

# What Happens to Plant Tissue During a Freeze Event?

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**Supercooling** = When the liquid phase of a tissue drops below its freezing point without the formation of ice crystals

- i.e. temps are below freezing but the tissue does not freeze.
- accomplished through the presence of osmotically active solutes
- can get deeper supercooling at low dew points (or... with heavy dew, the condensation of water from the air [with low solute concentration] on tissue will form ice crystals at a higher temperature and propagate to the apoplast).

**Intercellular Ice Formation** = water freezing between cells and in cell walls only

- Ice nucleation temperature to the High-temperature exotherm
- Release of energy from the latent heat of fusion of water
- Initially Non-lethal
- Duration dependant on continual freezing of water and release of heat
  - Only about 10-15% of tissue water is in the apoplast.
  - Basis for using sprinklers for freeze protection.
- Dehydration of symplast is the most common cause of injury**
  - Apoplastic water freezing increases solutes outside of cell and pulls more water out of the symplast across the cell membrane. (same process as ice wine)

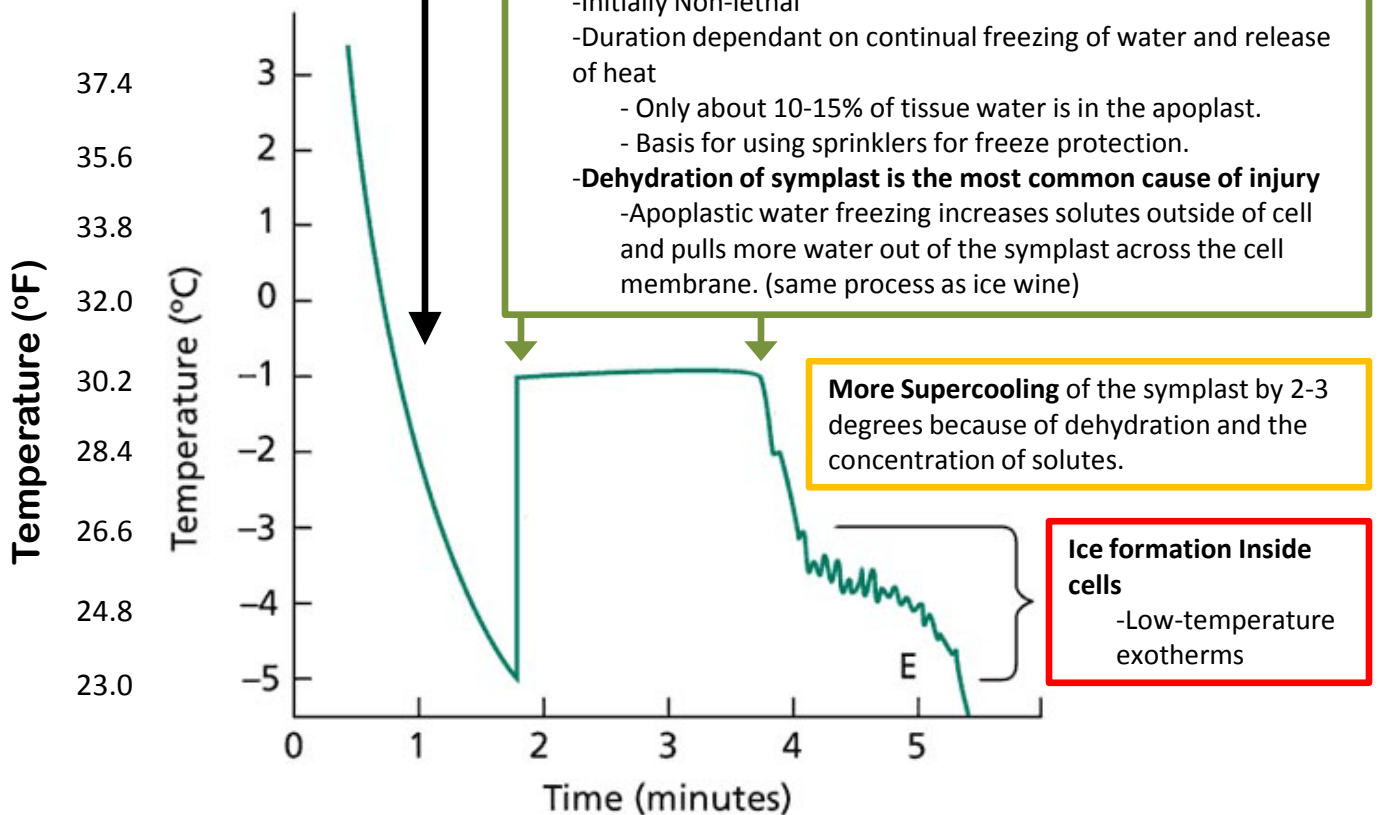


Chart from *Plant Physiology* by Taiz & Zeiger

Bud scales and down form extraorgan "ice sinks"

Less water -----More Water

Floral tissues do not supercool but they do resist dehydration during extracellular ice formation

