



## Flooding and Avocados

The North Island has experienced substantial and prolonged rainfall. Some areas have had record rain, with some events delivering rainfall in excess of 500mm in one week. Growers have reported flooding and/or standing water in orchards. In some cases trees are starting to wilt.

Avocado trees have a relatively shallow root system that spread slightly beyond the tree canopy – the drip zone and about a meter beyond.

Avocado roots:

- are extensively suberized (become very “corky”)
- have low hydraulic conductivity
- have no root hairs
- have very poor water uptake capabilities
- are sensitive to low soil oxygen concentrations.

These characteristics make it one of the most susceptible fruit trees to soil flooding.

We are concerned that growers don't understand the subtle differences between *Phytophthora* root rot symptoms, inundation (flooding) damage and *Verticillium* wilt.

**Verticillium wilt** is pathological and caused by the fungi *Verticillium dahlia*. There are other *Verticillium* fungi which also cause wilts but they don't affect avocado. This fungus causes trunk rather than root damage, the fungi blocks the xylem system in the trunk and causes the tree to wilt. This type of wilt is sometimes also caused by another fungus called *Fusarium*, which in New Zealand seems to mostly be associated with young orchards. This type of wilt is always triggered by some stress event (water, drought, cold or heavy flowering). There is no fungicidal cure!

**Phytophthora root rot** damage is a slow “creeping” type damage to the root system and the tree takes a period of time to decline. The damage is pathological (it is caused by a pathogen – in this case the fungus *Phytophthora cinnamomic*). The timeframe for root rot to develop and damage avocado trees is months to years. *Phytophthora* fungus thrives in soil conditions that the avocado tree struggles with. These are usually some sort of combination of continuously wet, water logged, compacted and anaerobic soils (very low oxygen). The avocado tree cannot physiologically survive in these soil types.

**Inundation or flood** damage is different. The damage is physiological and usually happens very quickly (days and weeks). When soils (even very well drained soils) are continuously exposed to continuous rainfall over many days the soils become and remain saturated. Under these conditions the soil environment becomes temporarily anaerobic. The non-suberized root tips die! The tree is then unable to take up water and the tree then wilts. The youngest new flush is the most seriously affected and shows the most intense wilt. The

tree also draws water from fruitlets which become spongy. Depending on the time of the year there can be excessive, even total fruit drop.

The suberized portion of the root system survives and new root tips can grow again. However, if the tree wilt is too severe (too much root damage) and the tree totally desiccates then the tree will die.

The water stress that the tree experiences is counter intuitive in that there is water everywhere and yet the avocado tree is literally dying of thirst. There are a number of inputs that can be made to help reduce water loss:

- urgent and severe pruning back of the tree is so important after a “drowning” event. The Florida literature recommends 1/3 to 2/3 of the “canopy” be removed depending on the severity of the rainfall event. It is essential that the sessile (dormant) buds in the tree trunks and major limbs do not desiccate as these buds are essential for new growth.
- Application of an anti-transpirant such as Haven to reduce internal water stress
- Apply foliar stress reducers such as Stimplex.

Additionally there are additional orchard inputs that arise from a flooding event, namely:

- A round, or two, of Foschek injections to prevent *Phytophthora* root rot from aggressively colonising the now weakened root system
- A revision of the fertiliser programme for the balance of the year
- The addition of some foliar nitrogen to help boost the trees aimed at trees with dysfunctional root systems.

## Injecting

Phosphonate once injected into the tree is transported in the xylem up to the leaves and then down to the roots in the phloem. Once in the roots it will protect against the colonization of *Phytophthora* which cause the roots to rot.

### Signs of Phytophthora

- Small light green to yellow leaves
- Defoliation causing a skeleton like canopy.
- Dieback starting at the top of the tree.
- Small fruit and a reduced fruit set
- Brown feeder roots instead of white
- Longterm - you get an unproductive tree and then ultimately death

### Injection timing (not quite what the label says)

- Inject all your trees again in Late Winter (July August)
- Inject all your sick trees once in Autumn (February to April)
- Make sure you leave at least 4 weeks between injecting and pruning.

### How to inject

Low pressure syringes need to be spaced evenly around the base of the trunk avoiding the old injection sites. Each syringe contains 20ml of either a 7%, 10%, 15% or 20% solution depending on the trees size and health (refer to the table). We recommend mixing the chemical and prefilling all your syringes before starting.

Using a 6mm drill bit, drill your holes 30-40mm deep in a slightly downwards angle. Work on spacing syringes a hand width apart (10-15cm) or one syringe per metre canopy diameter. On young trucks only drill 10-15mm deep as the outer bark is thinner. The chemical will not move laterally, so spacing the syringes correctly is important. If injecting is not done properly, some of the root system will not be protected. If your tree has multiple large trunks you must treat each trunk as its own tree. On horizontal limbs space your syringes around the top and sides of the truck, keeping the syringe plunger higher than the tip. Insert your syringe into the hole making sure the tip is at the lowest point. Pressurise the syringe by pushing the plunger down until you feel resistance. Turn the plunger ¼ clockwise to lock it in place. The fluid should all be taken up in 6-8hrs, if it hasn't repressurise and leave for 24hrs or move the syringe to a different location.

### Reasons the solution hasn't been taken up

- Dry hot days or overcast/wet days are not the best times to inject as the tree won't be actively transpiring to take up the solution.
- The area you drilled may be a dead area of xylem e.g. sunburned, old drill hole, etc
- Drilling too deep. Especially common in young wood due to the thinner outer bark and active functional xylem being closer to the outside of the limb.

40% Stock Solution (eg. Foschek & TreeDoc)				
Concentration % w/v	7%	10%	15%	20%
Used for	Young healthy trees	Young sick trees	Old healthy trees	Old sick trees
Amount of 400g/L	175ml	250ml	375ml	500ml
Amount of Water	825ml	750ml	625ml	500ml
Total Volume	1Lt	1Lt	1Lt	1Lt
60% Stock Solution (eg. Agrifos600)				
Concentration % w/v	7%	10%	15%	20%
Used For	Young healthy trees	Young sick trees	Old healthy trees	Old sick trees
Amount of 600g/L	120ml	166ml	250ml	333ml
Amount of Water	880ml	834ml	750ml	667ml
Total Volume	1Lt	1Lt	1Lt	1Lt