

Chemical Treatment for Sudden Oak Death

Based on information from Forest Pathology and Mycology Lab, UC Berkeley

Background on Agri-Fos and Pentra-Bark:

Agri-Fos (systemic fungicide) and Pentra-Bark (surfactant) were approved on 01 October 2003, under a FIFRA Section 24c Special Local Need Label, by the California Department of Pesticide Regulation to treat oaks and tanoaks at high-risk of becoming infected with *Phytophthora ramorum*. The treatment is only approved for use on oak (coast live oak, Shreve oak, black oak and canyon live oak) and tanoak trees. There is no evidence that the chemicals are effective in other species of trees. The treatment is not a universal “cure.” Designed for use on high-value trees in yards and gardens, Agri-Fos is a preventative, and is only effective for inhibiting the disease in uninfected or newly infected trees. Trees should be selected for preventive treatment based on the risk chart shown in the table below. Treatment is only recommended for trees that fall within risk ratings 1 and 2.

The treatment should begin before or within 1-2 months of the first signs of an infection — usually viscous brown droplets on the intact bark of the tree. The treatment is not recommended for trees that have had symptoms for six months or longer. In addition, there is a range of susceptibility to the Sudden Oak Death pathogen within individual trees in the oak and tanoak species. For instance, the treatment may not help oak trees that are extremely susceptible to the pathogen. Trees with significant rot or other structural problems may not respond well to treatment.

Agri-Fos is systemic; it is translocated through the tree and enhances the tree’s defensive mechanisms. Agri-Fos requires 3-6 weeks to be assimilated by the plant and start being effective against the pathogen. On true oaks, Agri-Fos may be used with Pentra-Bark penetrant and sprayed on to the exterior around the lower trunk for absorption through the bark. For tanoak, the material can only be adequately translocated if the material is injected into the tree.

Risk table for treatment of oak trees

Risk Rating by Tree Diameter

(1 = Most Severe Risk, 4 = Least Severe Risk)

Location	Up to 4 inches	Between 4 and 20 inches	Greater than 20 inches
A	3	1	1
B	4	2	1
C	4	3	3
D	4	4	4

A: The oak or tanoak is

- 30 meters or less from a California bay laurel tree known to be infected by *P. ramorum*
- OR 50 meters or less downwind or downhill from an infected California bay laurel tree
- OR 10 meters or less from an oak or any other tree known to be infected

B: The oak or tanoak is

- 30 meters or less from any California bay laurel tree
- OR 50 meters or less downwind or downhill from any California bay laurel tree
- AND there are known infections within 300 meters in any known Sudden Oak Death pathogen host

C: The oak or tanoak is

- 30 meters or less from any California bay laurel tree
- OR 50 meters downwind or downhill from any California bay laurel tree
- AND there are known infections within a 4-mile radius in any known Sudden Oak Death pathogen host

D: The oak or tanoak is in a region where there are no known infections within a 4-mile radius and there are no California bay laurel trees in the vicinity.

Agri-Fos Use Guidelines and Application Protocol

This protocol is designed to give the applicator practical information for successfully applying Agri-Fos® systemic fungicide to oak and tanoak trees for the treatment of Sudden Oak Death. Two application methods are currently available, injection under the bark directly into the sapwood and topical application of the product, mixed with Pentra-Bark™ surfactant, onto the trunk of the tree. Both methods have been found effective at controlling the growth of *Phytophthora ramorum* the causal agent of the disease.

The choice of application method is dependent upon a number of factors including the equipment costs, volume of chemical used, and the cosmetic appearance of the tree, post treatment. Both treatments have been shown to be effective on oaks; only injections have been shown to be effective for tanoaks. In general, injection treatments require additional equipment in the form of syringe-type injectors that maintain a positive pressure or a backpack

mounted hydraulic injector. The injections are made through multiple holes drilled in the trunk. But injections use significantly less product, usually about 10-80ml, to treat a tree. The trunk spray on the other hand can use a simple spray rig, is very quick, and does not leave holes in the tree. The spray method however requires considerably more product and may damage surrounding vegetation, including moss and lichens.

Applications should be made when the tree is actively transpiring. Avoid treating trees during very hot or very cold weather, or when new leaves are emerging. Treatments applied during leaf expansion are generally seriously compromised due to the accumulation of the applied chemical in the leaves rather than in the tree trunk, where it is needed. Currently the optimal treatment routine for oaks calls for two applications the first year followed by one application annually thereafter. It is recommended to treat in fall then spring, or spring then fall the first year. Follow-up treatments should be only in the fall annually (avoid treatments when temperatures are very low). If risk is minimal, meaning low abundance of infections or host species in the area, follow-up treatments can be applied bi-annually.

Injection Treatments

1. Calculate the number of injection sites:

1 injection per 1 yard canopy diameter measured at the drip line

or

1 injection per 6 inches of trunk circumference measured at 4 feet above the soil line

Example: Canopy diameter = 24 feet (8 yards) and trunk circumference = 48 inches (48/6=8). Prepare 80ml of treatment solution, 8 injections of 10ml each.

The applicator should use their judgment to determine the best method for determining dose. For example, multiple trunks or an asymmetrical crown may make it difficult to calculate the number of injections. If in doubt take both measurements and use the one that results in the higher dose.

2. Prepare the treatment solution as per the label and load 10ml per injection site:

1 part Agri-Fos + 2 parts water

equals

3.5ml (0.1oz) Agri-Fos + 6.5ml (0.2oz) water (makes 10ml)

equals

324ml (11oz) Agri-Fos + 624ml (21oz) water (makes 1 quart)

Wear gloves and safety glasses during preparation and application. Use a 5% bleach solution to disinfect syringes to prevent spread of the pathogen.

3. Drill 5mm (3/16in) diameter hole into live sapwood. Insert injector and inject the treatment solution. Remove injectors after the treatment solution has been dispensed.

The drill bit diameter is dependent on the type of injector used. Sharp bits and slower drill speeds perform better as they cut rather than tear the wood. The drill depth is

dependent upon the type and age of the tree as well as the thickness of the bark. With experience the applicator will learn to feel the change in wood density or slight “pop” as the drill enters the sapwood. The hole should be drilled perpendicular to the tree trunk or at a *very slight* downward angle. Run the bit in and out of the completed hole to clear out wood chips that may interfere with the injection. Place injections about 6 inches apart where there is a clear translocation path up the tree. Stagger the injections vertically to prevent bark delamination. Avoid drilling below limb stubs or near shakes, cracks, depressions, or into soft or punky wood. Check for leaks around the injection site. On actively transpiring trees the treatment solution will be absorbed in 1 to 5 minutes. High injection pressures can cause damage to the tree at the injection site. If the injection fails to be absorbed by the tree try cleaning out the hole with the drill bit or move to another site and drill a new hole. Injection holes may be left open, covered with a sealant such as grafting wax, or plugged with specifically designed plastic pegs.

Checklist for injection treatments:

- Agri-Fos systemic fungicide
- Water
- Bleach
- Liquid measuring devices, pipettes, conical tubes, or beakers
- Plastic mixing containers, beakers etc.
- 5 gal bucket for carrying syringes, washing, and disinfecting
- Rechargeable cordless drill
- 3/16 in drill bit
- Syringe-type tree injectors Chemjet®, Marley®, Sidewinder®, etc.
- Examination gloves
- Safety glasses

Basal Spray Treatments

1. Calculate the amount of treatment solution needed:

The spray mix is applied from as high as possible down to ground level. Full sized, adult oak trees may require between 500ml and 1 liter of spray mix per tree.

2. Prepare the product as per the label and pour mixture into spray tank:

1.9 L Agri-Fos + 1.9L water + 95ml Pentra-Bark surfactant
equals

62.4oz Agri-Fos + 62.4oz water + 3.2oz Pentra-Bark surfactant

Wear gloves and safety glasses during preparation and application. A plastic face shield and long sleeves may be worn during application as the mixture is slightly irritating to the skin. A variety of spray applicators may be used including hydraulic sprayers, hand pumped sprayers, and backpack sprayers. The spray mixture will foam if shaken or agitated. Use of a spray tank dedicated to Agri-Fos/Pentra-Bark application will allow you to mix the solution directly in the tank and avoid some of the foaming.

3. Apply the treatment solution to the tree trunk. Treatment is generally effective if it is applied uniformly from 3-4m (9-12feet) height (or as high as you can without spraying

the foliage) down to the ground level. Soak the tree trunk thoroughly until the spray treatment solution just starts to run off at the base of the tree.

Pay special attention to fissures and cracks, etc in the bark. Multiple or split trunks should be thoroughly treated, just as the main trunk. Rain or moisture does not appear to affect the application of Agri-Fos with Pentra-Bark surfactant, but applications should be made when the tree is actively transpiring (see Injection Treatments). Use caution and watch your overspray! Application of Agri-Fos with Pentra-Bark to foliage will cause significant damage to the leaves of most plants, including oaks, tanoaks, rhododendrons, moss, lichen, etc.

Checklist for basal spray application:

Agri-Fos systemic fungicide

Pentra-Bark surfactant

Water

Liquid measuring devices, pipettes, conical tubes, or beakers

Plastic mixing containers, beakers etc.

Spray equipment, hydraulic, pump-up type, or backpack mounted.

Examination gloves

Safety glasses or face shield

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