

Improving frost tolerance

Plants are most susceptible to frost damage in spring

Tree and vine crops in particular are very susceptible to frost during flowering and early season growth. Frost at flowering can have a particularly devastating effect on crop yields and profitability.

Frost damage is affected by many factors with some crops damaged sporadically and not all plants will show obvious symptoms.

Frost damage results from the formation of ice crystals inside plant tissue (not individual cells). The formation of ice crystals draws water out of the cells and dehydrates them, which causes injury to the cell.

Temperature Thresholds for damage

When fruit trees and vines are dormant, and their buds are tightly closed, subfreezing temperatures generally don't cause harm. Once buds swell and sap flows in the tree & vine, the buds become increasingly vulnerable to damage from frost.

Fruit Trees

Temperature thresholds are quite consistent among species of fruit trees.

When a bud opens to reveal green tips, it is still fairly resilient and only killed when temperatures reach the -4.5 to -9.0 °C range. Once the bud reveals petals, but hasn't opened, it may survive temperatures down to about -4.5°C without detriment.

Open flowers on fruit trees begin to die at -2.2°C, with most killed all across a tree if the temperature drops down to -4.0°C.

Grape Vines

Vines for example can tolerate -3.5°C at woolly bud stage, but only -0.6°C with shoots to 15cm long.

Some areas of an orchard or vineyard will be much colder than regional temperatures; longer duration and multiple frosts increase tree and vine susceptibility.

Protection against frost

Apart from the physical things that can be done to protect a crop from frost (fans, irrigation, etc) there are products that help improve a crops tolerance to frost.

Super Kelp and Vitazyme improve crop tolerance to frost. They are generally considered to offer an extra degree or two tolerance to frost; although some information suggests as high as 3-4°C.



Australian Growers have been using Super Kelp extensively to improve frost tolerance.

- Lowers the temperature at which cells will freeze This is because it is a highly effective brix builder. Plants with higher sugar content have a lower freezing point
- Cytokinins & Betaines increase turgidity of cell walls ie water less likely to flow out of cells
- Acts as "anti-freeze" - research suggests seaweed has digests that trigger the hardening off response plants have in winter



Two key active agents in Vitazyme improve plants tolerance to cold stress.

Triacontanol increases the content of photosynthetic pigments which has been shown to improve the tolerance of crops to cold stress.

Brassinosteroids - improves antioxidant enzymes and proline content which has been shown to improve growth under chilling temperatures.

There are over 500 International & Australian studies showing improved growth with Vitazyme.

Independent International Research papers support what we see on the ground. Call us for a copy ...

- Khan W et al, Seaweed extracts as biostimulants of plant growth and development. *J Plant Growth Regul* (2009) 28:386 -399.
- Rayirath P et al, Lipophilic components of the brown seaweed enhance freezing tolerance in *Arabidopsis thaliana*. *Planta* (2009) 230: 135-147.
- Wilson S, *Frost Management in Cool Climate Vineyards*. Grape and Wine Research Development Corporation 2001.
- Borowski, E, Response to chilling in cucumber plants treated with triacontanol and Asah SL. *Acta Agrobotanica* Vol.62 (2): 165 - 172
- Fariduddin, O, 28 Homobrassinolide improves growth & photosynthesis in *Cucumis sativus* through an enhanced antioxidant system in the presence of chilling stress. *Photosynthetica* 49(1): 55-64,2011.

Program to Improve your crops tolerance to frost

The first application, via foliar spray, should be made at least 36 hours before the expected frost; repeat every 10-14 days during susceptible period.

- Super Kelp 5L/ha; in 1,000L water, or
- Vitazyme 1L/ha; in 1,000L water

Both can be mixed with 0.5% MKP fertiliser to help strengthen plants.

Speak to us now about getting the most from your crop this season