Cold Damage Symptoms on Citrus

L.K. Jackson

TREE COLD INJURY

The extent of cold injury to citrus depends on a number of factors, and its expression may occur over an extended period of time. Factors involved include type and severity of freeze, location, tree dormancy, tree vigor, scion and rootstock, crop load and grove and soil conditions. Citrus is essentially not injured unless ice is formed in the tissues. Ice formation is usually accompanied by disruption of cell membrane which produces the damage. Ice in the leaves is indicated by dark water-soaked areas on the surface. Such areas may or may not turn brown after thawing. Completely frozen, killed leaves appear bleached brown in color. New succulent growth, when frozen, will often turn blackish in color instead of brown upon thawing. Leaf fall within a few days indicates that the wood is likely not killed, while leaf retention on the twigs usually indicates wood kill. Wood damage can be checked by scraping the outer layer of bark. Apparently green tissue in most (but not all) cases indicates live wood, and brown tissue, dead wood. Totally frozen trees will be covered with curled and brown leaves within 2 to 3 days of the freeze. Ice may also occur in wood and result in bark splits, particularly in young trees. Such splits may be extensive in larger trees resulting in serious trunk injury. Trees may also develop freeze cankers -- local areas of bark killed on the limbs and trunks. Scraping the bark away will reveal dead phloem areas. Such cankers will frequently appear in the crotches and on exposed limbs particularly following advective freezes. In future years such limbs may die or break off as a result of the canker. New growth developing on freeze-damaged trees following freezes will often collapse as the wood behind the growth dies. Hence the recommendation not to initiate pruning operations until the extent of the damage is determined. Varieties such as Pineapple oranges and Murcotts, when heavily laden with fruit, will often sustain severe freeze damage while similar trees when lightly cropped or without fruit following harvest, will tolerate freezes well.

Archival copy: for current recommendations see http://edis.ifas.ufl.edu or your local extension office.
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**Leaf fall.**

**bark splits.**

**freeze cankers.**

**FRUIT INJURY**

Fruit severely injured during a freeze may drop over time but usually its external appearance is not significantly changed. Temples and grapefruit are particularly susceptible to drop, while oranges are often retained on the tree for longer periods. Certain cultivars such as Murcotts and grapefruit may show dark or reddish-brown depressions, pockets, or pitting on the peel surface. Blemishes in the form of pitting may occur on the peel of grapefruit as a result of low, but nonfreezing temperatures, known as "chilling" injury. Following severe freezes, fruit usually show extensive internal injury which progresses with time. Thin-skinned fruit usually show greater internal injury than thick-skinned cultivars such as grapefruit. The first evidence of freeze injury is the presence of water-soaked areas on the segment membranes with the juice sacs or vesicles in injured areas subsequently becoming dry and collapsed. During the freeze and shortly after, cutting the fruit progressively from the outside to the inside starting at the stem end will show the amount of ice formed and its location. The deeper the ice, the greater the severity of injury. The frozen area will eventually dry out leaving the injured fruit partially hollow and lighter in weight than sound fruit of comparable size. Juice loss occurs over a period of several weeks with the extent of loss being dependent on damage severity and weather conditions following the freeze. The formation of white crystals of hesperidin on the membranes of the fruit is also a symptom of freeze injury but in no way detracts from its eating quality.

**Temples.**

**pitting.**

**extensive internal injury.**

**INFRARED PHOTOGRAPHY**

At the present time aerial color infrared (ACIR) photography can detect freeze damage in both foliage and fruit. Knowing the amount of freeze damage in foliage can help the experienced citrus grower estimate the amount of limb dieback. Using ACIR...
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hesperidin.

Photography after a freeze to determine the location and amount of freeze damaged fruit can be extremely important to a grower. Within hours, instead of days, a grower can determine in which groves or sections of groves fruit must be picked quickly for processing. Fruit in the remaining sections of the groves can be held on the trees for a better price.