Fumigation Guidelines for Orchard Establishment

Fumigation with Telone® II / Chloropicrin mixtures has been shown to enhance both orchard establishment and growth. Soil to be fumigated should be specially prepared to ensure the grower of a satisfactory job. Listed below are guidelines that will help ensure that maximum results are achieved from fumigation. If you have any questions regarding soil prep, please contact your Trident representative.

Application Timing

Delayed soil prep until the last minute is the mistake most often made by growers. Clearing should be completed as soon as possible, whether replacing an old orchard or establishing a new orchard site. If the proposed orchard is planted with grass or some annual crop, these need to be turned under 30 to 60 days in advance of fumigation. It is important to disc or rotary till the site following the initial ground breaking. The objective in all cases is to give plant residues time to break down. Plant residues absorb fumigants, reducing fumigation effectiveness.

Soil Prep

Plant residue from previous crops should be worked into the soil to allow for decomposition prior to fumigation. Plow or rip the soil to the depth to which effective treatment is desired. It is advantageous to rip the soil in two directions (i.e. X) at a depth of 24 inches. The soil should be worked to minimize any clods. Some soils will need to be rototilled. Common soil prep mistakes include delayed soil prep until the last minute not allowing plant debris time to break down. Another mistake is working soil when it is too wet. This will compact the soil and creates clods that the fumigant cannot penetrate. Removing debris (tree roots, pipe and large rocks) will aid in achieving the proper surface seal necessary to prevent gas escape.

Soil Moisture

50% - 75% field capacity. Fumigants perform poorly in wet soils. Excessive soil moisture restricts fumigant movement. Soil conditions that are ideal for discing and tilling are ideal for fumigation. The best results are obtained when surface soil moisture is in seedbed condition and subsurface levels are dry. If a compromise is to be made, fumigate more on the dry side.

Soil Temperature

Do not fumigate if soil temperatures are below 40° F. Generally soil temperatures between 45° F and 75° F at the depth of injection are best for fumigant volatilization. The lower the soil temperature, the longer the planting interval is required following fumigation.

Dosage/Rate

The pest to be controlled, degree of control desired and crop to be planted will determine product selection and rates. A soil sample can be taken and tested for nematodes and/or pathogens prior to the application. Crop history is also a good indicator of soil pest problems. Consult with your Trident representative for recommendations.

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Application

Depth of Application is as important as any factor involved in soil fumigation. Inject Telone II / Chloropicrin products at least 12"-20" below the final soil level. Deeper placement is recommended for deep-rooted plants, such as perennial fruits or vines.

Exposure

Immediately following the application, seal the soil surface. Use a disc and packer or a culti packer to remove shank marks and pack the surface soil. Failure to seal the soil surface may reduce fumigation effectiveness and/or expose non-target areas to the fumigant. The soil should remain undisturbed for 10 to 14 days following fumigation.

Fertilization

Fumigation may temporarily raise the level of ammonium nitrogen and soluble salts in the soil. This is most likely to occur on soils that are cold, wet acidic, or high in organic matter. To avoid ammonia injury and/or nitrate starvation avoid using fertilizers containing ammonium salts and use only fertilizers containing nitrates until after the crop is well established and soil temperatures reach 65° F. Avoid excessive manuring of soil. Liming of highly acidic soils before fumigation stimulates nitrification and reduces the possibility of ammonia toxicity. Phosphorous and micronutrients may become deficient following fumigation and may need to be applied before planting.

Planting

Because of the nature of soil fumigants and soil conditions as influenced by the weather, it is ideal to fumigate in the fall after harvest. This will allow for the necessary exposure period along with adequate time for fumigant dissipation before planting. Spring applications may delay planting. It is far better to plant later in the spring to allow for fumigant dissipation. Skipping fumigation because it sets back a planting date is a poor choice. A May-planted tree planted in fumigated soil will usually outperform a March-planted tree suffering from even a mild case of replant disease. Long-term productivity should be the main concern, not date of planting.

Many factors affect soil fumigation and its effectiveness for pest control. The pest and its habits will affect fumigant selection, application rate, and time of application, fumigant placement, and necessary length of exposure. Soil factors also play a key role in fumigation. Soil texture, soil conditions, debris, soil moisture, and soil temperature may affect the volatility, movement, and availability of the fumigant once applied. Fumigant dosage is both pest and soil dependent. Because these factors are beyond our control, Trident can neither give nor imply a guarantee of results.

Contact Your Local Trident Representative:

Alan Huntzinger	(509) 728-2006	Wenatchee, WA.
Robert Rauert	(509) 728-2004	Yakima, WA.
Dave Sbur	(971) 563-8848	Oregon
Jeff Fowler	(971) 563-9621	Oregon

Soil Fumigation for "Replant Disease"

The "replant problem" is the result of replanting perennial crops into soils plagued with pathogenic soil organisms present in most mature orchards. Poor root development leads to reduced vegetative growth and poor fruit yields throughout the life of the orchard. Replant disease is most common when apples or pears are planted either after apples or pears, or when cherries are planted after cherries.

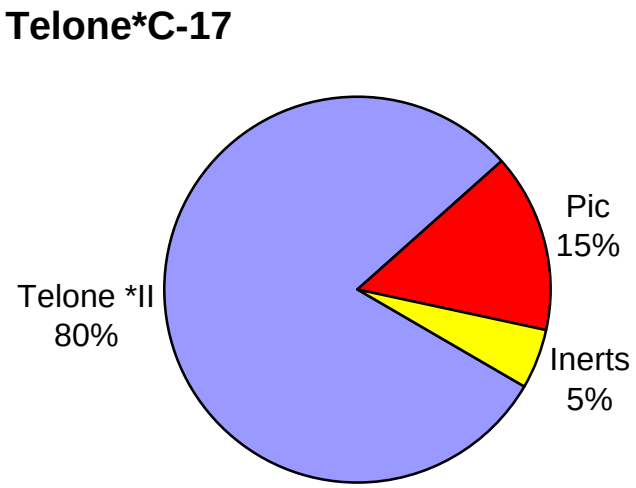
Deep Injected Soil Fumigants

Fumigants are highly toxic and volatile pesticides that are injected or incorporated into the soil where they become gases. These gases penetrate the soil pores coming into contact with the target organisms. The fumigant is absorbed into and through a water film surrounding the organism and killing it.

Telone*II Telone*II contains the active ingredient 1 ,3-dichloropropene. Injected as a liquid, Telone*II immediately volatilizes to a gas, which moves through the soil profile. Injected 12-20 inches deep, Telone*II can travel up to 15 inches from the point of injection. An excellent nematicide and soil insecticide, Telone*II controls nematodes that attack crops and vector diseases. Telone*II is applied in combination with chloropicrin in the orchards as C-15,C-17, C-35 and Tri-Form 35.

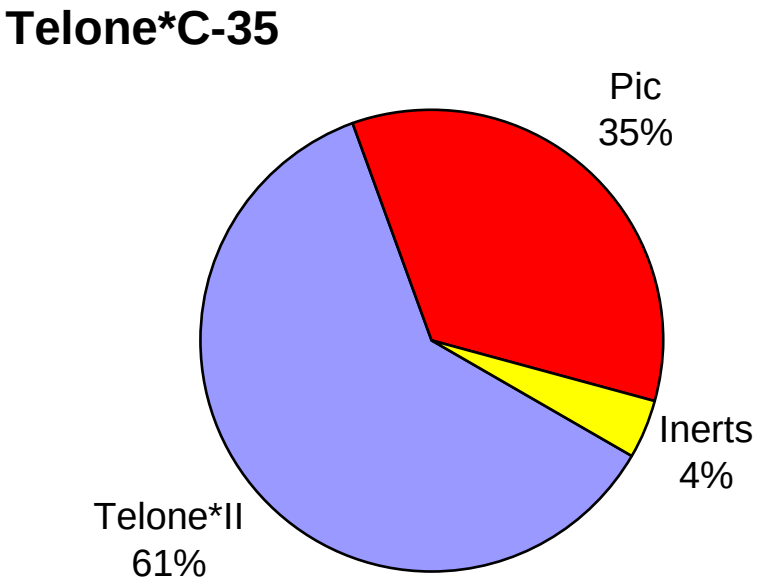
Chloropicrin The best fungicidal fumigant on the market which is used to control *Fusarium, Phythium, Phytopthora, and Verticillium.* The breakdown products of chloropicrin in soil are carbon dioxide, nitrate, and chloride, basic nutrients for plants and microorganisms that inhabit crop soils. By controlling target fungi in the soil the biological activity of root-friendly microorganisms recolonize the fumigated soil.

Telone* C-17 Telone* C-17 and Telone* C-15 contain approximately 78% 1,3-D and 15-17% chloropicrin. These products have direct activity on soil diseases and nematodes, which may vector disease.



Telone*II=Nematicide Chloropicrin=Fungicide

Telone* C-35 Telone* C-35 contains approximately 61% 1,3-D and 35% Chloropicrin. The high percentage of chloropicrin allows Telone* C-35 to have significant activity in managing high populations of soil-borne diseases, in addition to the suppression of nematodes. The combination of the two products has shown to be an effective methyl bromide alternative for the control of replant disease in orchards.



Application is as important as any factor involved with soil fumigation. A quality application is determined by:

1) **Soil preparation**

2) **Depth of Application**
   a. Where are the pathogen/pest concentrations through the soil profile?
   b. Can we/are we getting the product to the problem?
   c. How does the product move through your soil type?
   d. What does the label require for maximized product efficacy?

3) **Product distribution and monitoring**
   a. Computer system
   b. Radar based ground speed to vary rate
   c. Horsepower to get the depth for maximized product placement.

The decision to fumigate is expensive. Generally you have only one chance. Time and effort are required to identify and evaluate any potential pathogenic pressures. This is not easy and sometimes is more art than science. Cropping history can be a good indicator of pathogen pressure. Soil samples can be evaluated for nematodes and fungal pathogens.

Once an evaluation is complete a fumigant or combination of fumigants may be recommended for the suppression of replant disease organisms. Consult with your Trident representative on the price of different programs available.