

Rehabilitation of Frost Damaged Trees

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During and following the January, 1937 freeze there were a number of problems or questions of what we should do to prevent more damage to trees and what might be done to assist nature in the recovery of the avocado tree.

The following ten point program will at least open the subject for Dr. Coit's and Carter Barrett's discussion period;

1. To remove trees and replace them with nursery stock?
2. To prune, when and how?
3. To protect exposed trunks and limbs from sunburn?
4. To fertilize?
5. To irrigate?
6. To provide drainage?
7. To thin sucker growth?
8. To interplant a damaged orchard?
9. To top work to more hardy and marketable varieties?
10. To train new growth?

Plato, Aristotle or someone once said, "Define your terms before you talk to me." So it might be well for me to state that I have in mind an avocado tree either just planted or one under twenty-five years of age. It is located on one of the eighteen distinct types of soils in San Diego County, each of which has some variations which would affect an avocado tree. This tree I have in mind was in some state of growing condition from weak to extreme vigor. It was subjected to eight or more hours of temperature ranging from 14° to 28°. There may be some differences, but suppose each of you think of a tree of your choice and see if we can apply these general principles so that they will fit the needs of that particular tree.

Either you have a tree in mind damaged from low temperature only or you are thinking of a tree that was damaged by a combination of low temperatures, excessive rainfall together with poor drainage or some other complicating factor.

If there are no other factors involved than the loss of portions of a tree by its exposure to

low temperatures, then the loss of those tree parts by low temperatures are no different than if they had been removed by pruning. If all of the smallest twigs and leaves or perhaps these together with all of the wood less than two inches in diameter were removed by pruning, the condition of the tree would be in every way comparable to the freeze injured tree and presenting identically the same problem as those we have listed, with the exception of the one about pruning. There would, of course, be one difference which all of you learned during the months following the freeze. During the years when severe freezes occur in southern California they are usually accompanied by general weather disturbances and frequently are years of excessive rainfall, thus subjecting the tree that has been pruned by nature's freezes to complicating root and soil conditions not usually experienced by a man-made, excessively-pruned tree.

If you will agree with me on these fundamentals that a freeze is a heavy pruning which may be accompanied by soil moisture complicating factors, then I think we can proceed to a discussion of our ten points and what to do about it.

REPLACE WITH NURSERY STOCK?

To remove trees and replace with nursery stock? Where no other complications existed, the recovery of the frozen tree and its return to fruitfulness far surpassed any possibilities of a newly planted nursery tree. This would apply to even the well-established one-year-old tree frozen to a point above the bud. We must keep in mind that in years of freeze there are usually very few uninjured nursery trees available for making replacements. Replacements should be limited to those trees weakened by other factors in addition to the freeze injury.

TO PRUNE, WHEN AND HOW?

To prune or not to prune and if so, when, and how much? It is only adding insult to injury to prune a frozen tree before the tree has a chance to recover from the pruning done by the low temperatures, except in cases where severe root injury has taken place by excessive moisture and poor drainage. If one knew which trees were injured in their root systems, then additional removal of top-wood might be advisable and beneficial in establishing a new balance between the top and what remains of the old root system. The postponement of pruning until ample growth recovery has been made to determine what is dead wood from that which has been discolored by partial cellular destruction and until some determination can be made of the ability of the tree to stage a normal recovery has generally been found desirable. If recovery is not normal but weak, some early pruning might be of benefit, as this weak response would indicate an injured root system. For a tree on a normal root system without sunburned areas or dead spots on the trunk or branches below the new recovery growth, no pruning is desirable except that of taking out the dead branches and twigs about one year after the freeze. Or, as expressed by some, "They'll fall out when they are ready to come out." This is an extreme view, for most of us would rather remove the dead wood because of its unsightliness, as soon as recovery of new growth is well under way. This would be during August, September or October, following a freeze in early or mid-winter.

PROTECT EXPOSED TRUNKS AND LIMBS FROM SUNBURN?

This has to do with protecting the exposed trunks and limbs from sunburn. It is generally assumed that in topworking avocado trees, as in the sudden heavy removal of leaf surface for any reason, some protection should be supplied to prevent sunburning of the newly exposed bark areas. Where protection is not supplied in such cases, injuries frequently result.

It so happened that no sudden removal of the leaves took place following the 1937 freeze but dead leaves remained on the trees for weeks, supplying some protection to bark on trunks and limbs. Then, too, there was very little sunshine for many weeks following the freeze. It would seem that the trunks and limbs of trees, defoliated due to the freeze, were gradually adjusted to the exposure so that when the leaves were all blown off and when the sun resumed its usual radiance, no damage resulted whether protection was applied or not.

The kind of protection used was not worth the arguments it caused. Checked plots here in the county did definitely show a delayed starting of new growth on these trees which had been made white with whitewash or white water paint. It was assumed that this retarded start of growth was due to the heat-repelling-effect of the white surface, causing a temperature lag in the whitewashed trees. It would seem advisable and the part of wisdom to protect trees against possible injury from sunburn by spraying with whitewash in the event of another freeze as the leaves might not hang on or the sun be so obligingly hidden behind fog and clouds. What sunburn injury I have observed has been well on the south and southwest side of the tree so that a spray application on the southeast, south, and southwest sides and the tops of limbs would seem sufficient.

TO FERTILIZE?

Should we fertilize? Test plots of only one year are so complicated by other factors that no accurate conclusions may be had. Therefore, no plots were established as freezes do not come in series of five years each to make possible trials on the effect of fertilization on frost injured trees. It would seem desirable therefore to apply those facts developed by fundamental research from which comes all data not flavored with personal opinion. Warren Schoonover, Subtropical Specialist of the University of California tells us that we fertilize the soil—not the tree. We are advised to apply nitrates because scientists have proved that our soils are frequently or usually deficient in nitrates for all plant growth. By long series of test plots and trials, the University of California at Westwood and the Citrus Experiment Station at Riverside have demonstrated that when nitrates are applied to soils annually a response in tree development results, which justifies the cost of the material and its application. This, of course, assumes the use of the least expensive forms of nitrate such as sulphate of ammonia. If we are fertilizing the soil to meet a deficiency of a plant nutrient soil element, it would seem that the deficiency might exist around the roots of a frozen tree much in the same degree as around the roots of a tree not injured by the freeze. Therefore, the usual application of nitrates would seem to be advisable. During a heavy rainfall year, when leaching of the soils is excessive, there might exist an unusual deficiency of nitrates in our best avocado soils which are light and well drained.

TO IRRIGATE?

The questions on irrigation are no different than the problem that always presents itself in the spring or early summer, When should the first application of water take place? The rule of applying water to soils that are approaching dryness and avoiding the application of water to those soil areas that have remained moist is certainly definite, complete, and to the point, but no one can apply this rule effectively without the consistent use of a soil auger both before and after the application of water.

I have always believed that if people had an opportunity to know the facts, that the vast majority of a group would arrive at the correct answer to a problem. It continues to be a puzzle to me why the majority of avocado growers continue to conduct the practice of irrigation without the use of a soil auger.

Any tree, whose leaf surface has been greatly reduced from any cause, is increasingly susceptible to water injury; therefore the management of irrigation in relation to a frost injured tree is of great importance in the rehabilitation of that tree.

TO PROVIDE DRAINAGE?

Drainage naturally follows the subject of irrigation. Where sub-drainage or the downward movement of water is retarded by a heavy clay or other less pervious subsoils, a drainage problem is present. If the value of the grove justifies the expense, some method of more readily disposing of this subsoil water table should be attempted. Sometimes this excess water has originated on grass, brush or orchard land above the property being damaged and can be intercepted by an open ditch dug across the slope of the hill, deep enough to cross ditch the sub soil strata causing the lateral water movement.

No part of the rehabilitation of an avocado tree is as important as that of maintaining a healthy, uninjured vigorous root system. It is recognized by most growers that the opportunity for loss of vigor, decay and serious root injury is greatly increased by the loss of leaf surface or the slowing down of the natural life functioning of the top of the tree. This same problem enters into the picture of top working trees at any time or when the growing top is cut off to force out the bud on nursery stock. Conditions under the surface of the soil are of the greatest importance when leaf surface has been removed.

TO THIN SUCKER GROWTH?

Thinning sucker growth has been found to be unnecessary as the extra twigs were soon crowded out and naturally eliminated as recovery of the tree took place.

TO INTERPLANT DAMAGED ORCHARD?

The interplanting of a damaged grove is related to our No. 1 problem of tree removal. It is very doubtful whether avocados should be maintained on soils which produce root injury of sufficient importance to make necessary replanting or interplanting.

Interplanting, for the purpose of early yields while the frost injured trees recovered, is of doubtful value as by the time the new tree reached fruitfulness the recovered tree would likely have grown sufficiently to again use all of the space.

TO TOPWORK TO MORE HARDY AND MARKETABLE VARIETIES?

To topwork to more cold resistant and better marketable varieties. The severe set-back of the more tender varieties, and varieties not well suited to market demands, affords an opportunity, without further loss, to topwork these trees to some other more profitable variety.

TO TRAIN NEW GROWTH?

The training of the recovering tree is of real importance today to those who lost the entire top and some of the trunk of their trees. No unusual training will be required on the older trees where damage is limited to the small twigs and limbs. However the tree that has put out two or more equal limbs from the old trunk will require some attention. One may be tempted to let everything grow and thereby produce fruit at an earlier date but this does not seem as wise as considering the long-time-needs of the tree. If more than one branch is allowed to grow from a large old stump there is damage of a weak crotch developing as the old trunk rots away. It is considered undesirable for two or more limbs to grow from one point without subjecting them to some other leader, even though the avocado tree is less susceptible to this weak crotch condition than most other fruit trees. The single trunk, central-leader type of tree seems to be the most desirable. Therefore, in an attempt to assist the tree in its rehabilitation, this ideal should be kept in mind.

In these ten points of avocado tree rehabilitation I have discussed briefly the things that appear to me to be the answers. I urge your suggestions for corrections and additions in the discussion that is to follow May I take the liberty to further point out that, where injury was severe to root systems and the problem of recovery was greatly complicated by soil conditions, it may be wisdom to reconsider whether or not you have your avocado planting on the right kind of soil. There is no use kidding ourselves. The strict requirements of the avocado for soil, water, climate, and management are guarantees for future profit to those growers who find the correct answers.