DEPARTMENT OF
PRIMARY INDUSTRIES

Matching water application to water use to maximize production and quality of Pink Lady apple in the Goulburn Valley

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The Place To Be

THE UNIVERSITY OF MELBOURNE

CWLM
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Background

Catchment issues

- Horticultural industries have great potential for export growth
- Compared to other agricultural industries, horticulture has superior water use efficiency
- Recent research shown further water savings possible (30%)

Benefits of improved water management in orchards

- Better match water application to water use
- Efficiently achieve yield targets
- Avoid fruit quality losses

Project aims

1. Tree water use (sap flow sensors) is a function of canopy interception of photosynthetically active radiation (PAR)
2. Assess sap flow, trunk shrinkage and canopy temperature as tools to measure water stress for irrigation scheduling

$ET_c = K_c ET_o$ (FAO 56)

ET_c = crop evapotranspiration
(orchard water use)

ET_o is reference crop evapotranspiration
(water use of irrigated grass)

K_c is the crop coefficient
(convert grass to crop water use)

Canopy interception of PAR (previous study)

Aim 1

- Effective area of shade (EAS) is a good measure of canopy intercepted PAR
- EAS is calculated from estimates of area of shade cast by the tree on the soil surface at solar noon and 3.5 hours each side of solar noon
- For peach

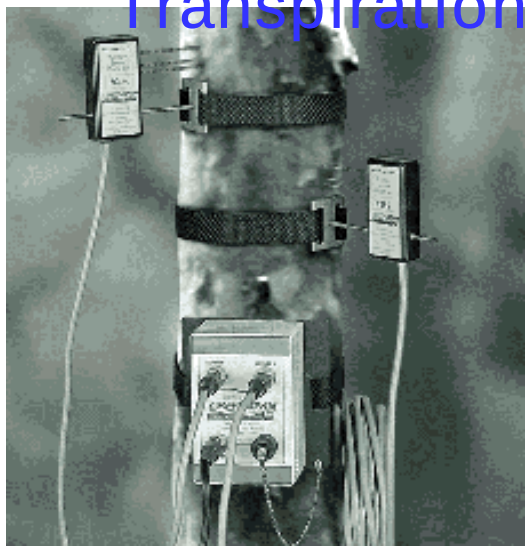
  adjusted Kc = 1.05 EAS (Goodwin and O'Connell 2004)

Plant based tools can indicate onset of water stress

Aim 2

LVDT
- Trunk diameter

Sap flow
-
Transpiration



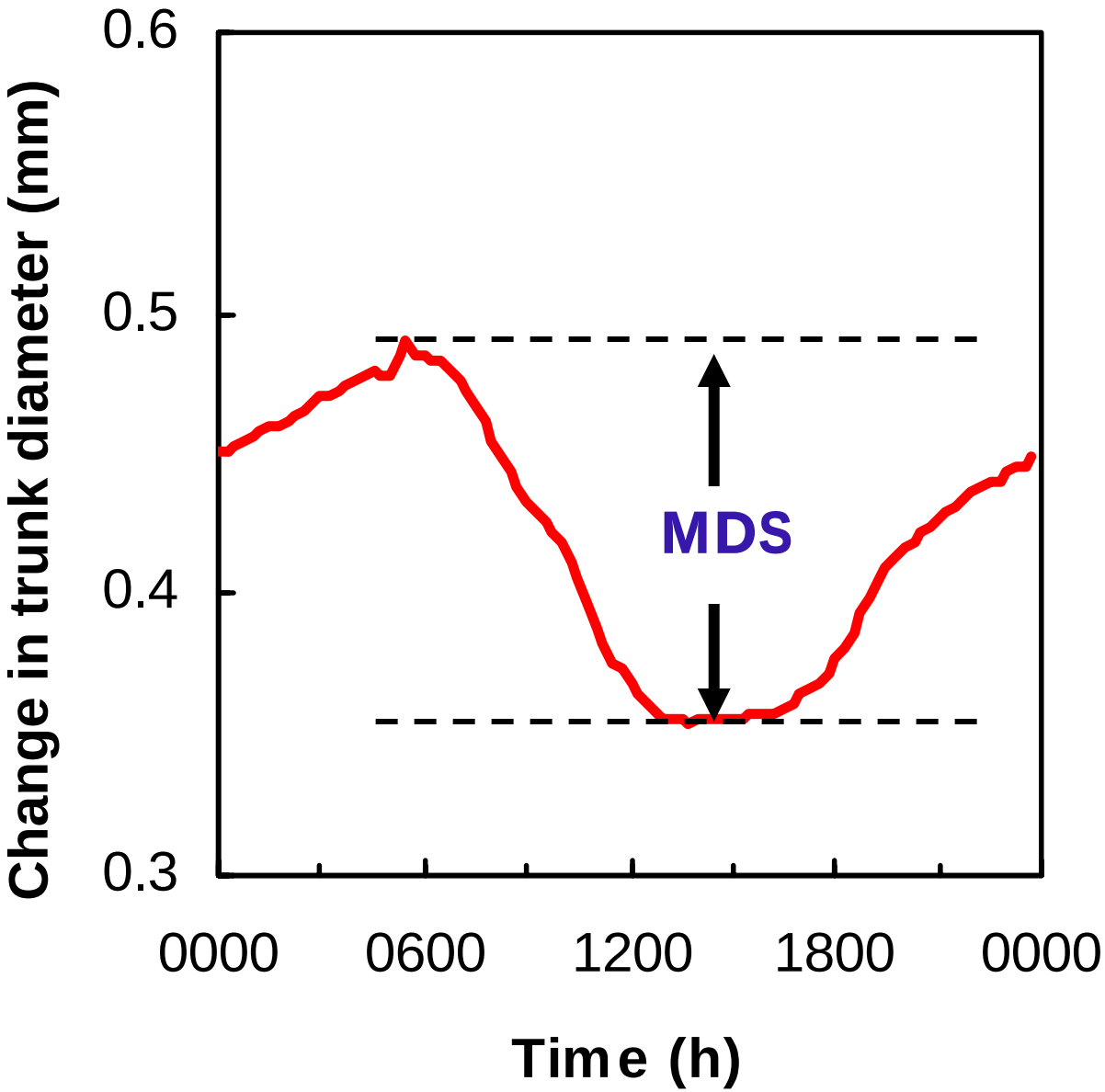
IR Temperature
- Canopy temperature

Aim 2

- Micro-technology in orchards for plant water stress
  - LVDT
  - Sap flow
  - IR Temperature
- Traditional plant based indicators of water stress
  - Effective area of shade
  - Shoot growth
  - Fruit growth
  - Midday stem water potential
  - Midday leaf conductance


Tree water stress (trunk shrinkage)
Tree water use (sap flow)

Aim 2


0.6
0.5
0.4
0.3
Change in trunk diameter (mm)
MDS
0000
0600
1200
1800
0000
Time (h)

Irrigation Experiment

Mt Major Orchard
Dookie Estate

Pink Lady Apple

Micro-jet
M26 rootstock
Planted 1996
4.5 x 2.5 m
Central Leader
5 Irrigation treatments (47% … 177% ETc)
3 Replicates

Irrigation Treatments

47%	ETc	Deficit	Water stress	2.63 ML/ha
67%	ETc	Deficit	Water stress	3.75 ML/ha
100%	ETc	Control*	No Water Stress	5.6 ML/ha
137%	ETc	Well watered	No Water Stress	7.7 ML/ha
177%	ETc	Well watered	No Water Stress	9.9 ML/ha

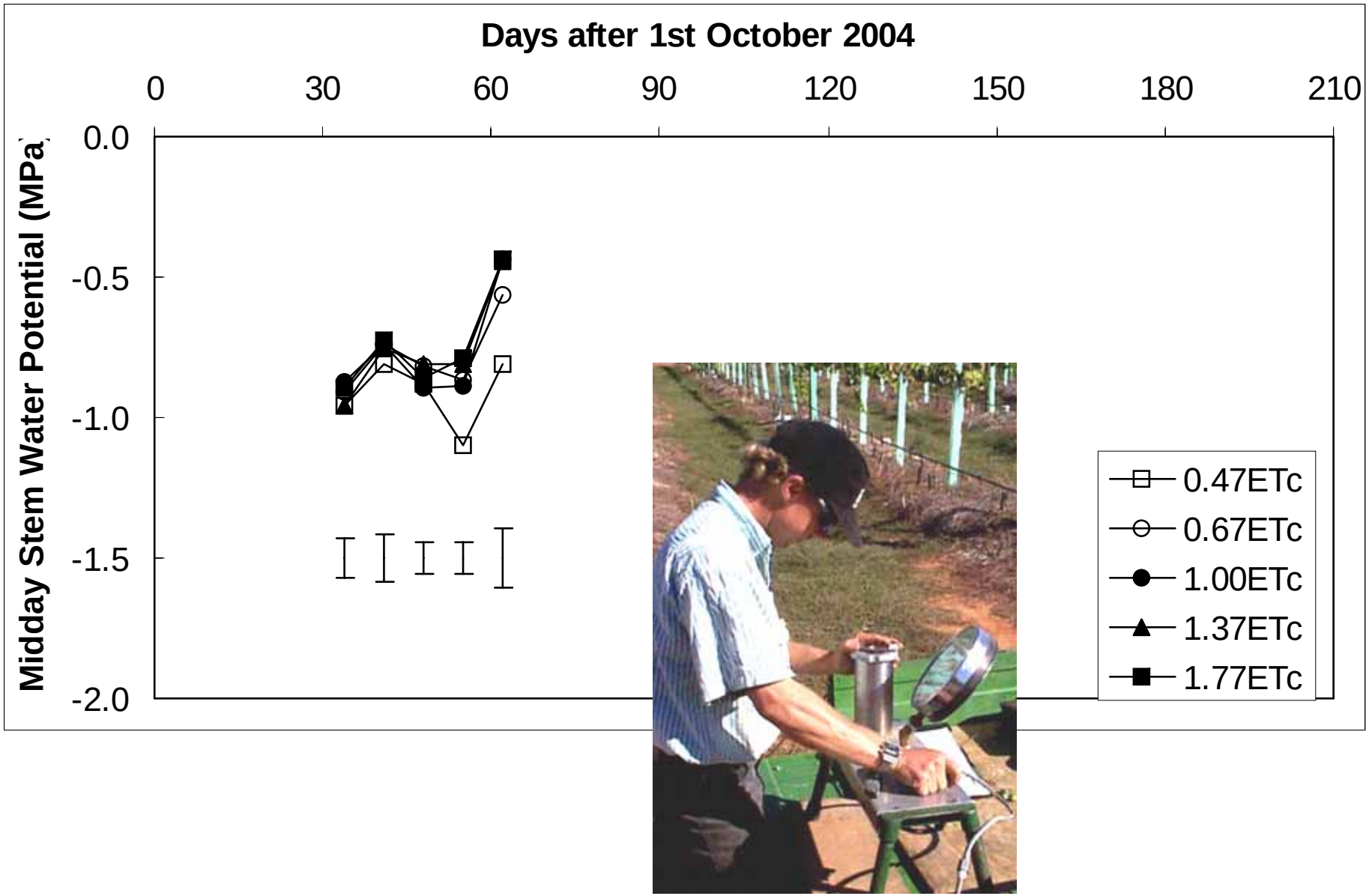
* Control is predicted and represents approx. 80% current industry practice (7ML/ha)

Effective area of shade

Shoot growth

Fruit growth

Water potential



Leaf conductance

Summary

Improved water management in orchards

- More appropriate crop coefficients based on canopy cover
- Increase water use efficiency
- Reduced leakage
- Improved capability to use RDI
- Demonstrated best-practice water management
- Re-allocation of water for other developments and/or environment

I look forward to presenting the full spectrum of results at next years conference.