

Is application of chemicals a necessary evil in the health management of urban trees?



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Overview

- Examples of urban tree health disorders – Perth, Australia
- Complexities of the causes
- Diagnosis & treatment of disorders
- Positives & negatives of treatments
- Treatment trials



Urbanisation in Western Australia

- Many examples – poor urban planning
- Disregard & lack of knowledge of tree health issues
- Many trees are ex-woodland
 - compromising root systems
 - increased exposure
 - risk of wind throw
- Impacts of urbanisation result in increased stress
 - vulnerability to pests, pathogens, nutrient deficiencies
 - Many new plants infected by pathogens
 - Mulch may be affected
 - Soil can be contaminated



Mechanical & pruning

- Usually avoidable – training & preparation
- Tree policies & urban planning
- Inappropriate equipment & personnel
- Increase susceptibility to pathogens/pests



- Spread of pathogens
- Premature decline & death
- Huge increases in cost

Herbicide damage

- Use can be avoided ie. create buffer zones, use mechanical
- Many are very toxic & residual (many unknown in diff. soils)
- Can cause loss of fine roots, loss of mycorrhizae
- Symptoms can be very similar to nutrient deficiency
- Interveinal chlorosis, foliar discolouration, crown thinning



Nutrient deficiency/toxicity

Can be caused by many factors

- compaction
- reduced transpiration
- fertiliser application
- disease
- pests
- mechanical damage
- damage to the root system





Insect attack

- Usually cyclical/seasonal
- Response to trees showing stress
 - ie. water deficit
- Annual defoliation & ‘flagging’
 - can lead to premature death
- Decay fungi can follow
- Many insecticides very nasty
 - toxic to beneficials/bees
 - i.e. (imidacloprid / confidor)



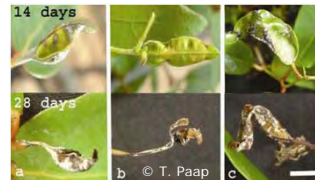
Root & basal stem pathogens

- Major genera include *Phytophthora*, *Armillaria*, *Phellinus*
- Spread by soil and plant material & root to root contact
- Urban conditions favour spread & infection
- Can be very aggressive
- Hygiene extremely important
- Contaminated mulch



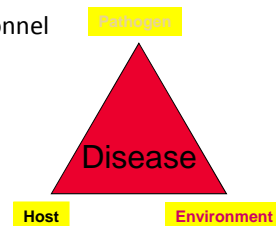
Stem & foliar pathogens

- Some are latent (*Botryosphaeria*)
- Some primary (*Mycosphaerella*, *Quambalaria*)
- Cause defoliation, decortication
- Spread by wind, rain, insect
- Contaminated equipment?
- Control can be difficult & expensive
- Often requires spraying smaller specimens
- Systemic application, some no good
- Breeding for resistance, ensuring optimal vigour



Complex causes

- Correct diagnosis of the cause(s) is critical for correct management
- Many disorders incorrectly diagnosed by unqualified personnel
- “Experts” unable to say “I don’t know”
- Many are not experts at diagnosis
- Different cause same symptom
 - *Phytophthora* can cause nutrient deficiencies
 - Insect/fungal damage can be confused
- Wasted money, loss of trees, avoidable use of chemicals



When treatment is an option

- In cases where pruning will not work and tree is moving into a steady state of decline or at risk of premature death
- If you are trialling new treatments for disorders
- No other options
 - In urban areas often limited
 - Access to root zone, chemical exposure, spray drift
- Decline due to pests, diseases, lack of nutrients
- Cost Benefit analysis often required
 - Invasive treatments OR premature death & removal
 - Treatment often inexpensive relative to pruning/removal
- Use as a preventative often more effective
 - ie. Phosphite & *Phytophthora*
- Sometimes treatment not suitable due to risk of stem failure

Develop a Strategy

Apply the Treatment

Evaluate the Results

Modify the Approach

 Implementation of the
 Pest/Pathogen Control System

Modes of treatment (negatives)

- Spraying & drenching
 - Increase exposure risk due to mixing, spray drift, residual in soil
 - Limited uptake and efficacy
 - Requires access to root system or foliage
 - Often requires expensive equipment
 - Effect on adjacent vegetation
- Injecting
 - Increase exposure risk due to mixing of chemicals, equipment failure
 - Limited by weather and transpiration
 - Can require expensive equipment (sidewinder, many syringes)
 - Forcible injection & drilling can cause damage to the stem tissues & leave open wounds
- Implanting
 - Invasive due to drilling of tree



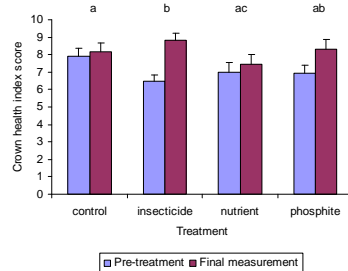
Modes of treatment (positives)

- Spraying & drenching
 - Can treat very small plants
 - Can be used as a protectant
 - Can cover large areas quickly (less so in urban areas)
 - Non invasive
- Injecting
 - No drift and limited exposure once in the tree
 - Rapid uptake (can also be a negative – phytotoxicity)
 - Not dependant on access to roots and foliage
- Implanting
 - No drift and limited exposure once in the tree
 - Does not require expensive equipment
 - Slow release so reduced risk of phytotoxicity & dependence on weather
 - Seals the wound
 - Not dependant on access to roots and foliage
 - No mixing of chemicals and drift – reduced risk of exposure



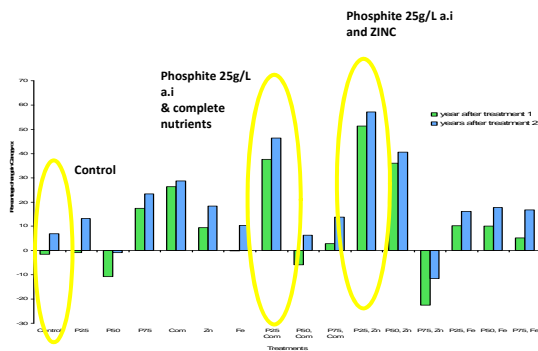
Treatment trials

- Defoliation of *Eucalyptus rudis* from annual attack by lerp psyllid (*Creiss periculosa*)
 - Established trial to determine potential control treatment
 - Treatments
 - MEDICAP MD implants (nutrients N, P, K, Fe, Mn, Zn)
 - Systemic insecticide implants (ACECAP: ai acephate)
 - Phosphite liquid injection (fungicide)
 - Best results from insecticide & phosphite
 - *Phytophthora* also playing a role??



• **Decline of *Eucalyptus gomphocephala* from complex causes**

- Established trial to determine potential control treatment & provide clues to the cause(s)
- Treatments included singular & combinations of:
 - Phosphite liquid injection
 - MEDICAP MD, MEDICAP ZN (zinc), MEDICAP FE (iron) ACECAP implants

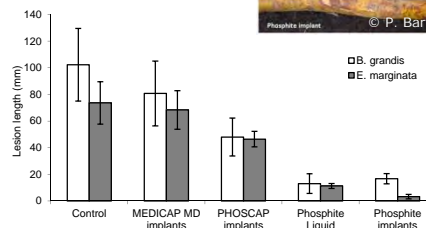


- Preliminary trial
- Best performing treatments
 - Phosphite & MEDICAP MD
 - Phosphite & MEDICAP ZN
- Results since trial show:
 - Correlation b/w decline & zinc
 - New species of *Phytophthora*
 - *P. multivora*

Scott et al. (2009) *Phytophthora multivora* sp. nov., a new species recovered from declining *Eucalyptus*, *Banksia*, *Agonis* and other plant species in Western Australia. *Persoonia* **22**, 1-13.

• **Death of *Eucalyptus marginata* & *Banksia marginata* from *Phytophthora* dieback**

- *Phytophthora cinnamomi* is a major killer of plants throughout the world
 - Big problem in urban & rural landscapes
- Treatment currently commonly used is Phosphite liquid injection/spray
 - Many issues regarding this mode of delivery
 - Equipment, phytotoxicity, weather dependant, labour intensive
- New Phosphite implants developed for research purposes
 - Slow release, minimal equipment, no mixing of chemicals, quick
- Trial included underbark inoculation of tree species with *P. cinnamomi*
- Treatments
 - Phosphite liquid
 - Phosphite implants
 - MEDICAP MD implants
 - PHOSCAP implants (High P, K + trace)
- Best results
 - Phosphite implants & liquid
- Interesting results with nutrients - PHOSCAP



Summary



- Urbanisation is placing increased stress upon trees
- Increased stress – increased susceptibility to health disorders
- Preventative is better than curative – not always possible
- Many agricultural/horticultural treatments not suitable
 - Risk of exposure, lack of efficacy
- Treatments are available
- Better to treat than to watch the tree die
 - Safety issues must also be considered
- Different treatments have positives/negatives
- So yes....at present chemical application is a necessary evil!

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