SESSION NINE

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Fruit size and production

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Photo-oxidation in Avocado leaves

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Photo-oxidation

- Occurs when there is excess light during periods of low temperature
- Photo-oxidation is damage caused by ‘free radical’ oxygen
- Avocado leaves become golden yellow
- Photosynthetic performance is possibly reduced, therefore the productivity of the tree

Photo-oxidation

- Photo-oxidation may cause leaves to drop early
- Mature leaves are thought to be important because they provide support for fruit set and spring growth

Masters thesis research

- **The research will consist of two parts:**

1. **Regular monitoring of photosynthetic performance 2005/06**

2. **Experiment during 2006 winter to evaluate effectiveness of the current industry treatment in restoring photosynthetic performance**

Research questions

1. What photosynthetic performance achieved during summer and months in the Bay of Plenty?

2. What is the relationship between leaf yellowing and photosynthetic performance?

3. Is there an effective treatment to return photosynthetic performance to normal?

Plant physiology measurements

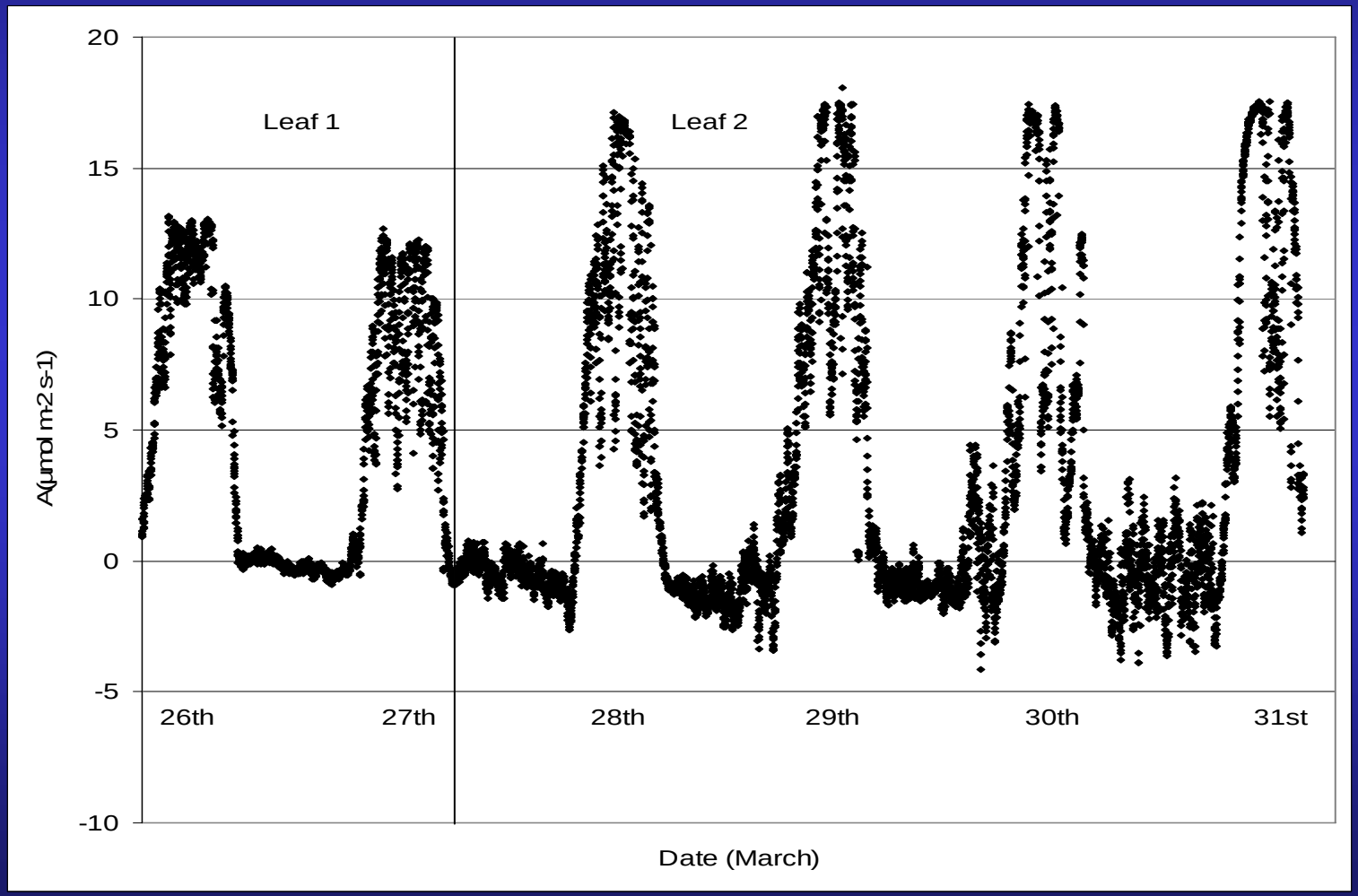
- CO_2 assimilation
- Stomatal conductance
- Chlorophyll fluorescence
- Xylem tension
- Chlorophyll content

and environmental parameters

CO_2 assimilation and stomatal conductance

- CO_2 assimilation is a direct measure of photosynthetic performance in the leaves. Data is collected in two ways:
  - with an automated leaf gas exchange chamber, under ambient conditions on a single leaf for up to 3 days
  - spot measurement of 50 labeled leaves under saturating light intensities at

Photosynthesis

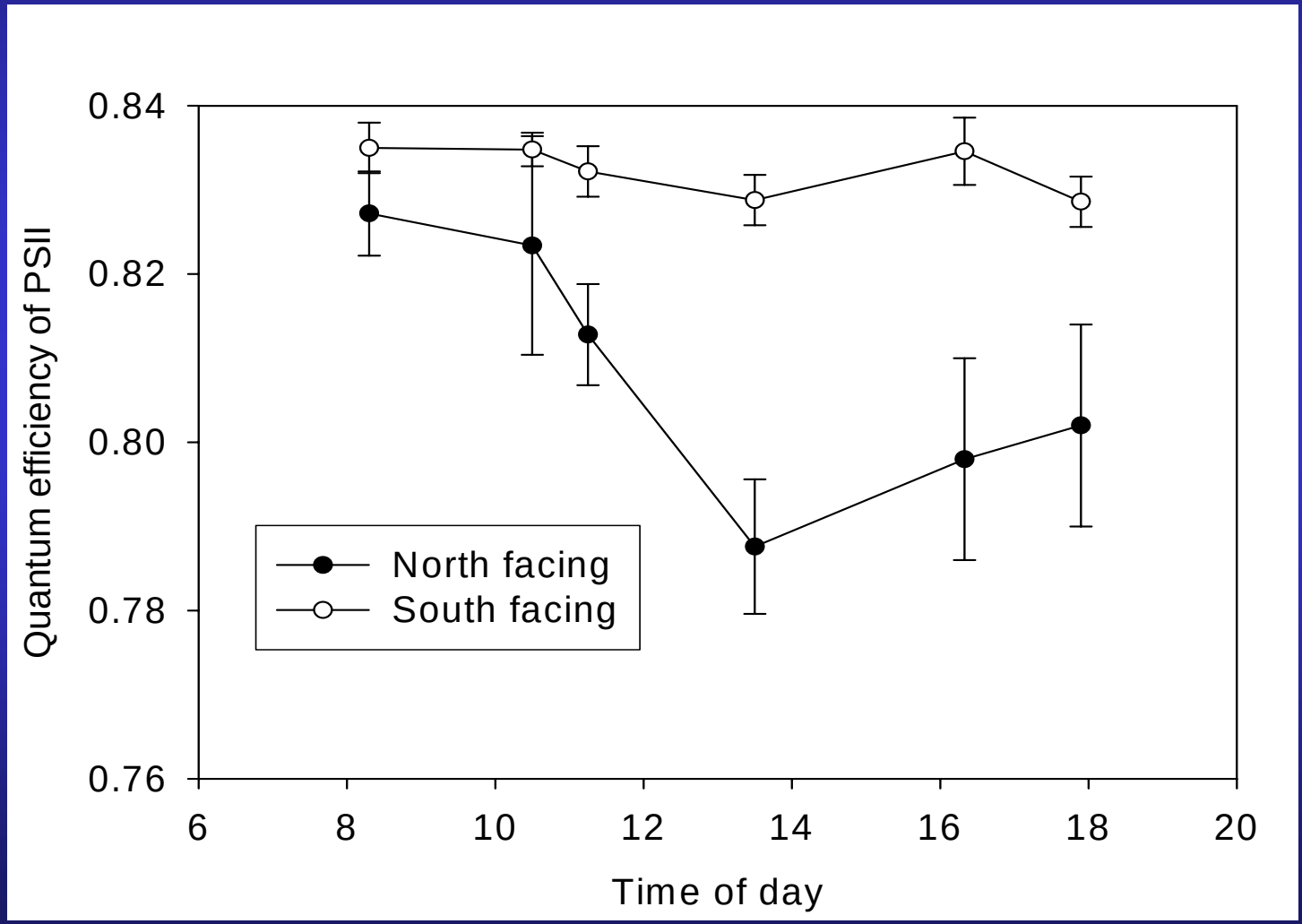


Chlorophyll fluorescence

- Excess light energy arriving at the leaf can be re-emitted as fluorescent light
- The 'quantum efficiency' of the leaf can be determined, providing a measure of plant stress

- A portable Mini-PAM meter collects data from dark adapted leaves

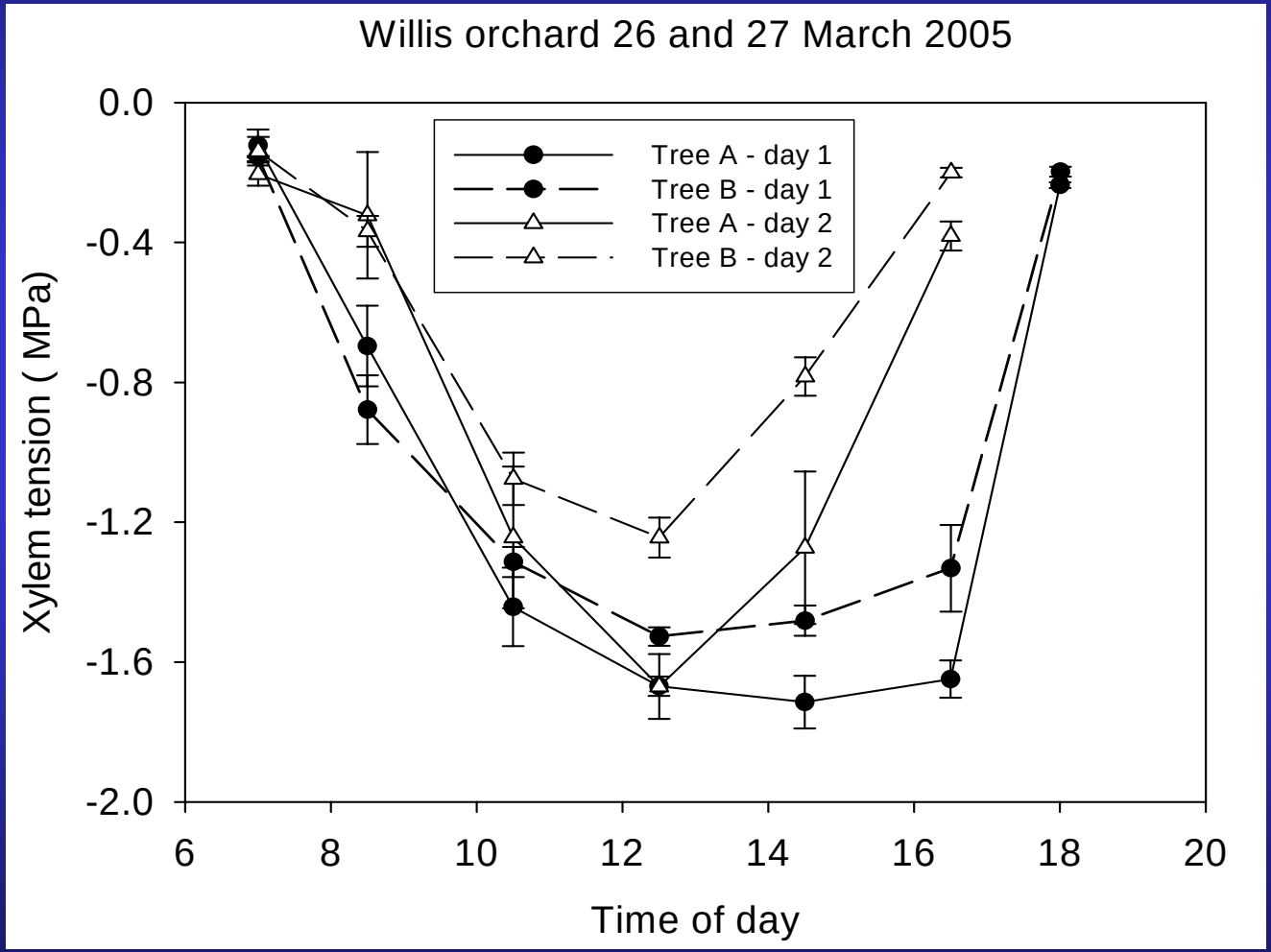
Chlorophyll fluorescence



Xylem Tension

- Xylem tension is the negative pressure within the xylem vessels that is created by the evaporation of water from the leaf
- Measured with a ‘pressure bomb’ device
- Xylem tension provides a measure plant water stress

Xylem tension



Leaf chlorophyll content

- Photosynthtic performance is on chlorophyll content
- Measured with a SPAD, instant chlorophyll meter, calibrated against chlorophyll extraction

- Chlorophyll is a proxy for leaf colour, leaf yellowing can be monitored with changes in chlorophyll content

Future Work

- Evaluate the use of low biuret urea and magnesium sulphate a restorative treatment for photo-oxidation yellowing
- Trial to be completed during a yellowing period during winter 2006, or created artificially with chilling chambers

In Summary

- Photo-oxidation causes avocado leaves become yellow in high light, low temperature conditions
- Research is currently underway to investigate the relationship between photo-oxidation and photosynthetic performance
- An experiment will be conducted to evaluate a treatment for photo-oxidation

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