

Methods of Protection

Mature Orchards

Only two general methods of protecting avocado groves have proved satisfactory - heaters and wind machines. A combination of these two also is used. Many makes and designs of heaters and wind machines are offered for sale and they must be compared on the basis of protection provided and cost of installing and operating. This publication is limited to their general application in avocado groves. Their actual operation is discussed in other available publications of the University of California.

Orchard Heaters

Experience has shown that a large number of small fires burning throughout the orchard provide better protection than a few large fires concentrated in spots. The value of heaters is noted below to provide a basis for selecting the general type of protection needed.

Their advantages are:

- They usually furnish more adequate protection than wind machines. However, in extremely cold conditions they, too, can be inadequate.
- Only enough heaters to maintain safe temperatures need to be lighted.
- Additional heaters and oil can be stored in the field for emergency conditions.
- They distribute heat to all parts of the grove.

Their disadvantages are:

- Smokiness. However, certain types have low smoke output when properly operated.
- Relatively high costs of investment and operation.
- Fire hazard due to mat of leaves beneath the trees.
- Trouble and work of operation and maintenance.
- High labor requirements.

For colder locations and positive protection, orchard heating is the only proven method. Pipe line heaters, using either heater oil or natural gas under pressure from permanently installed pipelines, are efficient but very expensive. Economical and effective heating is provided by heaters with 9-gallon capacity bowls and improved designs of stacks burning a low grade of diesel oil. Usually 45 to 90 heaters are used per acre depending on the frost hazard.

Wind Machines

In certain locations, wind machines have provided economical protection. Their effect is essentially that of a large fan which mixes the air within and above the orchard so that the average air temperature near the ground is raised. Their precise effects are not completely understood, but studies are being continued by the University of California.

Their advantages are:

- More economical than orchard heaters
- Low labor requirements for operation
- Adequate protection against local radiation frosts when temperatures go only 2 or 3 degrees below the damaging point
- Useful in increasing air movement in groves where dead air occurs
- Increased effectiveness of heaters.

Their disadvantages are:

- Inadequate protection with freeze conditions or when temperatures go 4 or 5 degrees or more below the damaging point
- Inadequate protection in locations where little or no ceiling occurs
- Unequal protection throughout grove
- Less effective in young plantings.

Machines providing at least 5 horsepower per acre should be selected on the basis of cost and ease of operation. The location of the machine or machines in an orchard depends on the drift, the topography, and the other variables. Consult other University of California publications for additional information.

Combination Heaters and Wind Machines

Usually 8 to 25 heaters per acre uniformly scattered throughout the grove are sufficient when used with an effectively installed wind machine. The combination provides adequate protection for even the colder locations. The wind machine will protect the grove for some of the nights by itself, but for the very cold nights, the heaters are available to add heat and thus provide positive protection. Usually the heaters are lighted whenever the wind machines cannot maintain the temperatures above the danger point.

This combination method has the advantage over heaters used alone, in that it is cheaper, while providing as complete protection.

A great many other types and methods of protection has been tried, but because of one or more faults in each, they cannot be recommended.

Protecting Young Trees

Orchard heaters and wind machines are less effective in protecting young trees in their first two or three years in the orchard than other methods which are usually cheaper, anyway. The first consideration in protecting newly planted trees is to have the trees as large as possible. Planting and topworking should be done in the spring so the trees will make the maximum growth during the summer and fall, before low temperatures occur in the winter.

In locations having serious frost hazard, you might try the practice of planting Mexican seedlings in place in the field and permitting them to grow for 2 to 3 years before topworking. Then if the topworking is done early in the spring, the young trees will have made enough growth to better withstand the cold of the following winter.

Protection for young trees is best accomplished by sheltering them from radiation heat loss. Shelters for this purpose are of many types, the most common are sketched below.

In cold location, young trees may require several types of protection; they may be wrapped with paper, mounded with dirt, or surrounded with corn stalks.



Frame with burlap cover (removable top and south side).



Corn Stalks



Insulative wrap (aluminum foil backing or fiberglass).

Care of Frost Damaged Trees

Determining the amount of damage is often a difficult job and cannot be done accurately for some months following the freeze. It is usually better to let the tree recover by itself.

Sunburn Prevention

Exposed limbs can be badly damaged by sunburning. Whenever defoliated trees have not grown enough new leaves to protect the limbs before hot weather occurs, you should provide protection.

Protection is best provided by spraying or painting all exposed limbs with either a cold water white paint or a whitewash. One good whitewash formula would include 50 lbs. hydrated lime and 4 lbs. zinc sulfate to each 100 gallons of water.

Irrigation

Do not irrigate frosted trees until the soil in the root zone approaches dryness. The loss of leaves reduces the use of water so the soil will remain wet longer than with unaffected trees. Careful, frequent examination of the soil is necessary to prevent excess moisture from normal irrigations. Avocado root rot occurs in soils with excessive moisture when the cinnamomi fungus is present, and growers must guard against this disease following frost damage.

Pruning

Do no pruning until you know how much of the tree has been killed. No foliage will grow from the remaining live wood and the tree will recover better without pruning.

When new shoots are at least two or three feet long, you can remove the dead wood. This will usually be mid-summer, 6 to 8 months following the frost. At the same time, suckers should be thinned out to select the new limbs to replace those lost. Large pruning cuts (3 inches or more) should be painted with an asphalt emulsion, or other sealing paint, to prevent drying and infection.

Care of Young Trees

Badly frozen young trees usually develop strong sucker growth that can be used to form a tree as good as a replanted tree. If these suckers are from above the bud union, you can develop a new top by thinning and

training. On young trees frozen back to below the bud union, strong root suckers can be budded or grafted to the desired variety the following spring. If the sucker growth is weak, the tree should be removed.

Severely Frozen Mature Trees

The handling of severely frozen mature trees where they have been killed back to the large scaffold limbs, to the trunk, or to the ground, presents many problems. Each tree should be considered separately. Often growers should topwork badly frozen trees to a more resistant or productive variety. Ask your Farm Advisor to assist you in determining the best procedures.