TECH SHEET 4

# FROST MANAGEMENT

Frost damage can be severe on avocado trees when temperatures drop below -2°C for extended periods of time. Frosts during flowering can also be very harmful to fruit set. This fact sheet describes the effect of frost and the options available to minimise the effects of harmful frosts.

## Susceptibility to frost damage

Avocado trees are most susceptible to frost damage following a warm autumn or winter followed by severe cold spells. Trees suffering from any stress, low nutrition, root rot, heavy crop load or sixspotted mite, will be more prone to frost damage. Healthy trees with a dense leaf canopy and a high carbohydrate status are hardier to cold than malnourished or diseased trees. Young trees are affected more by frost than mature trees and it is important to protect young trees with good tree shelters. Trees with predominantly Guatemalan parentage, i.e. Hass and Reed, should not be planted in areas where the temperature is likely to drop below -2ºC. Trees of mixed Mexican and Guatemalan parentage, i.e. Bacon, Fuerte and Zutano, are more cold tolerant than Guatemalan cultivars.

## Tissue susceptibility to frost damage

The order of tissue susceptibility to frost damage is: anthers, buds, fruit stalks, leaves, fruit then stems.

*Bud damage*

Even if the trees show no obvious sign of frost damage the new flowering buds can have been killed by the frost. Buds affected by frost will have a brown centre indicating they are dead. Frost damaged trees will drop leaves and fruit. These trees should not be pruned until spring when the full extent of damage will be known. The exposed branches in defoliated trees should be whitewashed as soon as possible to avoid sunburn.

### Light frost damage (~ -1ºC)

Symptoms: Light bronzing on leaves, but fruit stalks light yellow or green (healthy). Flower buds likely to be damaged but the tree will continue to carry the current crop.

*Light frost damage with mild bronzing of leaves, flowers are unaffected deep within the canopy.*

*Above: Browning of leaves. Right: Browning of fruit stalks.*

### Moderate frost damage (~ -2ºC)

Symptoms: Bronzing of leaves, browning of fruit stalks, some bronzing of fruit surface.
Trees are likely to drop most of their fruit. These fruit will be unmarketable. Flower buds are damaged and flowering will be very poor in spring. Trees should be given a light prune in spring.

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### Severe frost damage (less than -3º C)

Symptoms: Leaves severely bronzed, browning of fruit stalks, fruit with some bronzing, stems may show signs of damage.

All flower buds have been killed and there will be no flowering likely in spring. Young, 1 year old wood is likely to have suffered frost damage. Trees should be pruned back to 2 year old wood in spring. The trees will be out of production for at least two years.

*Fruit and small branches*

*Young trees*

*Bud damage.*

## Frost management options

Cold air tends to flow like water and will build up in hollows and where there are obstructions to its movement such as behind a shed on a slope. Look for areas on the orchard where cold air can accumulate.

## The effects of frost can be minimised by:

**Avoiding frost prone sites** – the best sites are those that have a northerly aspect, with a gentle slope and no hollows. Having gaps in shelter belts will allow cold air to drain away particularly in low altitudes.

**Ensuring high leaf health** – leaves that are glossy and are a dark deep green colour will have high leaf nitrogen and can therefore tolerate cold temperatures better than yellow stressed leaves.

**Wind machines** – can be used to mix warm air from an inversion layer. However they do require resource consent and an initial capital outlay. Alternatively helicopters can be used instead of wind machines. Neither wind machines nor helicopters will be effective when there is no inversion layer.

**Water sprays** – can effectively be used through the release of latent heat in the plant as the water on the leaf surface freezes. However this requires a large volume of water and could potentially water log tree roots.

**Orchard heaters** – are used to directly heat the air through radiant heat. They can be either fixed or mobile. They can be expensive to run and the area heated is generally limited.

**Herbicide strips** – by ensuring the earth around the trees is kept bare this can act as a heat sink and increase the temperature in the immediate vicinity of the tree.

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