

Not another frost!

By ADAM WILLSON

HOW MANY FROSTS WILL IT TAKE before farmers and the agricultural industry begin to ask the question: why does a plant freeze during a frost? Is it my bad luck or can my management, in fact, have something to do with it? Should I continue in the way I'm currently farming or should I change direction? These are big questions indeed and financial success depends on finding the right answers.

Incidents increasing

It seems now, more than ever, producers are exposed to unseasonal frosts and cold airstreams. We are now seeing early autumn and spring frosts that affect a wide range of grain, vegetable, fruit, pasture and viticultural crops across Australia. Nowhere seems to be safe from this deadly problem.

The process

In most crops, frost damage starts long before the visible signs appear. Frost damage first occurs when the plant sap cools and begins to crystallise. Plant sap is the liquid found in the leaves and stems of every plant and is responsible for the movement of nutrients and dissolved solids (solutes) to and from the leaves and roots.

Frost damage commonly occurs in lighter soils (as they dry faster) and drought-affected soils, recently cultivated soil and low-lying areas. Once this rapid cooling begins, the flow of water in the plant stops and cell walls begin to burst from the expanding freezing sap.

An experiment

The temperature at which crystals form inside the plant is dependant on the type and amount of solutes (mineral and organic compounds) in the sap. These solutes in turn are affected by every farm manager's soil and plant nutrition programme.

As a practical illustration every farmer should try this experiment at home. Find two old glasses and fill them with water. Put 12 teaspoons of sugar in one (equivalent to your local cola drink). Place



both of these glasses in the freezer and observe them every 15 minutes. Which is the one that freezes first? The glass of water, of course.

This practical demonstration is exactly what happens in the sap of every plant. If the mineral and organic compound concentration in the sap falls, it will be more prone to drops in temperature. It's not going to protect your crop from a black frost but it can give you protection of up to six degrees celsius. While no one can control the climate, the question which farmers should be asking themselves is: what can I do to minimise frost risk in the future?

Some control over the effects of the elements can be regained by working on increasing the resilience of the farm. All too often farmers will put this question in the too-hard basket.

The too-hard basket

There are a number of practical steps a grower can take to minimise frost damage and increase the concentration of solutes in plant sap.

- The crop must be grown in humus-rich soil. Humus reduces the daily (diurnal) temperature fluctuations in the soil. As nutrient uptake is dependant on soil temperature, humus increases the ability of the plant to uptake nutrients. (Note that organic matter is not humus.) Stable humus is the byproduct of microbes breaking down organic matter. It doesn't move and is insoluble in water. Ground rich in humus is dark, soft and spongy. If you don't know anything about humus I

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Growers and others beware

SOME sources of lime and dolomite contain high levels of heavy metals (in particular, cadmium). When using these products, producers should request a heavy metal analysis from the supplier.

If this is not possible, it is in your interest to send a sample of the product off to a reputable laboratory for full heavy metal analysis.

Examples of such laboratories include AMAL Analytical, phone: (03) 9885 2855; and SWEP Laboratories, phone: (03) 9701 6007.

recommend you find someone who does and hang onto them.

- Every plant releases organic compounds (root exudates) through its roots into the surrounding root zone (rhizosphere). These root exudates help release nutrients and feed the surrounding soil microbes. The more attention a manager gives to adequate and balanced nutrition, the more root exudates that will be produced. As a result of these interactions, plants are able to absorb many nutrients, amino acids and vitamins from the soil. This adds to the ability of a plant leaf to increase its solute concentration and minimise the effects of frost. What is critical here is the right balance of cations (calcium, magnesium, potassium etc) and anions (sulphate, chlorides etc). (Failure to address this can reduce your production by up to 60%.) This is a key feature which is generally the differentiating factor between an excellent organic grower and an average grower.

- Certain organic foliars dramatically increase leaf solutes when applied with the right wetting agent. They can enter the plant within as little as four hours and can last for up to 23 days.

The lap of the gods

Frost damage in Australia costs the agricultural industry more than \$60 million per annum. The organic industry is not immune from this and I have heard of many growers who have lost whole crops. What is even more alarming is the effect of cold harsh conditions leading to reduced yields.

How much loss can you afford? This is a problem that can be addressed using sound organic principles and good management.

The issue of frost is no longer in the lap of the gods; it's in your hands. ☺

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