWN DIP AND PREPLANT DUST APPLICATIONS

- Dip cuttings, bare root transplants, crowns, or bulbs in undiluted Bio-Tam 2.0 powder or in a suspension that contains 0.25 - 2.0 lbs of Bio-Tam 2.0/gallon of water.

- After dipping the cutting, bare root transplant, bulb or crown, follow standard

practices for planting.

### BROADCAST APPLICATIONS

- For broadcast applications, apply Bio-Tam 2.0 as a spray at a minimum volume of 10 gallons of water per acre prior to or at planting. Thorough and uniform coverage of the soil surface is necessary. Immediate incorporation of the Bio-Tam 2.0 is necessary either by watering in using sufficient water to wet the upper 1" of soil or using light cultivation to incorporate the treatment into the seeding or rooting zone.
- Use higher application rates when the weather conditions are expected to be conducive for disease development, if the field has a history of disease development, if disease pressure is high, or if minimum/low till programs are in place.

### IN-FURROW SPRAY APPLICATIONS

- For in-furrow applications, apply Bio-Tam 2.0 as an in-furrow spray in 3-15 gallons of water per acre at planting.
- Mount the spray nozzle so the spray is directed into the furrow just before the seeds are covered.
- Use higher application rates when the weather conditions are expected to be conducive for disease development, if the field has a history of disease development, if disease pressure is high, or if minimum/low till programs are in place.
- The Bio-Tam 2.0 Rates for In-furrow Spray Applications provides common row spacing and the amount of Bio-Tam 2.0 to apply when banding a 4" infurrow spray into the seeding trench.

### GROUND BANDED APPLICATIONS

- Soilborne diseases that develop later in the season are generally controlled by banded applications that are watered in by irrigation.
- In banded applications, applied band width depends on crop and plant root diameter.
- For banded applications, apply Bio-Tam 2.0 prior to infection as a directed spray to the soil, using single or multiple nozzles adjusted to provide thorough coverage of the soil surface in close proximity to the plant and lower stems. For surface banded applications, immediate watering in with 0.25" to 0.5" of water is required for optimum performance. Soil applications can be applied during cultivation or hilling operations to provide soil incorporation, followed by watering in with 0.25" to 0.5" of water.

- Use higher application rates when the weather conditions are expected to be conducive for disease development, if the field has a history of disease development, if disease pressure is high, or if minimum/low till programs are in place.
- Application rates in the Labeled Crops and Use Rates table are generally expressed as an amount per acre, which refers to the total crop acreage to be treated. If a 7 inch band is used, consult the table below for the ounces of product needed per acre of field. If a band width other than 7 inches is desired, consult the formula provided below to determine the appropriate amount of product needed.

#### HANDHELD OR BACKPACK DRENCH APPLICATIONS

- Bio-Tam 2.0 may be applied by handheld or backpack sprayer as a drench application.
- Suspend Bio-Tam 2.0 at a rate of 0.025 – 0.075 oz/gallon of water with thorough agitation.
- If using this method, thorough wetting of the first inch of soil with the Bio-Tam 2.0 suspension is required.
- It is required that sprayer clean out directions (listed in the Sprayer Tank Cleanout section) are followed before mixing Bio-Tam 2.0 in sprayers previously used for other pesticides.

#### GREENHOUSE AND NURSERY DRENCH APPLICATIONS

- Suspend 2.5 – 7.5 oz Bio-Tam 2.0 in 100 gallons water with thorough agitation and apply suspension as a drench to greenhouse plantings or container crops.
- For flats or beds with a maximum depth that does not exceed 4 inches, apply 50 to 100 gallons prepared Bio-Tam 2.0 suspension per 800 ft<sup>2</sup>.
- Apply 4 to 8 fluid ounces ( $\frac{1}{2}$  to 1 cup) of prepared Bio-Tam 2.0 suspension per pot or container, or 100 gallons per 400 ft<sup>2</sup> prepared Bio-Tam 2.0 suspension when the flat, bed, or container exceeds a depth of 4 inches.
- Constant agitation during application will ensure Bio-Tam 2.0 remains in suspension.

#### CHEMIGATION APPLICATIONS

- Apply Bio-Tam 2.0 through listed irrigation/chemigation systems up to 1 week prior to planting and immediately after planting or transplanting. Apply 2.5 to 5.0 lbs product per acre.
- Bio-Tam 2.0 applications may be repeated every 14 to 21 days as needed depending upon disease pressure.

- Bio-Tam 2.0 should be applied to moderately moist soils using irrigation volumes (typically 0.25 to 0.50 inches water) that do not cause runoff from the treated area. Agitation during the application process should be continuous and application volume constant in order to apply the specified application rate evenly to the treated area.
- Bio-Tam 2.0 may be premixed in a supply tank with water when fertilizer or other allowed tank mixed agricultural chemicals are needed. Constant agitation is necessary.
- Mix Bio-Tam 2.0 into at least 50 gallons or more of water while maintaining continuous agitation and inject through a 50 mesh screen into the irrigation line. Alternatively, a suspension may be formed using a smaller volume of water. This may be performed by combining 1 pound of Bio-Tam 2.0 for every 1.25 gallons of water and mixing thoroughly. Next, pour the suspension through a 50 mesh screen into the final volume of water for injection into the chemigation system.
- Apply Bio-Tam 2.0 immediately and do not allow the product to remain for prolonged periods (i.e. overnight) in the chemigation system as settling of the suspension may occur.
- Injection of the Bio-Tam 2.0 suspension should be performed only after the system has become fully pressurized with water (normally 30 to 60 minutes after start up) to allow uniform distribution of the product over the target area.
- After application, flush the system with clean water for another 15 to 20 minutes to clear the irrigation lines and prevent fouling.
- Refer to Requirements for Chemigation for additional use instructions and requirements.

#### Limitations, Restrictions, and Exceptions

#### DIRECTIONS FOR USE

It is a violation of Federal law to use this product inconsistent with its labeling. Do not apply this product in any way that will contact workers or other persons; either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe; consult the agency responsible for pesticide regulation. Always read this FIFRA 2(ee) bulletin and the entire label on the product container before using this product.

## Product Information

Bio-Tam 2.0 is recommended for control of Grape Vine Pruning Diseases in grapes in the State of Oregon and Washington.

## USE RATE AND APPLICATION INSTRUCTIONS

Apply as a directed spray within 24 hours of pruning. Make a suspension containing 2 lb Bio-Tam 2.0 / 100 gallons of water. Apply at 1 lb per acre in 25 to 50 gallons of water ensuring adequate coverage. Apply Bio-Tam 2.0 by broadcast application.

### \*Additional detailed use directions

Apply Bio-Tam 2.0 at 1 pound per acre using a final spray volume of 25 to 50 gallons water per acre to protect against grapevine pruning diseases caused by Esca.

Apply Bio-Tam 2.0 within 24 hours of pruning. Regardless of spray volume, it is recommended that a spray dye be used during the application followed by visual inspection to verify thorough coverage of the pruning cuts and susceptible tissue. A second application of Bio-Tam 2.0 is recommended approximately 14 days later when pruning high risk vineyards (vineyards with a history of grapevine pruning disease, new vines replanted over a highly infested area, or where high disease pressure from surrounding area is present) or if rainfall or high humidity persist resulting in environmental conditions favorable for disease development.

If double pruning of the vineyard is being performed, treatment does not need to be performed after the first, non-selective pruning pass if environmental conditions do not favor infection and disease development into tissue beyond where the final pruning cuts will occur. Under this scenario, apply Bio-Tam 2.0 within 24 hours of making the second pruning cuts. The second application of Bio-Tam 2.0 should be applied 14 days after the first application when rainfall and high humidity favor infection and disease development. If the risk of infection and rapid disease development is high, resulting in development of disease into tissue past where the second pruning cuts will be made, Bio-Tam 2.0 should be applied after the first non-selective pruning cuts followed by a second application after the second and final pruning cuts are made. Again, the use of a spray dye is recommended to ensure thorough coverage of all cut surfaces.

## PRECAUTIONS

- Do not apply by aircraft.

- Apply Bio-Tam 2.0 when the soil temperature is at least 50°F (10°C).
- Apply Bio-Tam 2.0 to moist soil or growth media, but not to saturated or waterlogged soil. Soil or growth media must remain moist after application of Bio-Tam 2.0 to provide adequate control of soilborne fungal diseases listed on this label.
- Bio-Tam 2.0 may be applied to sterilized or fumigated soil, but must be applied after the sterilizing agent or fumigant has dissipated.
- Bio-Tam 2.0 has no curative effect and therefore is not effective against plants infected with disease at the time of application.
- In case of applications on or to dry soils, pre-irrigate until soil is moist. Then irrigate again immediately after application.
- Bio-Tam 2.0 product life is approximately 15 months when stored as directed under the Storage and Disposal section of the product label.
- Bio-Tam 2.0 is not compatible with the following fungicides: imazalil, dichloran, mancozeb, propiconazole, tebuconazole, thiram, and triflumizole. Do not tank mix with, or apply Bio-Tam 2.0 within 3 days before or after use of these products.
- Prepare a suspension, combine 1 pound of Bio-Tam 2.0 for every 1.25 gallons of water, and mix from time to time in order to promote the germination of conidia and obtain faster soil colonization.

#### BROADCAST APPLICATIONS

- For broadcast applications, apply Bio-Tam 2.0 as a spray at a minimum volume of 10 gallons of water per acre prior to or at planting. Thorough and uniform coverage of the soil surface is necessary. Immediate incorporation of the Bio-Tam 2.0 is necessary either by watering in using sufficient water to wet the upper 1" of soil or using light cultivation to incorporate the treatment into the seeding or rooting zone.
- Use higher application rates when the weather conditions are expected to be conducive for disease development, if the field has a history of disease development, if disease pressure is high, or if minimum/low till programs are in place.

#### Method

[Directed Spray](#)

[Broadcast Spray](#)

#### Rates

[field rates 0](#)

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Restricted Entry Interval



4 hours

Timings

When the soil temperature is at least 50°F (10°C).