

AVOIDING COLD DAMAGE TO CITRUS

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Citrus are subtropical plants. When frost or freezing temperatures are predicted, precautions must be taken in order to minimize damage to the trees and fruit.

Irrigate now!

If your ground is not wet now, and you have irrigation water, **irrigate well** to be sure your ground is wet. Wet ground will maintain its temperature and moderate air temperatures above it, whereas dry ground can contribute to frost/freeze damage. Irrigation can make a difference of 1-2 degrees. A well-watered tree is more cold tolerant than a dry one.

Cold Hardiness

Satsuma mandarins on Trifoliolate rootstocks are the most cold hardy mandarins, mature trees can withstand temperature down to 15 or 16° if they have had a chance to acclimatize. Clementines and other mandarin varieties are slightly less cold hardy, as are other rootstocks such as C-35 and Carrizo. Oranges and lemons are also less cold hardy than mandarins. General cold

hardiness for mature trees:
kumquat (18°) > Satsuma
mandarin (20°) > Meyer lemon
(22°) > oranges (Navel, blood,
etc.) (24°) > grapefruit (26°).

Citrus trees should be fairly well hardened to the cold now. A gradual adaptation to the cold (hardening off) has happened so trees are as protected as they can make themselves.

Leaves, green wood, and fruit are more cold sensitive than hard wood. In general, hardened mandarin leaves can tolerate up to 4 hours at 20° before serious damage occurs.

Remember that the amount of time at low temperature is critical. For example, mandarin fruit will withstand a brief drop to 24°, but several hours at 26° will damage it.

Ripe fruit is more tolerant of cold than unripe fruit because the soluble solids (sugars, etc.) essentially act as antifreeze to decrease the temperature at which the liquid will freeze.

However, fruit are more sensitive to freeze damage than

the wood or leaves. Pick any ripe fruit on the tree as soon as possible. Trees with fruit on them are less cold hardy than trees without fruit, so taking as much off as possible will help protect your investment in the trees.

Protecting Young Trees

If you have young trees – 1-3 years old, you should consider some type of protection if you are in a cold area. If you are covering them, a cover should:

- Entirely cover the plant but not touch the foliage.
- Extend as far to the ground as possible.
- Be removed the next morning once temperatures rise.

You can also install Christmas lights on the trees to increase the temperature around the trees.

Row cover may be a good option for rows of small trees. However, plastic that touches the foliage may actually cause more damage because of condensation and subsequent freezing that can occur.



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Sprinklers

Either overhead or micro-sprinklers can be used for frost protection. For microsprinklers, you must have adequate water to deliver a minimum of 20 gallons of water per minute per acre. Higher volumes are better.

Microsprinklers can give you several degrees of protection by warming the air beneath the tree with water that is warmer than the air. You are not looking for ice formation, but a continuous application of water that is warmer than the air.

Overhead sprinklers

Think carefully before you decide to use overheads for freeze protection. Overhead sprinklers need much higher volumes of water, so be sure you have enough water. It is also critical to understand how overheads work in freeze protection, so that you do not cause more damage than leaving the trees unprotected.

Ice does not protect the tree-- protection results from the continuous freezing of the additional water applied. As new water is applied and freezes, the ice layer gets thicker and thicker --but the temperature of the tissue under the ice layer is maintained at or just below the freezing point. If the water supply is interrupted, the temperature of the tissue beneath the ice will quickly

drop, usually to levels below air temperature, and remain there until the ice melts, causing more damage.

If you do use overheads, **you must start before the air temperature reaches freezing and continue until ice in the shade outside the orchard begins to melt.** So you need a LOT of water.

Cloud cover and other antitranspirants:

The consensus among researchers and farm advisors is that these do not give any frost protection. Thus, they are a waste of money.

Comments from a Farm Advisor in the Valley on Antitranspirants:

Ask the vendor to provide you with the reference for the valid scientific research paper where they found 4°F of protection by using an antitranspirant. It does not exist.

The polymer spray is supposed to be an antitranspirant, which has little or nothing to do with the mechanisms of frost damage. Frost damage occurs because ice crystals form in the intercellular spaces in the plant tissue. This draws water out of the cells and causes dehydration and cell wall damage. It is not related to transpiration, which is extremely low on a frost night.

The only possible positive effect of the spray would be if the polymer had an effect on ice-nucleating bacteria. Then it could potentially be beneficial I, however, have never seen any research on that topic. Until the company provides the results of a valid statistical trial on the effectiveness of the polymer spray on frost damage, then they have no leg to stand on.

After the cold...

- **DO** remove frozen fruit as soon as possible.
- **DO NOT** prune freeze-damaged trees until the extent of the cold damage has been determined – usually at least until spring when the weather warms.
- **DO** reduce your irrigation and fertilizer in the spring if you do have freeze damage. An excess of either can cause further damage.