Seasonal water relations in four co-occurring eucalypt species in southwestern Australia

Pieter Poot and Erik Veneklaas
School of Plant Biology, Crawley WA 6009, Australia

Introduction

- Wandoo is a widespread tree species endemic to SW Australia.
- Since the early 1980's wandoo has been suffering from crown decline.

- The onset of the decline coincided with a marked drop in rainfall.
- Is wandoo more vulnerable to drought then three co-occurring eucalypt species?

M & M

Field site: Julimar State forest ca 100 km NE of Perth

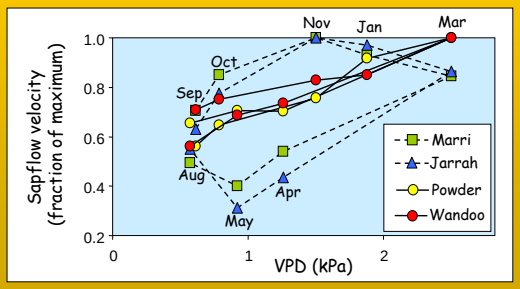
Species: Wandoo (*Eucalyptus wandoo*)
Powderbark (*Eucalyptus accedens*)
Jarrah (*Eucalyptus marginata*)
Marri (*Corymbia calophylla*)

Measurements:

Sapflow (heat ratio method), leaf gas exchange and water potential, local climate

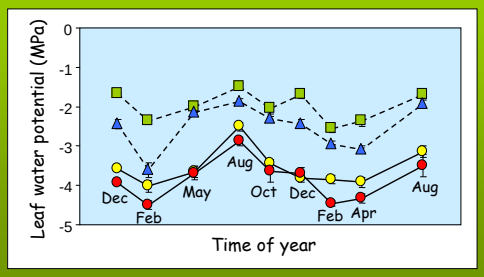
Results:

Seasonal patterns in sapflow (10 am) as dependent on the vapour pressure deficit (VPD) of the air:



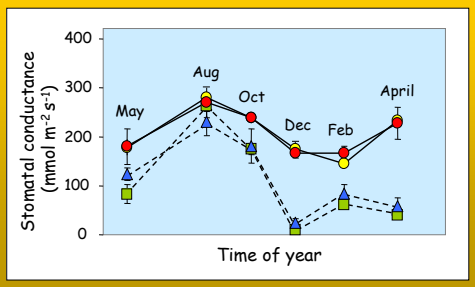
- Water use of Wandoo and Powderbark is related to VPD and is independent of the time of the year
- Water use of Jarrah and Marri is less related to VPD and is strongly seasonal

Seasonal patterns in leaf water potentials (midday):



- Wandoo and Powderbark generally attain much lower leaf water potentials
- During summer, Wandoo attains the lowest water potential of all species

Seasonal patterns in leaf stomatal conductance (midday):



- During winter and early spring all species have similar conductances
- From late spring to autumn Wandoo and Powderbark maintain much higher conductances

Discussion/Conclusions:

- Species from lower rainfall inland sites (Powderbark and Wandoo) are least conservative in their water use
- Their physiology allows them to attain very low leaf water potentials presumably providing access to tightly bound soil water
- During the height of summer Wandoo attains the lowest leaf water potentials, suggesting they are the most stressed at that time
- Chronic drought stress may make Wandoo more vulnerable to insects (wood borers) and fungal pathogens who both have been implicated in the decline
- Is Wandoo crown decline caused by an interaction between climate change, plant stress and vulnerability to insect and pathogen attack?

Government of Western Australia
Department of Environment and Conservation

The University of Western Australia
Faculty of Natural and Agricultural Sciences