

liquid logics

agronomy update

Liquid Logic No. 0010

August 06, 2007

Potassium and Frost damage prevention

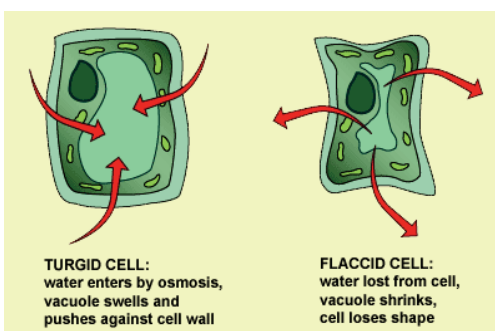
Are you concerned with frost damage this season? Do you want to improve your tree or vine resistance to frost damage?

Spring last year provided some of the most devastating frosts across the fruit growing regions of Australia. This year we have already had some cold snaps and now we are coming into the frost risk period it is time to consider your options with frost protection.



Severe frost (-5°C) in vineyard in Barmera SA 15/6/07

Frost damage to crops is not the result of cold temperature but is the formation of ice crystals inside plant tissue (not in the individual cells). The formation of ice crystals draws water out of the cells and dehydrates them which causes injury to the cells.


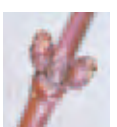

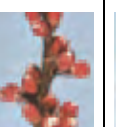
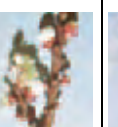

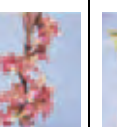



Elevated levels of potassium in the plant have been shown to induce a greater tolerance of frost in many crops. Potassium plays an important role in a plant's ability to withstand extreme cold and hot temperatures. This is because potassium is responsible for the plants regulation of water use, as it affects water transport in the plant, maintains cell pressure and regulates the opening and closing of stomata. If the plant can regulate the water lost through respiration, this reduction in moisture loss by the plant raises the level of turgidity in the plant, which has been shown to assist the plant in surviving periods of freezing.

Prolonged cool weather will tend to increase bud hardiness during the early stages of bud development. A combination of the susceptibility of the plant and the growth stage determines the temperature at which ice will form inside the plant tissue and when damage occurs. The amount of frost injury increases as the temperature decreases and the temperature corresponding to a specific level of damage is called a "critical temperature". The critical temperature can be used as a guide to forecast potential frost damage at different growth stages.

Source: Washington State University Extension Bulletin 1240

Critical temperatures(°C) for blossom buds: **Apricots**

Bud development stage	First swelling	Tip separate	Red calyx	First white	First bloom	Full bloom	In the shuck	Green fruit
								
Ave. Temp for 10% Kill	-9.4	-6.6	-5.5	-4.4	-3.9	-2.8	-2.8	-2.2
Ave. Temp for 90% Kill	---	-17.8	-12.8	-10	-7.2	-5.5	-4.4	-3.9

Critical temperatures(°C) for blossom buds: Grapes

Bud development stage	First swelling	Tip separate	Bud burst	First leaf	Second leaf	Third leaf
Ave. Temp for 10% Kill	-10.5	-6.1	-3.9	-2.8	-2.2	-2.2
Ave. Temp for 90% Kill	-19	-12.2	-8.8	-6.1	-5.5	-3.3

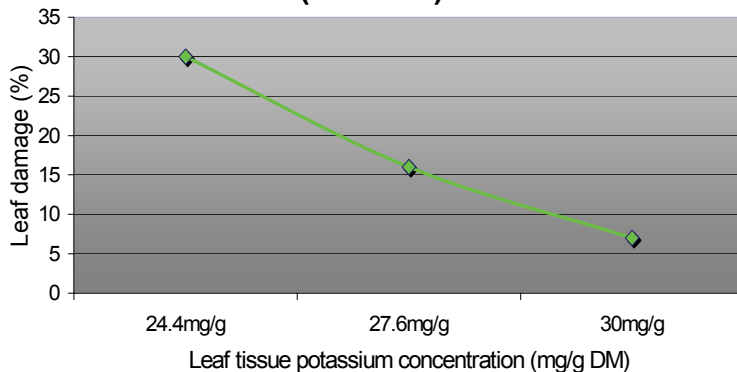


Source: Washington State University Extension Bulletin 0913

Potassium's anti-transpirant role works as passive frost protection

Studies have shown that increased potassium levels in the soil and in the plant tissue have significantly reduced frost damage in crops. Several experiments conducted in India on potatoes have shown that application of potassium fertiliser post flowering in depleted soils significantly reduced the frost damage and increased the yield. This was replicated by other researchers and they have also concluded that frost damage is significantly related to the plants response to potassium application.

Effect of increasing potassium leaf tissue concentration against frost damage (Potatoes)



Source: Grewel, J.S and Singh, S.N (1980) Plant Soil 57.

Potassium application considerations

Timely application of potassium is important for it to give preventative frost protection because once potassium deficiency symptoms are present, the plant's ability to withstand stress conditions, such as frost are diminished and it is too late. Another consideration with pre flowering fertiliser application is that excess nitrogen can inhibit the uptake of potassium and so should be avoided on frost susceptible crops during winter.

Agrichem's potassium solutions

Supa K 30 is 30 % readily available potassium in a unique citrate liquid form for fast uptake. With the potassium in this form it has a major advantage over the inorganic salts such as muriate of potash and potassium sulphate. The citrate molecule, which is found in all plants, is immediately recognised and completely assimilated by the plant. Another potassium option is **Agri K 415**, which is 41.5 % potassium in the potassium carbonate form.

For any further queries about potassium products, their application rates or compatibilities please contact your local Agrichem representative or the agronomy team on 1800 654 758.

