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Post-Freeze Citrus Culture

Cold Tolerance of Citrus Trees and Fruits

Citrus leaves and wood experience modification of their freezing point temperature when they are "hardened off" by cool weather and fog. Such tissue can tolerate 4 hrs at 20°F for leaves, and twigs will withstand temperatures into the teens without killing of plant tissue. Killing of 3/16" wood has been followed by 60-100 percent normal flowering and fruit setting.

Fruit response to cold does not involve a hardening process. Supercooling as much as 5°F below the fruit's freezing point occurs under many conditions. The danger point temperatures (sheltered thermometer) for citrus fruits are listed as follows: ripe navels – 26° to 25°, ripe Valencia's – 27° to 26°, and lemons – 28° to 26°. New buds, blossoms, and button fruit are at risk from 30°F.

Care of Trees

Continue to preserve the canopy from additional freezes. This requires that protection be provided when temperatures of 20° or below are anticipated with hardened-off or dormant trees. In the spring when new growth has begun, this temperature will be considerably higher, probably near 30°. A reminder: the exposed surface temperatures may be several degrees below air temperature so protection may need to start above the danger point.

Leaf Drop

Where leaf drop has occurred and wood is exposed an application of a sun reflectant such as a whitewash spray is recommended to prevent sunburn.

Pruning

Delay pruning for 6-12 months to determine the degree of damage and the ability of the tree to recover. The extent of dieback has been found to become worse for trees that are pruned shortly after injury. Recovery is best when trees are allowed to define their own injury limit. It is also not necessary to provide dressings or other painted-on coverings to wounded bark such as frost or frozen splits, since most of these treatments resulted in greater bacterial and fungal infections.

Medium-sized trees or juvenile trees that have exhibited moderate to severe damage may be allowed to recover on their own before any rehabilitation efforts are begun. In cases where tree losses are involved it may be more useful to consider intersetting and growing a new orchard in between the established planting.

Newly planted trees that were subjected to lethal temperatures should also be allowed to demonstrate their degree of injury. Salvaging trees is possible if the freezing has not gone below the bud union. Bringing up a new shoot and even using the old dead trunk as the stake has been a common practice. If nursery stock is in short supply, it might make economic sense to let the rootstock resprout and attempt budding in the field. The main drawback here is that nursery operations are spread out over an extended acreage.

Cultural Programs

Irrigation requirements will be modified by trees with smaller canopies. The canopy may be reduced as a consequence of leaf loss. The timing or scheduling of irrigations should be made according to evapotranspiration requirements based on the new

canopy size. Arrange applications to be shallow, involving just the rooting zone and avoid deep percolation losses. Avoid saturated conditions that may injure roots. If water supplies are adequate for using a larger flow for winter frost protection, consider redesigning the system to achieve this objective.

Nutrition may also be adjusted downward since the plant may be starting a new foliage canopy. Consider foliar applications of urea to the new flush for the nitrogen requirement and for stimulation of flower formation. Zinc applications as foliar sprays will probably be necessary on new growth.

Pest control programs will reflect the effect of the freezes. One of the more important things will be the regrowth of the canopy so that attention will be necessary for control of citrus thrips. These insects have the ability to distort new growth and the canopy may suffer. Both California red scale and the Aphytis parasites may have experienced mortality as a result of the effect of the freezing temperatures on tree canopies and fruit. In orchards where parasites have been liberated it may be helpful to collect twigs and fruit to determine the impact of the freeze on the parasite population.

Soil Management

While it is desirable to maintain as little weed growth as possible, especially to retain the advantages of frost protection, evaluate the label of the residual herbicide being used to see if there are special uses or methods of use that apply to stressed trees.

Freeze Damaged Citrus Trees*

It is impossible to determine the full extent of severe injury for several months.

In very severe cases dieback may continue for the entire season. No pruning should be done for 6-12 months.

Time should be given for new growth and dying back. Early pruning often leaves limbs continuing to die back and removal of some limbs that would recover.

Early pruned trees do not recover as soon as trees pruned later. Different degrees of injury require different treatment.

1. **Light damage. Foliage and small twigs only are damaged.**

Require no special treatment. No special pruning during season following freeze. All foliage should be retained to nourish root system and support crop that develops.

2. **Medium damage. A considerable part of the top is killed but the trunk and main crown limbs show little damage. No pruning for several months until full extent of damage is visible.**

Save as much framework as possible.

Cut below all serious bark injuries.

When injured limbs are removed cut back to good strong new shoots that are the best available.

In some cases distribution of the framework branches can be controlled to some extent by a very light pruning the first season, but nothing is lost by delaying pruning a full year.

After injured branches have been cut to new leaders, further pruning consists of gradual thinning over a period of years of excessive sprouts. Otherwise, they will crowd and interfere with the growth and branching of the leaders forming the new framework.

3. **Severe damage. Where the top and crown limbs are mainly killed but the trunk shows little injury.**

No action until full extent of injury is known – usually after midsummer.

Remove entire top of tree cutting below all large areas of injured bark.

Numerous sprouts on trunk will have appeared by then. New head of tree must be developed from these. Select uppermost good sprout and cut off trunk just above this sprout, sloping the cut downward away from the sprout.

Then choose 2-3 other sprouts properly spaced to form a new head and favor their growth by pinching back sprouts that crowd them.

All sprouts that are formed should be left until a balance between root and top is established. The

unnecessary sprouts should then be gradually removed.

4. **Very severe damage. Where the top is killed and the injury extends well down the trunk, but is followed by the appearance of strong sprouts above the bud union. Here a new trunk and head must be formed. This can be produced by a strong shoot coming from above the bud union.**

Cut off branches, leaving trunk as a support for the special sprout.

Favor this sprout by pinching back other shoots which crowd it. When new head the size of 2 year old, remove old trunk carefully with cut starting just above base new trunk and sloping downward.

Cut surface should be painted after drying.

During year following freeze and until old trunk is removed, all sprouts should be allowed to grow but their growth controlled by pinching back.

5. **Trees killed to a point below the bud union. In most cases trees killed to bud union should be replaced.**

If tree is retained, a shoot from below the bud union must be trained and budded to the desired variety as soon as it is large enough to take a bud (1/4 – 3/8 inch in diameter). Place bud at height of 18-24 inches.

This allows shoots to grow around base of tree without shading the bud.

Interplanting: In the cases of #4 and #5, the trees may not make a good recovery.

Interplanting with new trees increases return during recovery and reduces impact if some older trees fail to develop.

**from Treatment of Frost Injured Trees by J.C. Johnson*

University of California
Cooperative Extension
Tulare County
4437B S Laspina St
Tulare, CA 93274-9537

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Neil O'Connell
Farm Advisor