

# **PREPLANT SOIL FUMIGANT USES - FOR UNTARPED SHANK AND BROADCAST APPLICATION**

## General Information

## Product Information

TRI-PIC 100 FUMIGANT is a pre-plant fumigant for the control of soil-borne pests, such as wireworms and nematodes, and diseases caused by certain species of Phythium, Phytophthora, Fusarium, and Verticillium.

## Use Precautions

- This fumigant is a highly hazardous material and must be handled with care only by certified applicators or persons under their direct supervision who are trained with its proper use.
- Comply with all local regulations and ordinances. Obtain an application permit from Agricultural Regulatory Agencies as required.
- Obtain medical assistance at once in case of illness after exposure, and do not allow conditions which could accidentally cause further exposure until recovery is complete.
- Never fumigate alone. It is imperative to always have an assistant and proper protection equipment, to aid in case of an accident.
- Drivers of application equipment must advise other workers of all precautions and procedures. In addition, drivers must instruct their helpers in the mechanical operation of the tractor and how to work with the tractor driver while fumigating.
- Handle this fumigant in the open, when possible, with the operator "upwind" from the container where there is good ventilation.
- Keep pets, livestock, and other domestic animals out of the treated area during application and during tarp perforation and/or removal if a tarp is used.
- Fumigation may temporarily raise the level of ammonia nitrogen and soluble salts in the soil. This is most likely to occur when heavy rates of fertilizer and fumigant

are applied to soils that are either cold, wet, acid, or high in organic matter. To avoid injury to plant roots, fertilize as indicated by soil tests made after fumigation. To avoid ammonia injury and/or nitrate starvation to crops, avoid using fertilizers containing ammonia salts and use only fertilizers containing nitrates until after the crop is well established and the soil temperature is about 65°F. Liming highly acid soils before fumigation stimulates nitrification and reduces the possibility of ammonia toxicity.

#### Application Restrictions

- The use of this product is restricted to the methods described in the label.
- Apply TRI-PIC 100 FUMIGANT only through drip (trickle) irrigation systems. Do not apply this product through any other type of irrigation system.
- Do not connect an irrigation system (including greenhouse systems) used for pesticide applications to a public water system unless the pesticide label-prescribed safety devices for public water systems are in place.

#### Bedded and Broadcast Shank Applications: Additional GAPS

In addition to the GAPS required for all TRI-PIC 100 FUMIGANT soil fumigation applications, the following GAPS apply for injection applications:

#### Tarps (when tarps are used in TRI-PIC 100 FUMIGANT applications)

- Tarps must be installed immediately after the fumigant is applied to the soil.

#### Soil Preparation

- Trash pulled by the shanks to the ends of the field must be covered with tarp, or soil, depending on the application method before making the turn for the next pass.

#### Soil Temperature

- The maximum soil temperature at the depth of injection must not exceed 90° F at the beginning of the application.
- If air temperatures have been above 100° F in any of the three days prior to the start of the application, then soil temperature must be measured and recorded in the FMP. Record temperature measurements at the application depth or 12 inches,

whichever is shallower.

## Application Methods and Equipment

- Apply TRI-PIC 100 FUMIGANT with chisel equipment or a Noble plow.
- For shallow (injection depth minimum 8-10 inches) broadcast work, use a shank spacing of 9-12 inches.
- For deep applications (injection depth minimum 18 inches), a shank spacing up to 24 inches may be used; however, it is recommended that the shank spacing not exceed 18 inches.
- When applying TRI-PIC 100 FUMIGANT with a Noble plow, use an outlet spacing of 9-12 inches along the sweeps.

## Application Depth

- For Tarped-Broadcast and Tarped-Bedded Applications: The injection point must be a minimum of 8 inches from the nearest final soil/air interface.
- For Untarped-Bedded Applications: The injection point must be a minimum of 12 inches from the nearest final soil/air interface.
- For Untarped-Broadcast Applications: The injection point must be a minimum of 10 inches from the nearest final soil/air interface.
- For Untarped-Broadcast Deep Applications: The injection point must be a minimum of 18 inches from the nearest final soil/air interface.

## Soil Sealing

- For Broadcast Untarped Applications: Use a disc or similar equipment to uniformly mix the soil to at least a depth of 3 to 4 inches to eliminate the chisel or plow traces. Following elimination of the chisel trace, the soil surface must be compacted with a cultipacker, ring roller, and roller in combination with tillage equipment.
- For Bedded Applications: Preformed beds must be sealed by disruption of the chisel trace using press sealers, bed shapers, cultipackers, or by re-shaping (e.g., relisting, lifting, replacing) the beds immediately following injection. Beds formed at the time of application must be sealed by disrupting the chisel trace using press

sealers, or bed shapers.

- For Tarped Applications: The use of a tarp does not eliminate the need to minimize chisel traces prior to application of the tarp, such as by using a Noble plow or other injection shank that disrupts the chisel traces.

### Soil Moisture

- The soil must be moist 9 inches below the surface. The amount of moisture needed in this zone will vary according to soil type. Surface soil generally dries rapidly and must not be considered in this determination.

- Soil moisture must be determined using one of the following methods:

- the USDA Feel and Appearance Method for testing (see below), or

- an instrument, such as a tensiometer.

- Available water capacity must be equal to or greater than 50% for shank applications. If there is less than 50% available water capacity 9 inches below the surface, the soil moisture must be adjusted. If irrigation is not available and there is adequate soil moisture below 9 inches, soil moisture can be adjusted by discing or plowing before the start of the application. To conserve existing soil moisture, pretreatment irrigation or pretreatment tillage should be done as close to the start of the application as possible.

- Measure soil moisture at a depth of 9 inches at either end of the field, no more than 48 hours prior to the start of the application.

The USDA Feel and Appearance Method for estimating soil moisture as appropriate for the soil texture:

- For coarse textured soils (fine sand and loamy fine sand), the soil is moist enough (50 to 75% available water capacity) to form a weak ball with loose and clustered sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.

- For moderately coarse textured soils (sandy loam and fine sandy loam), the soil is moist enough (50 to 75% available water capacity) to form a ball with defined finger marks, very light soil/water staining on fingers, darkened color will not stick.
- For medium textured soils (sandy clay loam, loam, and silt loam), the soil is moist enough (50 to 75% available water capacity) to form a ball, very light staining on fingers, darkened color, pliable, and forms a weak ribbon between the thumb and forefinger.
- For fine textured soils (clay, clay loam, and silty clay loam), the soil is moist enough (50 to 75% available water capacity) to form a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
- For fields with more than one soil texture, soil moisture content in the lightest textured (most sandy) areas must comply with this soil moisture requirement. Whenever possible, the field should be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed. Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If there is uncertainty in determining the soil moisture content of the area to be treated, a local extension service agent, soil conservationist, or pest control advisor (agriculture consultant) should be consulted for assistance.

#### Prevention of End Row Spillage

- Do not apply or allow fumigant to spill onto the soil surface. For each injection line either have a check valve located as close as possible to the final injection point, or drain/purge the line of any remaining fumigant prior to lifting injection shanks from the ground.
- Do not lift injection shanks from the soil until the shut-off valve has been closed and the fumigant has been depressurized (passively drained) or purged (actively forced out via air compressor) from the system.

## Calibration, Set-up, Repair, and Maintenance for Application Rigs

- Brass, carbon steel, or stainless steel fittings must be used throughout. Polyethylene tubing, polypropylene tubing, Teflon tubing or Teflon-lined steel braided tubing must be used for all low pressure lines, drain lines, and compressed gas or air pressure lines. All other tubing must be Teflon-lined steel braided.
- Galvanized, PVC, nylon, or aluminum pipe fittings must not be used.
- All rigs must include a filter to remove any particulates from the fumigant and for pressurized systems a check valve to prevent backflow of the fumigant into the pressurizing cylinder or the compressed air system.
- Rigs must include a flow meter or a constant pressure system with orifice plates to ensure the proper amount of fumigant is applied.
- To prevent the backflow of fumigant into the compressed gas cylinder (e.g., nitrogen, other inert gas, compressed air), if used, applicators must:
  - Ensure that positive pressure is maintained in the compressed gas cylinder at not less than 200 psi during the entire time it is connected to the application rig, if a compressed gas cylinder is used. (This is not required for a compressed air system that is part of the application rig because if the compressor system fails the application rig will not be operable.)
  - Ensure that application rigs are equipped with properly functioning check valves between the compressed gas cylinder or compressed air system and the fumigant cylinder. The check valve is best placed on the outlet side of the pressure regulator, and is oriented to only allow compressed gas to flow out of the cylinder or compressed air out of the compressed air system.
  - A pressure relief valve must be installed between the regulator and the check valve to ensure a regulator failure does not over pressurize the fumigant cylinder.
  - Always pressurize the system with compressed gas or by use of a compressed air system before opening the fumigant cylinder valve.

- Before using a fumigation rig for the first time or when preparing it for use after storage, the operator must check the following items carefully:
- Check the filter, and clean or replace the filter element as required.
- Check all tubes and chisels to make sure they are free of debris and obstructions.
- Check and clean the orifice plates and screen checks, if installed.
- Pressurize the system with compressed gas or compressed air, and check all fittings, valves, and connections for leaks using soap solution.
- Install the fumigant cylinder, and connect and secure all tubing. Slowly open the compressed gas or compressed air valve, and increase the pressure to the desired level. Slowly open the fumigant cylinder valve, always watching for leaks.
- In case of the rupture of a hose or fitting while applying the fumigant, immediately stop the tractor or motor. Get off the tractor and get to a place where the problem can be observed without exposure to the fumes. Approach from upwind, with respiratory protection if required and make the necessary repairs.
- When changing cylinders, be certain they are turned off and the fumigant system is not under pressure.
- When the application is complete, close the fumigant cylinder valve and blow residual fumigant out of the fumigant lines into the soil using compressed gas or compressed air. If the rig uses a centrifugal pump instead of compressed gas to inject fumigant into the soil, you may clear residual fumigant from the fumigant lines using an application wand connected to the system's low point via a drain hose. Place the wand in the soil until all residual fumigant has drained from the system. The wand and drain hose must be free of dirt to allow proper drainage. At the end of the application season, disconnect all fumigant cylinders from the application rig. At the end of the season, seal all tubing openings with tape to prevent the entry of insects and dirt.

Application equipment must be calibrated and all control systems must be working properly. Proper calibration is essential for application equipment to deliver the correct amount of fumigant uniformly to the soil. Refer to the manufacturer's instructions on how to calibrate your equipment, usually the equipment

manufacturer, fumigant dealer, or Cooperative Extension Service can provide assistance.

### Planting Interval

After application, leave the soil undisturbed for 10 to 14 days. Wet soil retards diffusion of the fumigant, thus requiring a longer soil exposure period. At the end of the soil exposure period, aerate the soil by plowing or deep cultivation. If heavy rains accompanied by low temperatures occur during the soil exposure period, working the soil several times is essential for thorough aeration. Aeration is usually complete when the odor of the fumigant is no longer evident.

### Drip Applications: Additional GAPS

In addition to the GAPS required for all TRI-PIC 100 FUMIGANT soil fumigation applications, the following GAPS apply for drip applications. The certified applicator or WPS trained handlers under the supervision of and in communication with the certified applicator shall shut the system down and make necessary adjustments should the need arise.

### Soil Preparation

- Till fields with known plowpans because they can lead to puddling of the fumigant due to inadequate soil drainage.
- Beds should be listed, shaped and ready for planting.

### Soil Moisture

- For all soil types, pre-application moisture should be dry enough to prevent soil saturation and bed collapse once application and flushing is complete.
- Soil moisture should be at 50% of field capacity in the top 2-3" at the time of TRI-PIC 100 FUMIGANT application.

### Product and Dosage

- Plan the application by calculating the amount of TRI-PIC 100 FUMIGANT required at the appropriate rate for the crop, treated area, and target pest.
- TRI-PIC 100 FUMIGANT must be applied through a drip irrigation system to wet the



soil thoroughly in the area being treated. Drip emitters should be spaced 8-12 inches apart.

- Pre-mix with TS Series surfactant prior to application through drip system at a ratio of 1:20 surfactant to TRI-PIC 100 FUMIGANT. Contact your Cardinal representative to obtain TS Series surfactants.

- TS Series surfactant may be metered into the supply line for TRI-PIC 100 FUMIGANT and then passed through a mixing device such as a centrifugal pump or static mixer, to assure proper agitation. The mixture of TRI-PIC 100 FUMIGANT and the TS Series surfactant must then be metered into the water supply line and passed through a mixing device such as a centrifugal pump or static mixer, to assure proper agitation before it is distributed into the drip irrigation system.

- Meter TRI-PIC 100 FUMIGANT into the drip system according to the dosage. An adequate concentration of TRI-PIC 100 FUMIGANT must be present in order to be effective. At no time should the concentration of TRI-PIC 100 FUMIGANT exceed 1,500 ppm by weight in the drip line. For example, a 300 pounds per treated acre application rate would require 24,000 gallons of water per treated acre to deliver a 1,500 ppm concentration.

### System Controls and Integrity

- The irrigation system (main lines, headers, drip tape) must be thoroughly checked for leaks before the start of application. Leak detection requires that the irrigation system be at full operating pressure. The amount of time needed at full operating pressure will vary by irrigation system design. Look for puddling along major pipes (holes in pipes or leaky joints), at the top and ends of rows (leaky connection, open drip tape), and on the bed surface (damaged drip tape, malfunctioning emitters). Any leaks discovered during the pre-application check must be repaired prior to the start of the application.

- To inject fumigant, use a metering system (such as a positive pressure system, positive displacement injection pump, diaphragm pump, or a Venturi system) effectively designed and constructed of materials that are compatible with the fumigant and capable of being fitted with system interlocking controls. Do not use containers, pumps, or other equipment made of aluminum, magnesium or their alloys as chloropicrin can be corrosive to such metals.

- The system must contain:
  - A functional check valve, a vacuum relief valve, and low-pressure drain appropriately located on the irrigation pipeline to prevent water source contamination and backflow;
  - A functional, automatic, quick-closing check valve to prevent the flow of fluids back toward the fumigant container;
  - A functional, normally closed solenoid-operated valve located on the intake side of the injection point and connected to the system interlock to prevent the fumigant from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down; and
  - Functional interlocking controls to automatically shut off the fumigant injection when the irrigation water flow stops or decreases to the point where fumigant distribution is adversely affected.
- Crop injury and/or lack of effectiveness can result from non-uniform distribution of treated water.
- If you have any questions about calibration, you should contact State Extension Service specialists, equipment manufacturers or other experts.

#### Site of Injection and Irrigation System Layout

- Site of injection must be as close as practical to the area being treated (such as direct injection of fumigant into the header pipe/manifold or into an aboveground delivery pipe attached to the header). If the fumigant is injected into a main line, make sure the irrigation pipe is able to be cleared of all fumigant as the fumigant may pool in low sections of the pipe. Also make sure that valves on lateral lines of the main line are closed if these lateral lines lead to areas not being fumigated at the time of the application.

#### System Flush

- After application of the fumigant, continue to drip-irrigate the area with water to flush the irrigation system. Do not allow the fumigant to remain in the irrigation system after the application is complete. The total volume of water, including the

amount used for flushing the irrigation system, must be adequate to completely remove the fumigant from the lines, but should be less than the amount that could over-saturate the beds (bed collapse can occur from over-saturation) and should not exceed 1.5 acre-inches (40,000 gallons) of water per acre. If common lines are used for both the fumigant application and water seal (if a water seal is applied) these lines must be adequately flushed before starting the water seal and/or normal irrigation practices.

### Soil Sealing

- If tarps are used they must be put in place before the application starts.
- Tarp edges must be buried along the furrow and at the ends of rows.

### Application Depth

- For Untarped Applications: The drip tape must be buried at a minimum of 5 inches.

### Planting Interval

- Do not disturb treated soil for 2 weeks. Wet soil retards diffusion of the fumigant thus requiring a longer aeration period. Aeration is usually complete when the odor of the fumigant is no longer evident.

### Requirements for Pre-Plant Drip Irrigation Soil Fumigation in a Greenhouse

- The maximum application block size that can be treated is 50,000 square feet.
- All applications must be tarped.
- During the application keep all doors, vents, and windows to the outside open, and keep all fans or mechanical ventilation systems running within the greenhouse.
- Leaks through which gases could enter adjacent enclosed areas must be sealed.

See label for Entry Restricted Period and Notification

### Limitations, Restrictions, and Exceptions

### PREPLANT SOIL FUMIGATION USES

Application Rate (pounds product/ treated acre) for untarped shank broadcast

applications

Table: Do not exceed specified maximum application rates in Table 1.

All other crops: Not to be used with aquatic plants or for forestry uses. To facilitate application of this product when applying in low dosages, dilution with the solvent Exxsol D-80 is allowed.

Pounds product/treated acre: The maximum rate of Exxsol D-80 shall not exceed 150 lbs./acre.

Method

[Broadcast](#)

Rates

[field\\_rates 0](#)

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Timings

[Preplant](#)