Wise Water Use for Container Production

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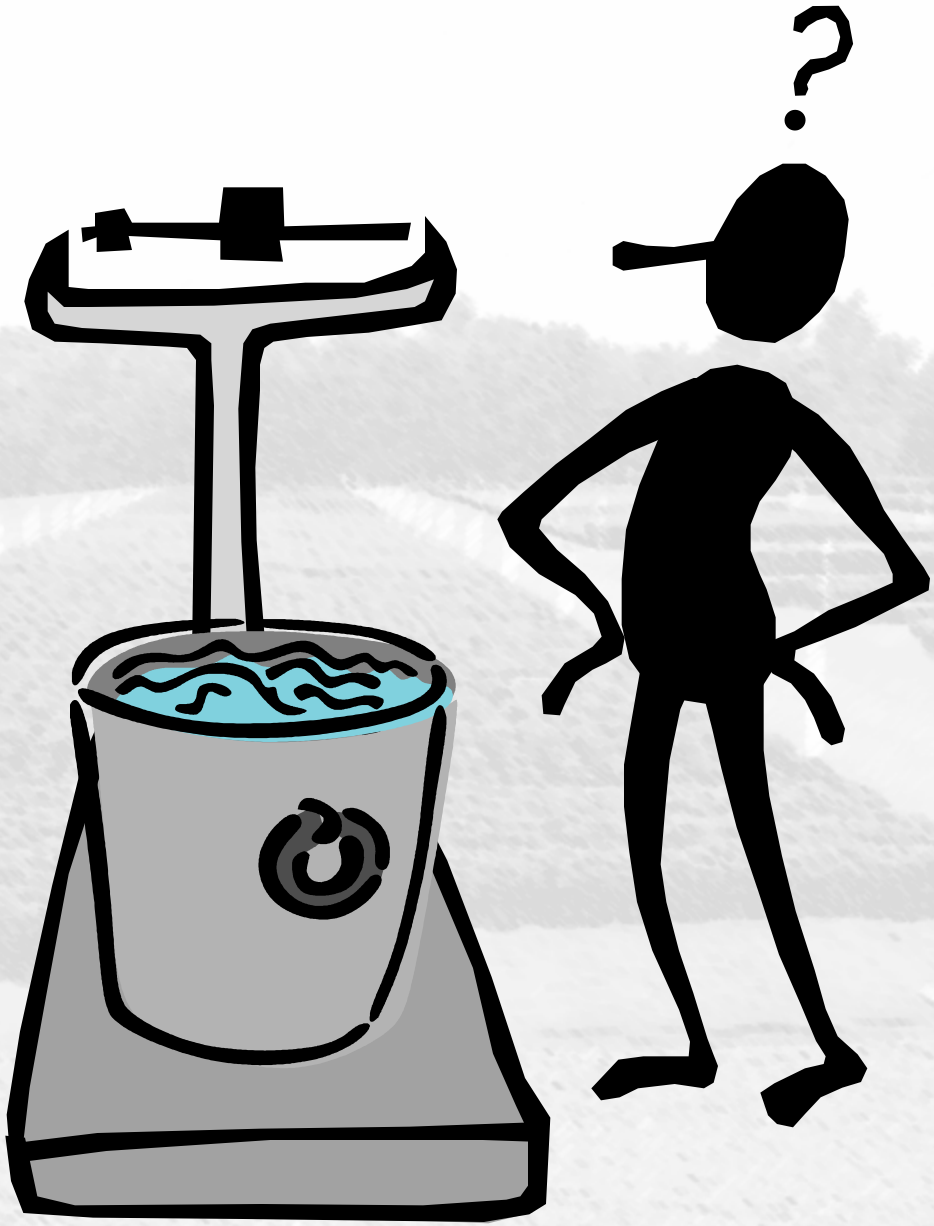
Water will be the ‘oil’ of the 21st century!

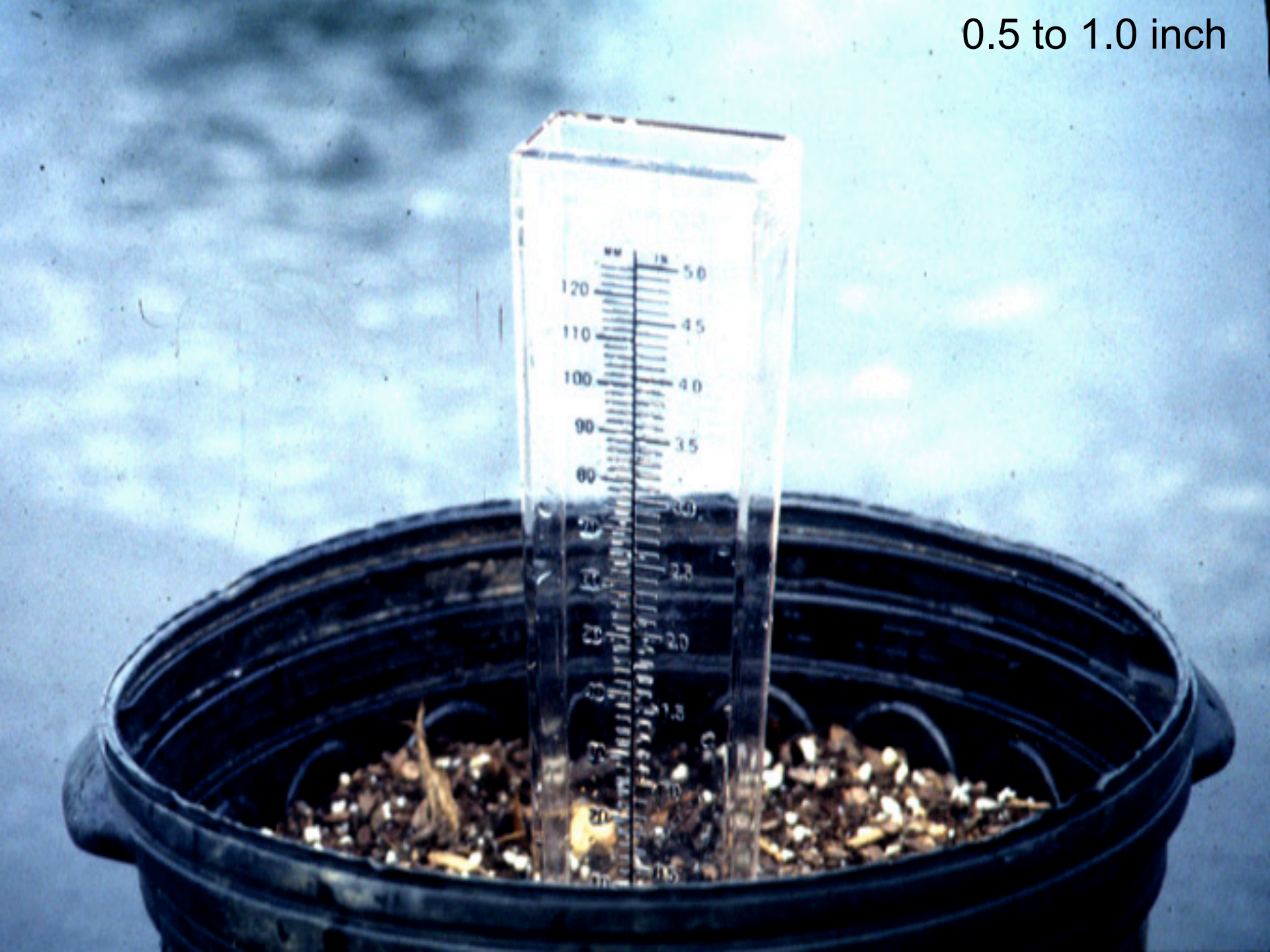
avoca.vicnet.net.au/.../WATER_CALCULATOR.jpg

Irrigation Decisions

- How much?
  - Leaching fraction
  - Cyclic irrigation
- How often?
  - Growth Stage
  - Substrate
  - Grouping
- When?
  - Time of Day

How much?




0.5 to 1.0 inch

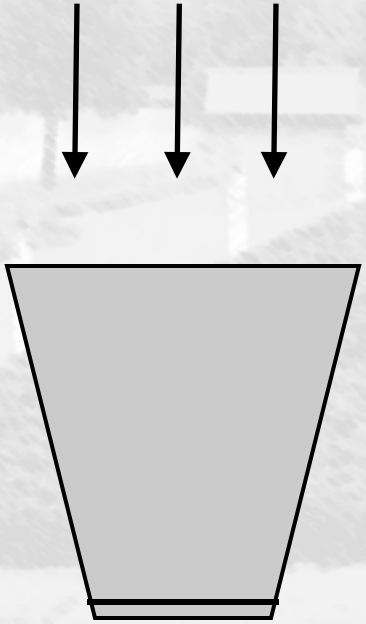
Leaching Fraction

Leaching Fraction = Volume Leached / Volume Applied

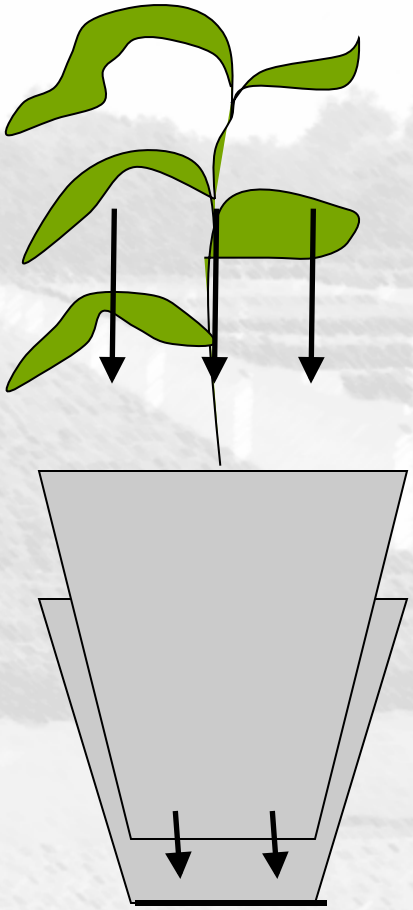
Irrigation volume determined
by plant and substrate

Leaching Fraction

Leaching Fraction = Volume Leached / Volume Applied



Lined or sealed



Sealed outside pot

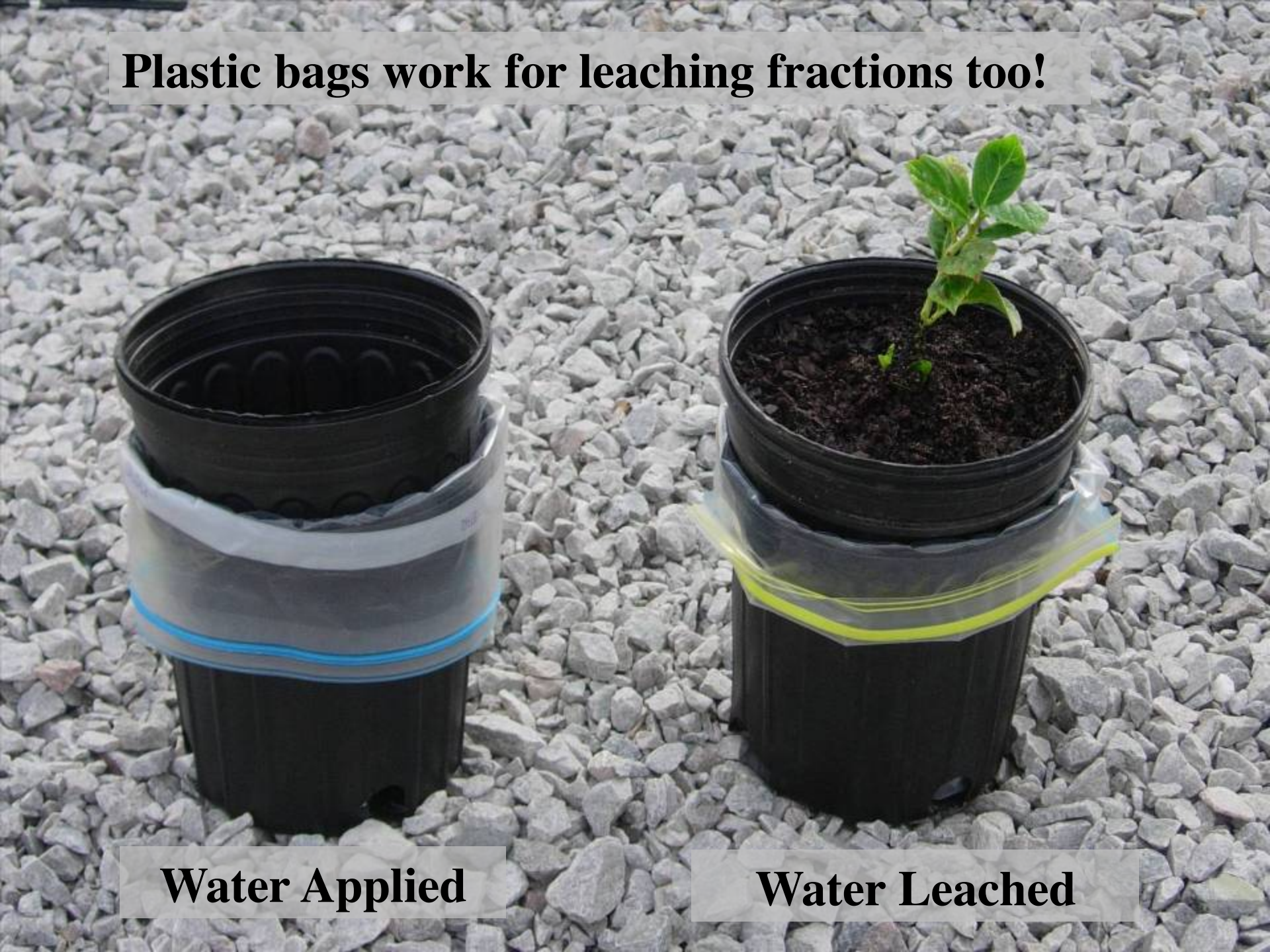
Bilderback, personal communication

Total Water Applied for container diameter area is measured as "total volume" to calculate leaching fraction

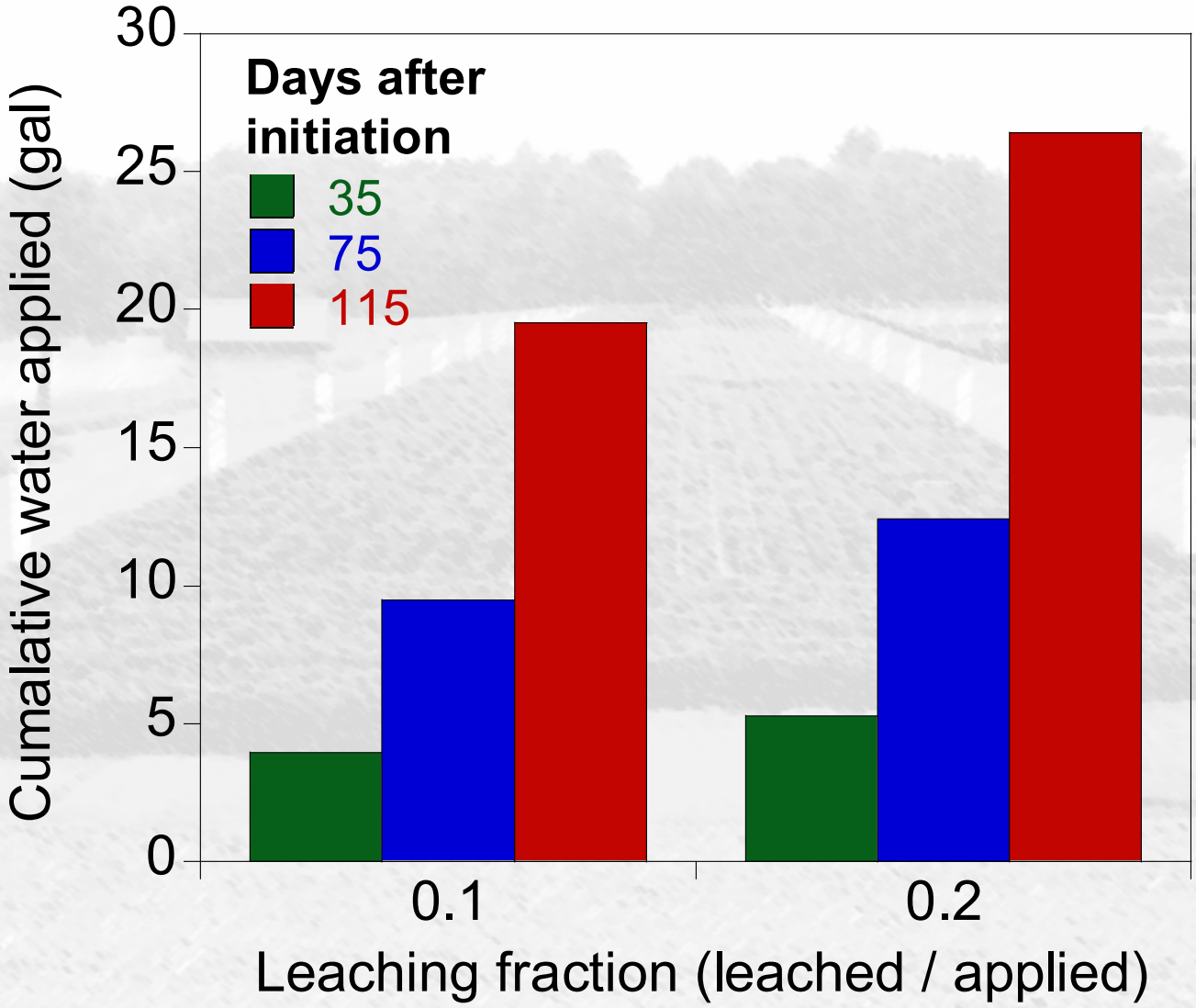
Bilderback, personal communication

Leaching Fraction ~ 0.20

Bilderback, personal communication

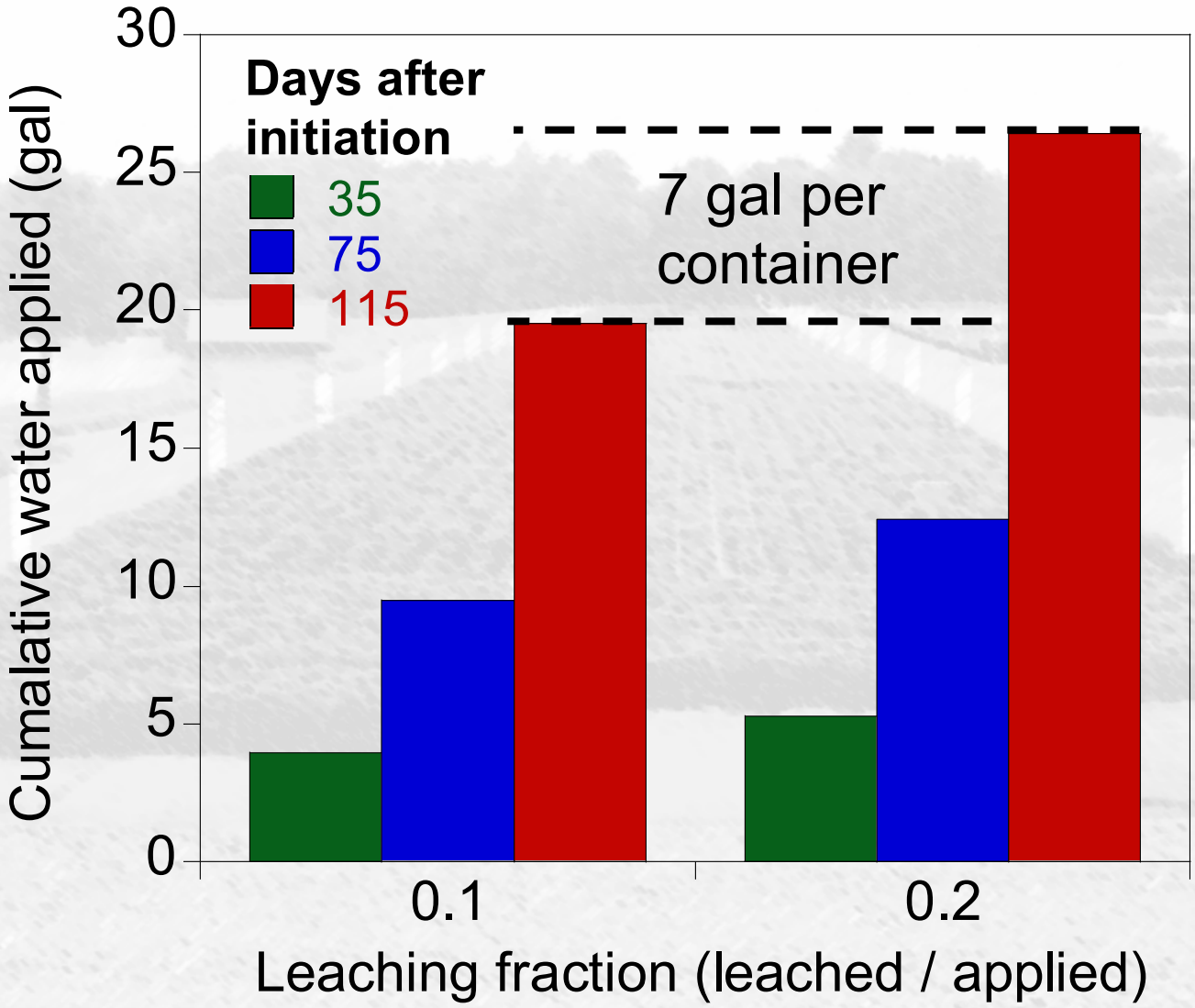

Plastic bags work for leaching fractions too!
Water Applied
Water Leached

Leaching fraction



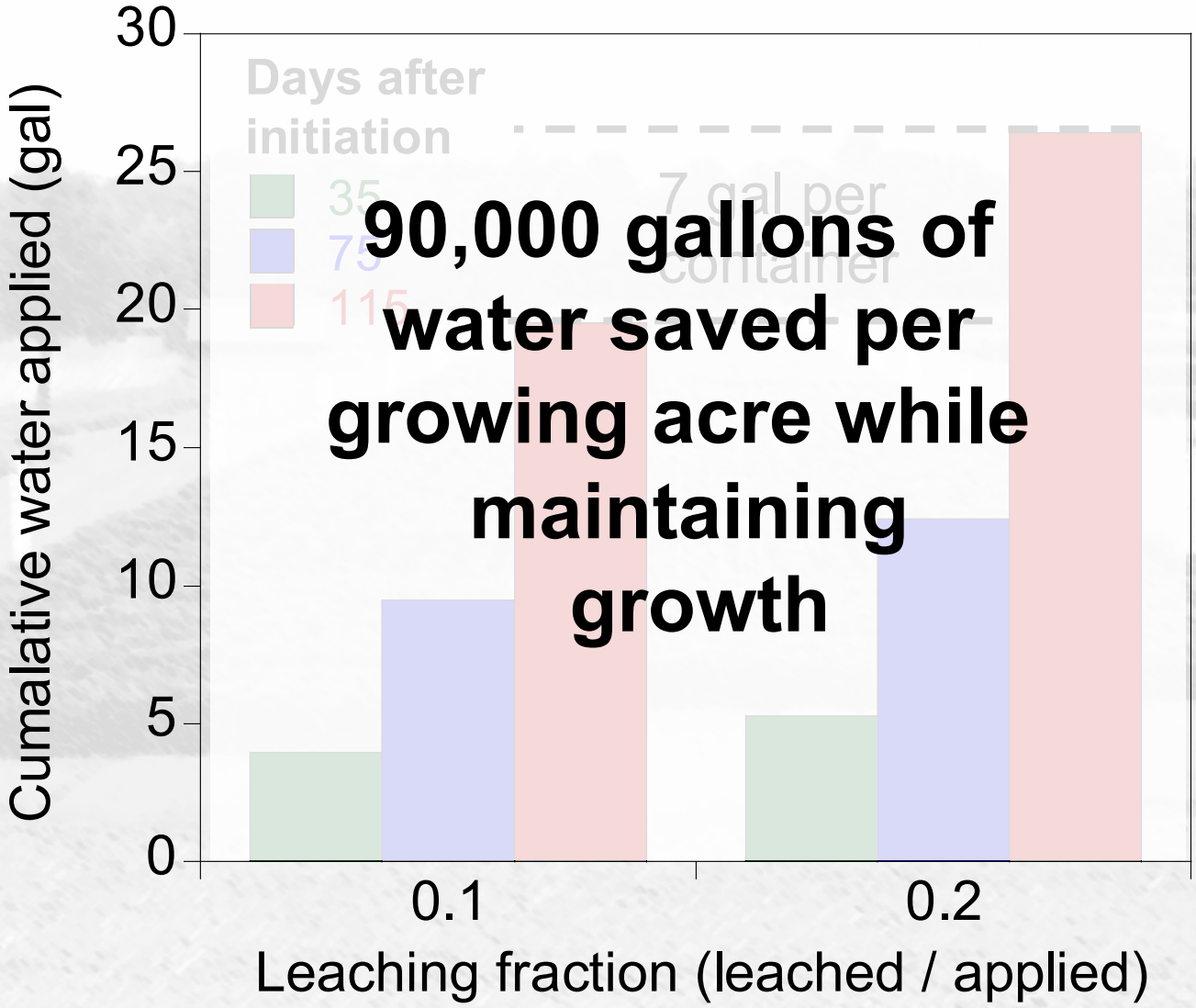
Owen. 2006

Leaching fraction



Owen. 2006

Leaching fraction



Owen. 2006

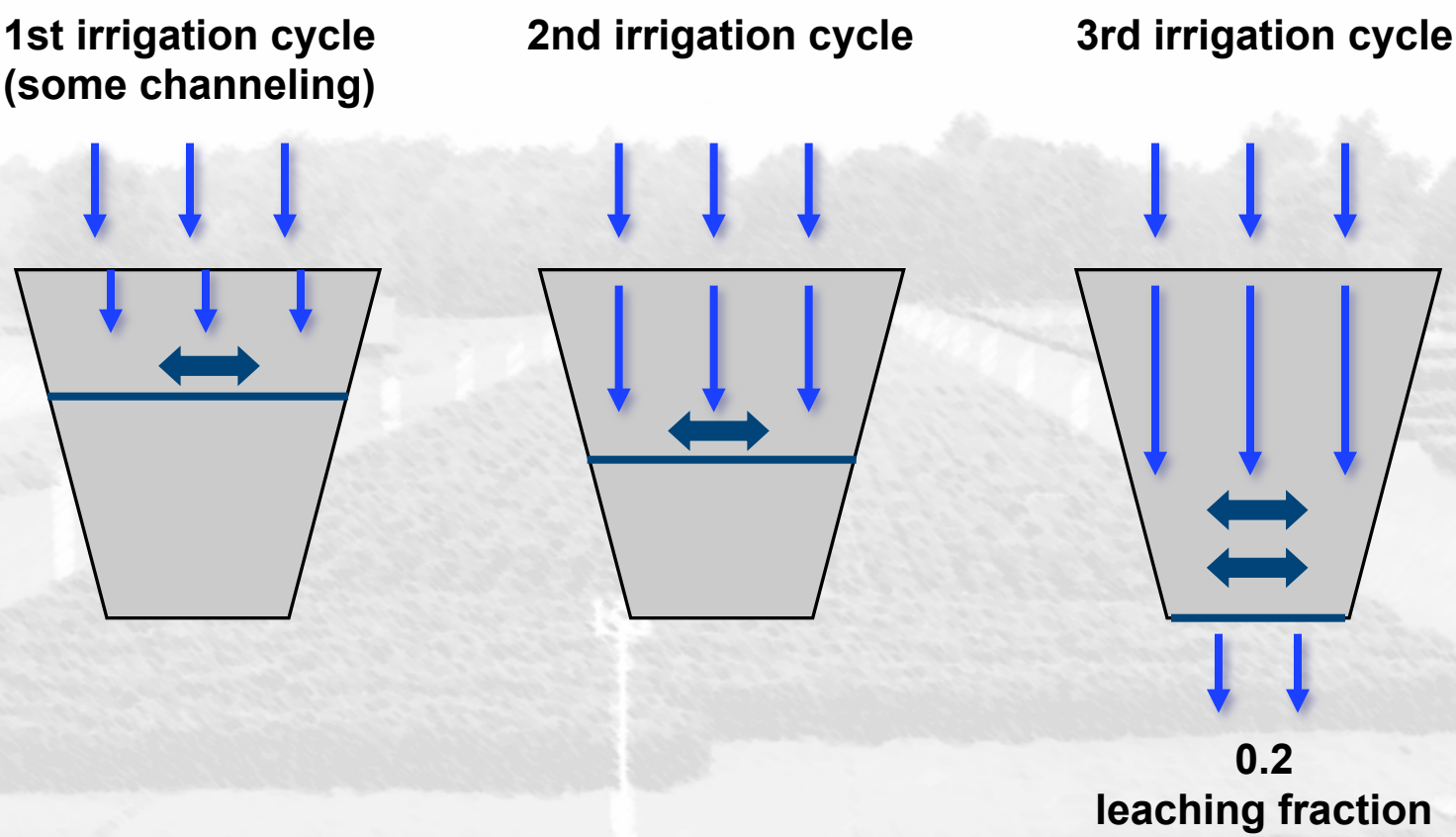
Leaching fraction

- Advantages
  - Based on plant need
- Disadvantages
  - Management

Cyclic Irrigation

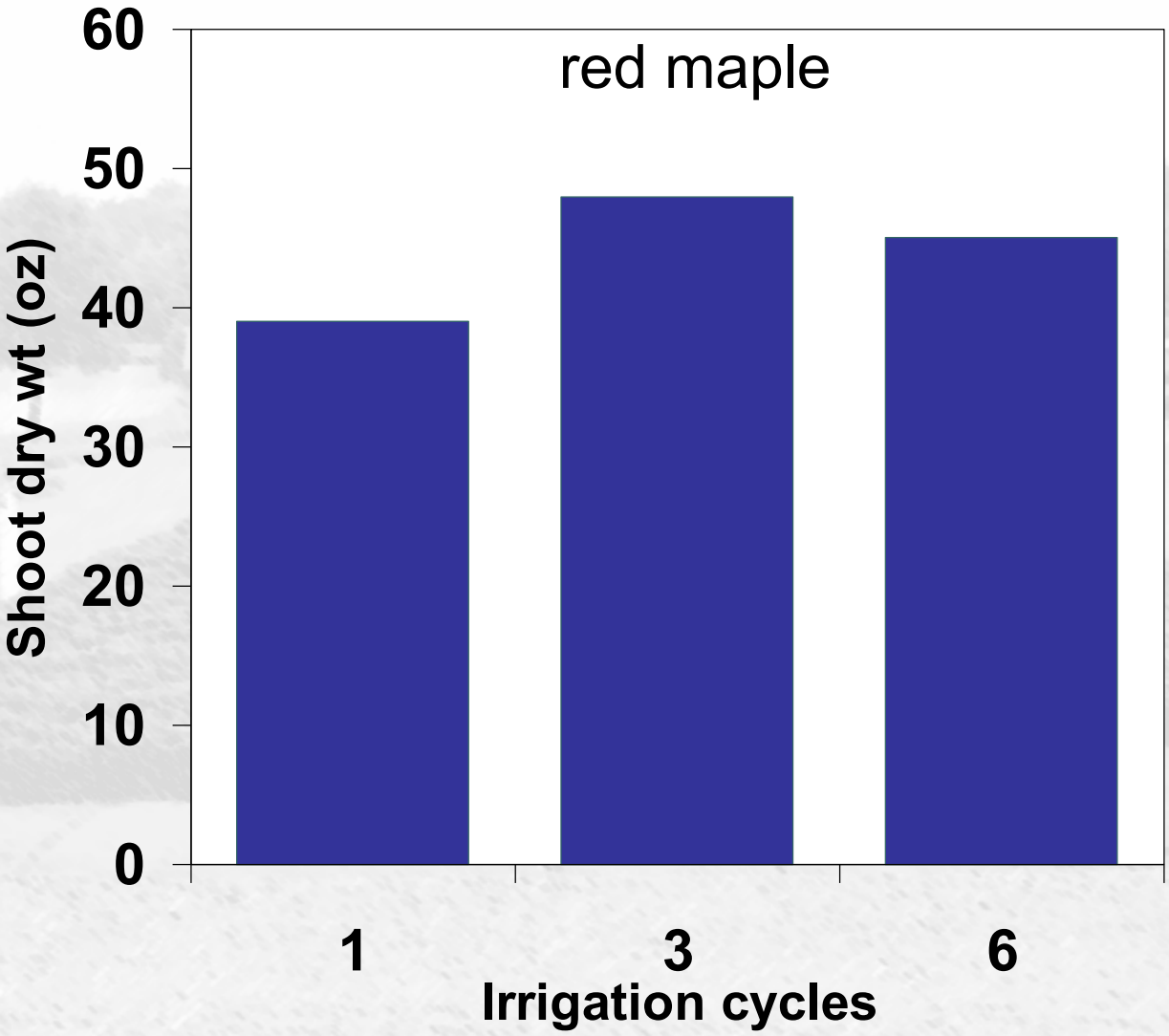
Total water applied daily divided equally and applied in intervals to minimize water channeling and maximize substrate rewetting

Cyclic Irrigation



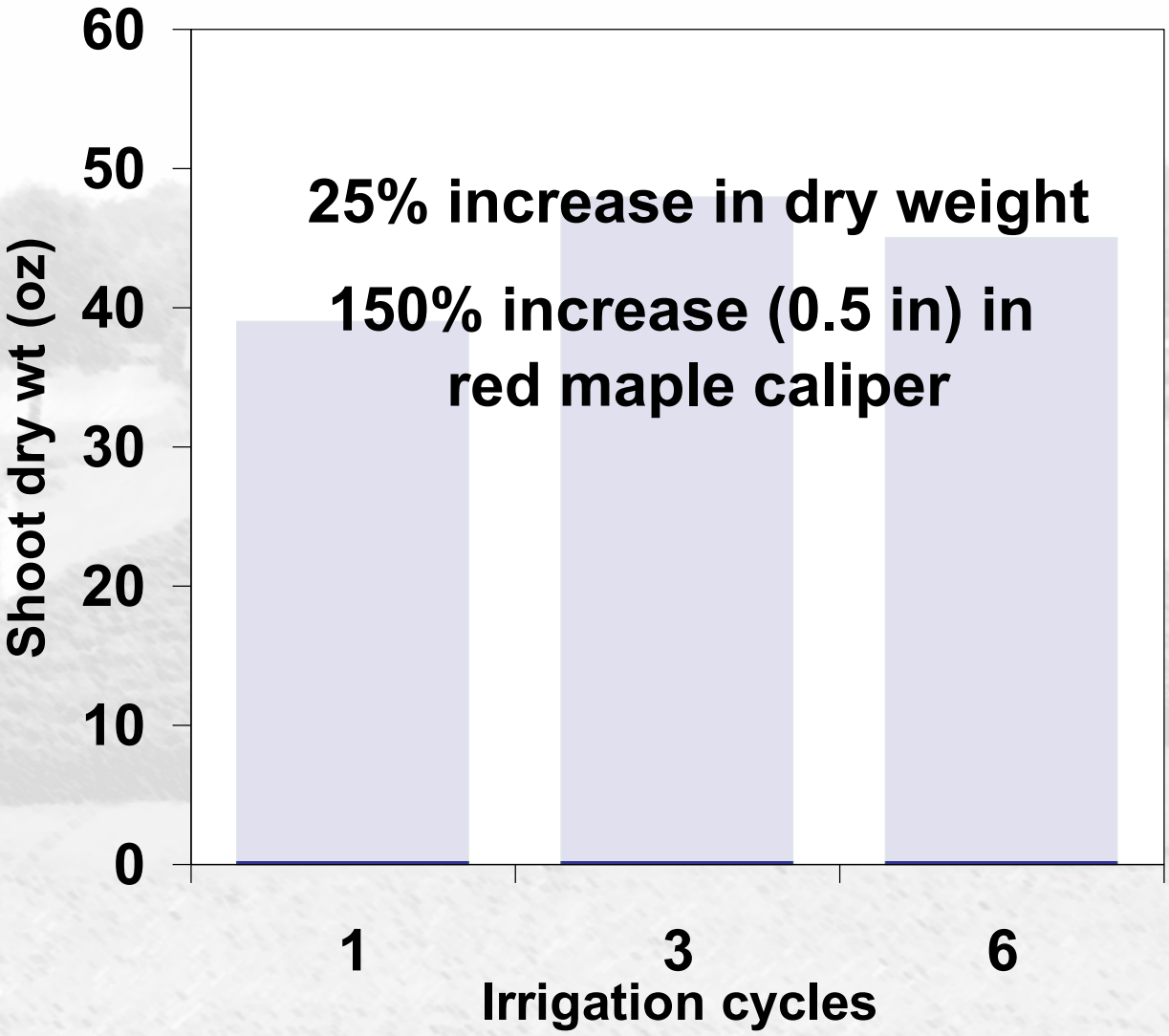
Ted Bilderback (personal communication)

Cyclic irrigation



Fain, Tilt, Sibley. 2000. **Less is More!** Highlights of Agriculture Research

Cyclic irrigation

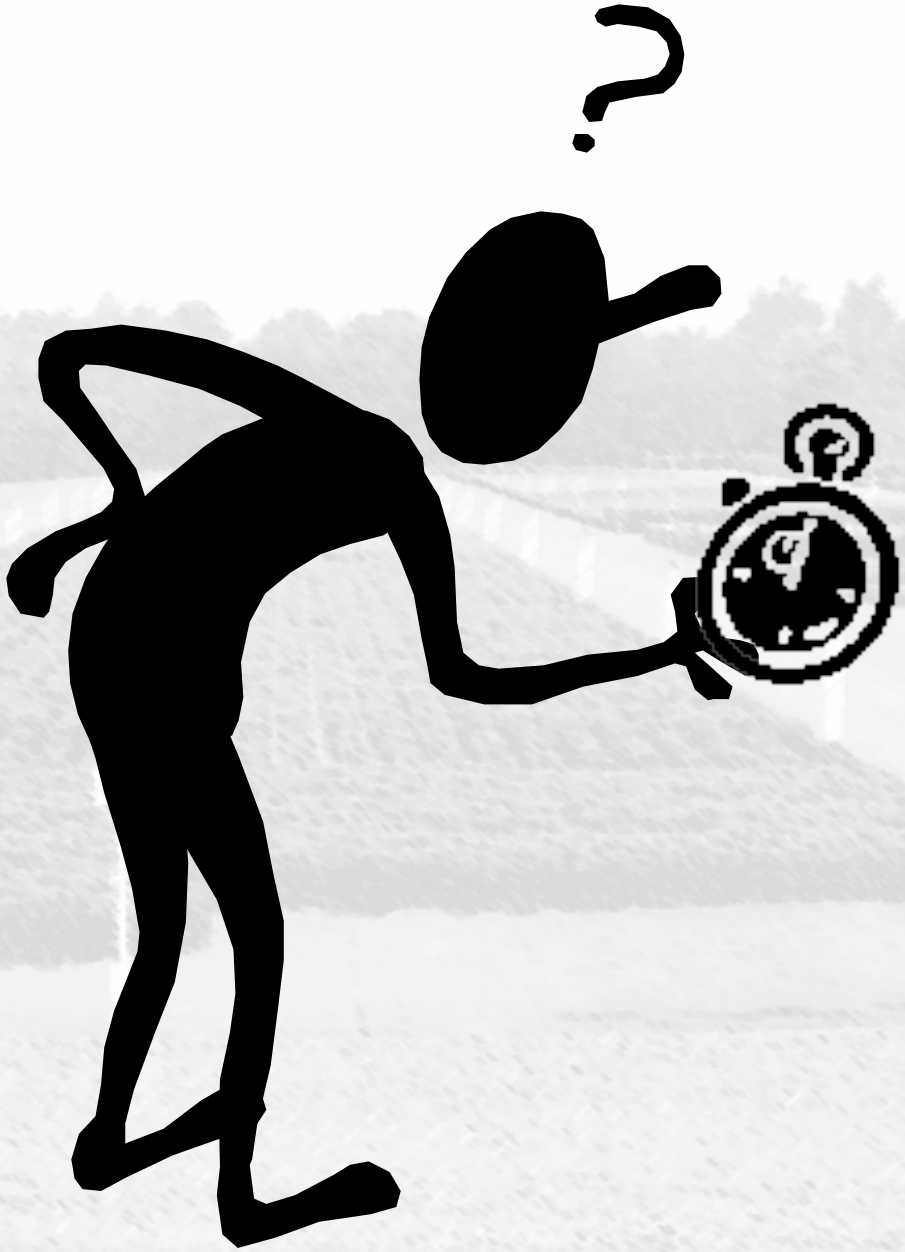


Fain, Tilt, Sibley. 2000. **Less is More!** Highlights of Agriculture Research

Cyclic Irrigation

- Advantages
  - Increases plant growth
  - Increase water use efficiency
  - Increases nutrient use efficiency
- Disadvantages
  - Irrigation timing
  - Management

How often?



Plant Growth Stage

- Growth stage or production phase
  - Transplant / shift
  - Growing
  - Salable

Plant Growth Stage

Transplant / shift

Plant Growth Stage

Growing / production

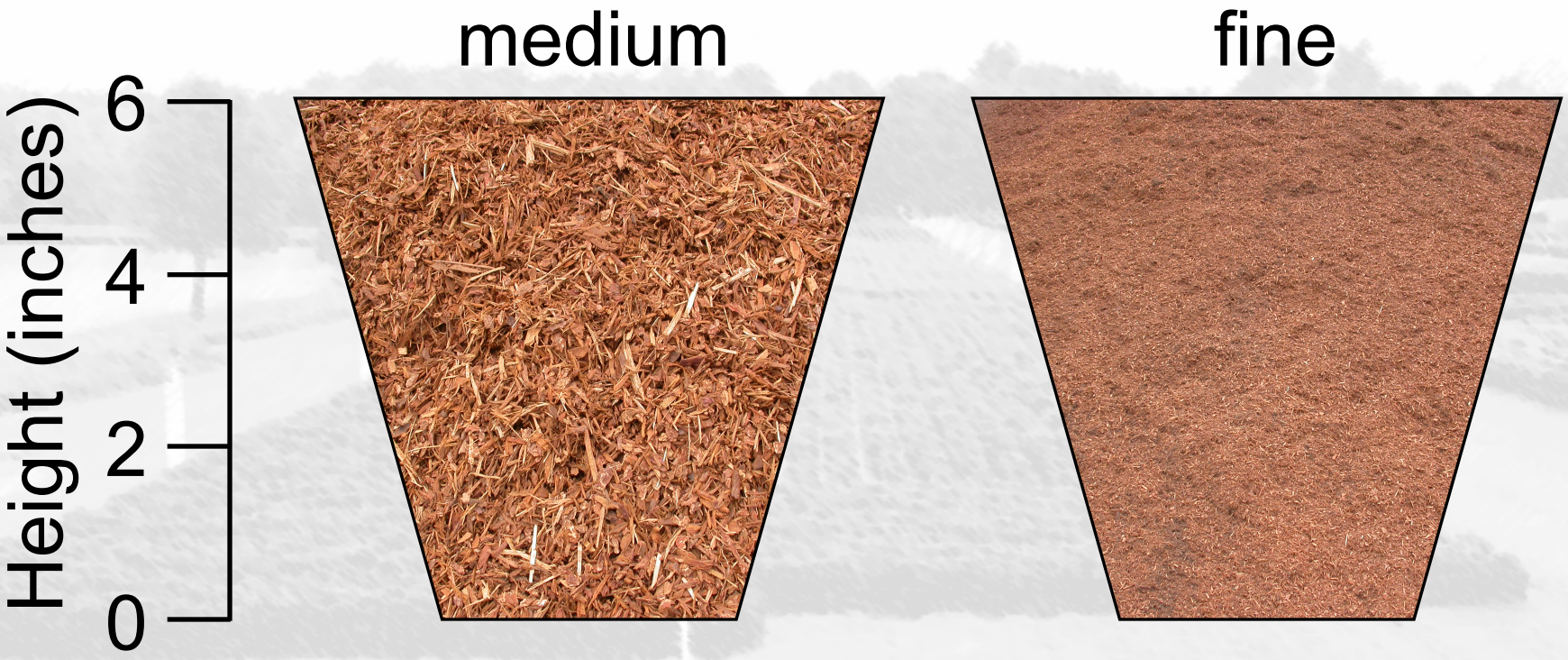
Plant Growth Stage

Sale / Holding / Retail

Substrate

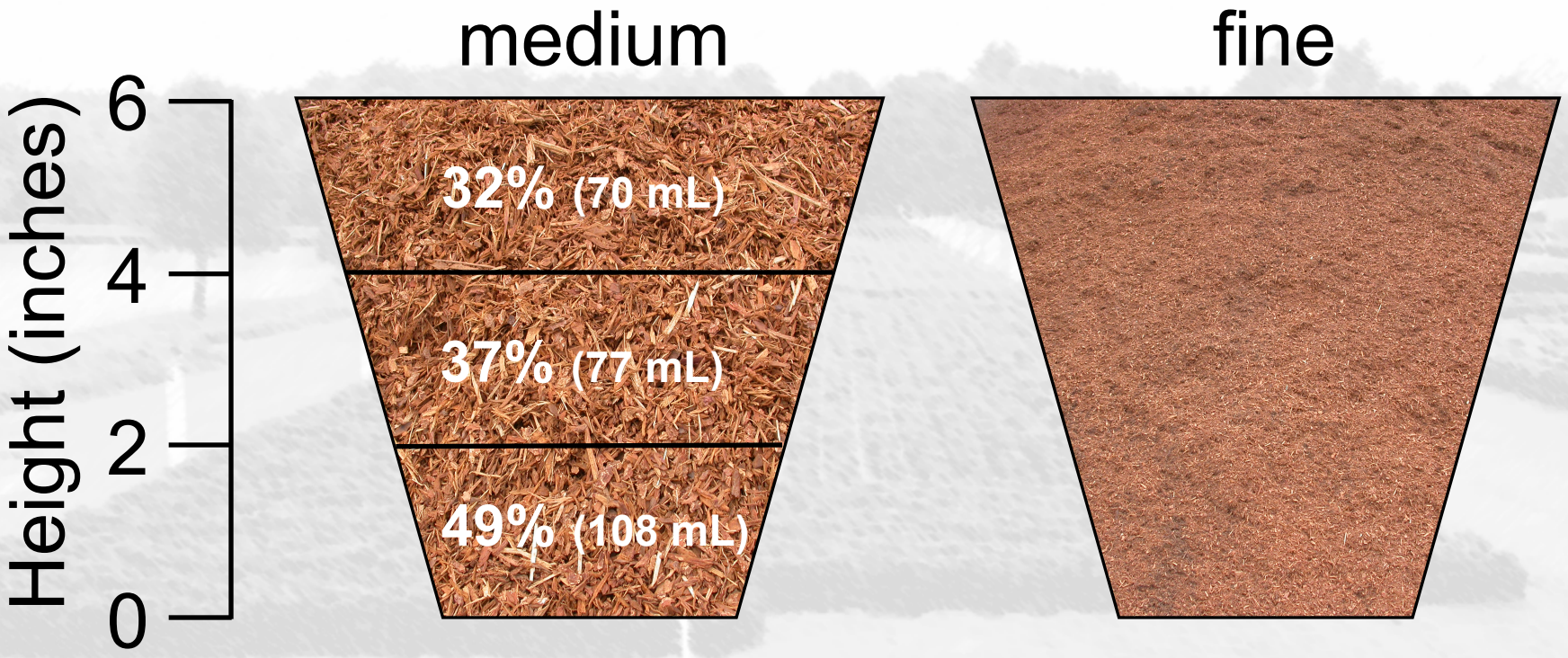
- Water buffering capacity
  - Douglas fir bark texture
    - Particle size
  - Amendments
    - Clay
    - Peat
    - Coir

Substrate Texture



Owen and Altland. 2006.

Substrate Texture



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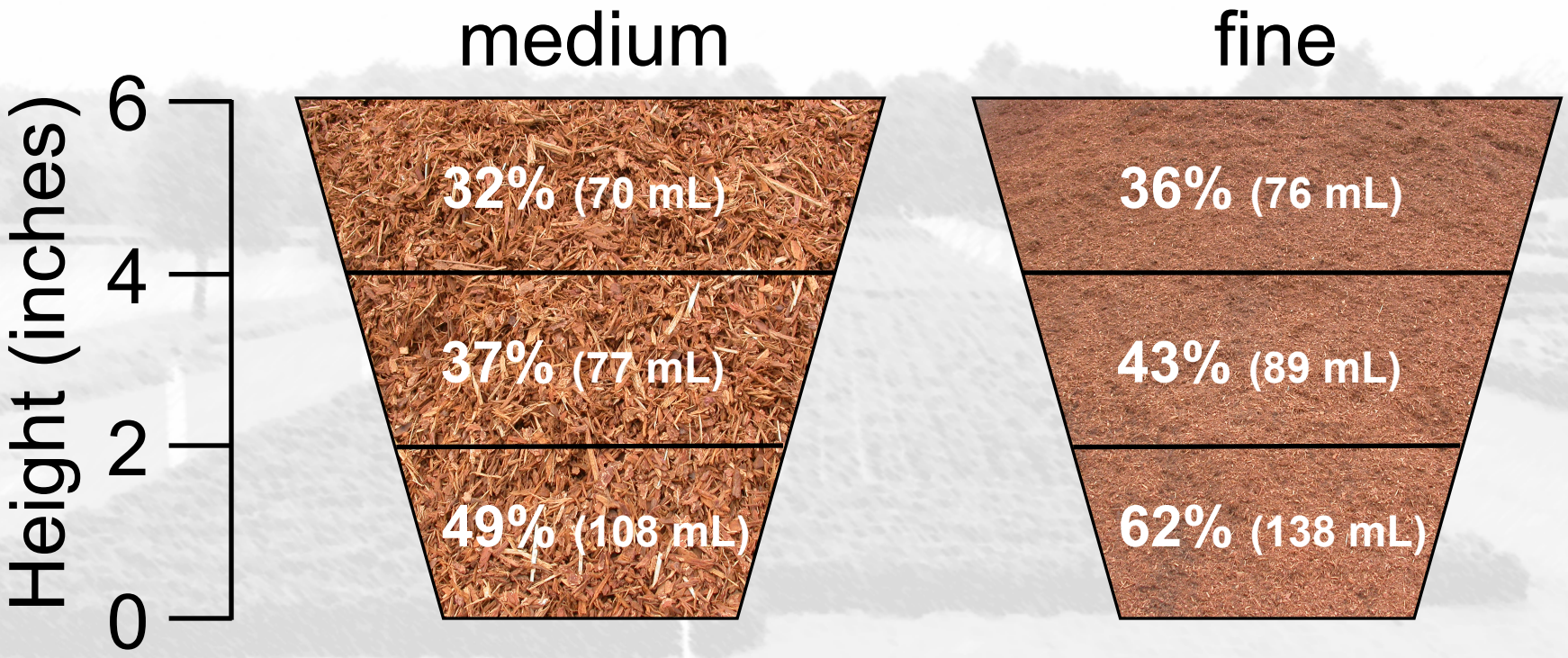
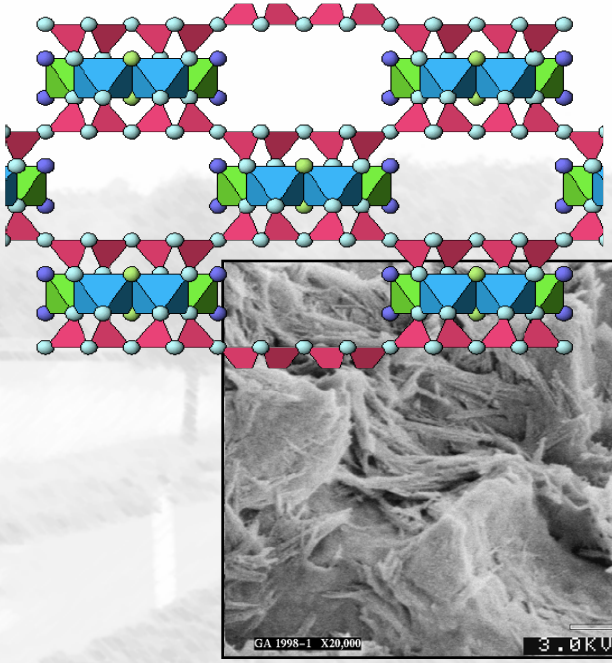
Substrate Texture

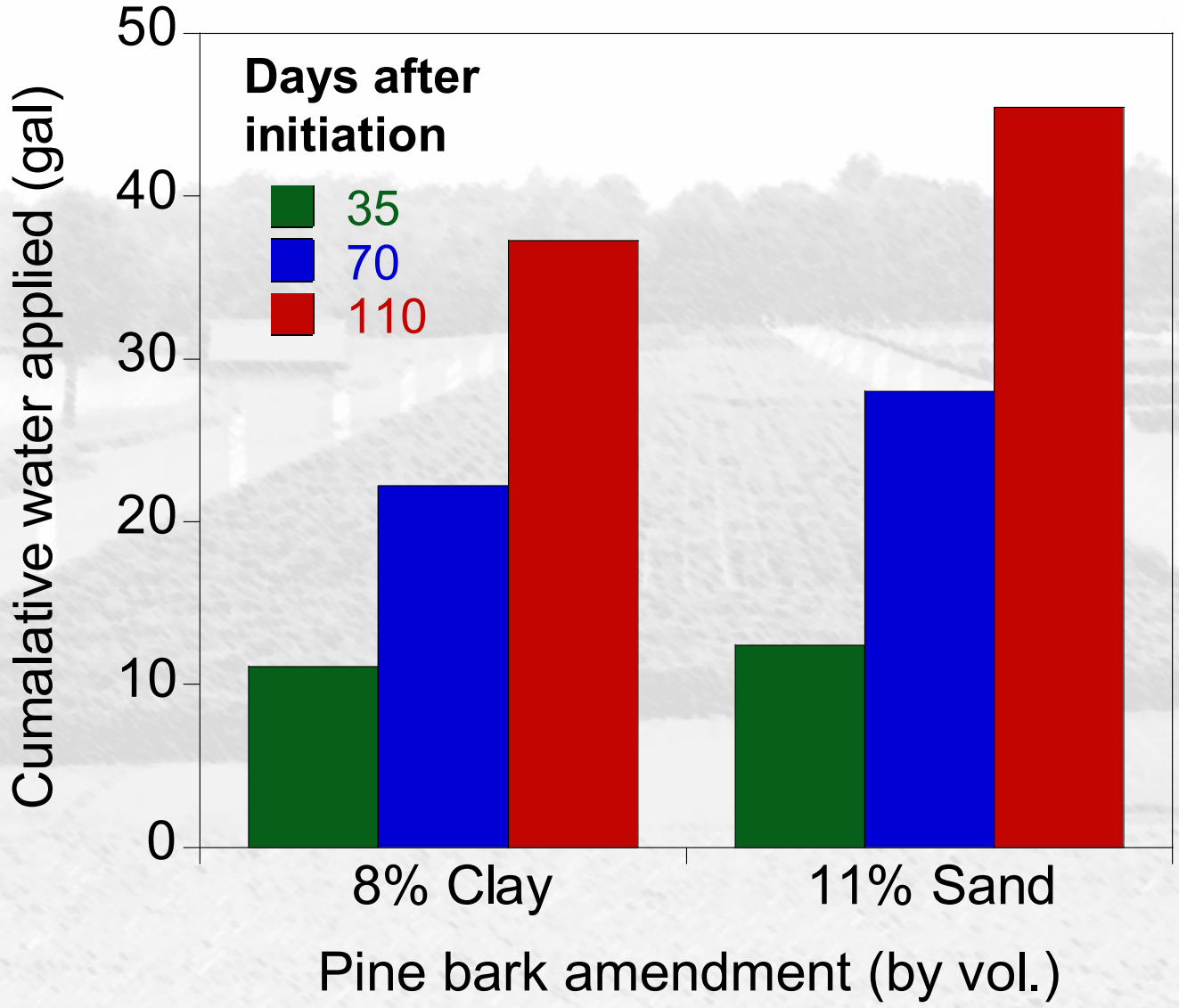


Owen and Altland. 2006.

Substrate Amendment

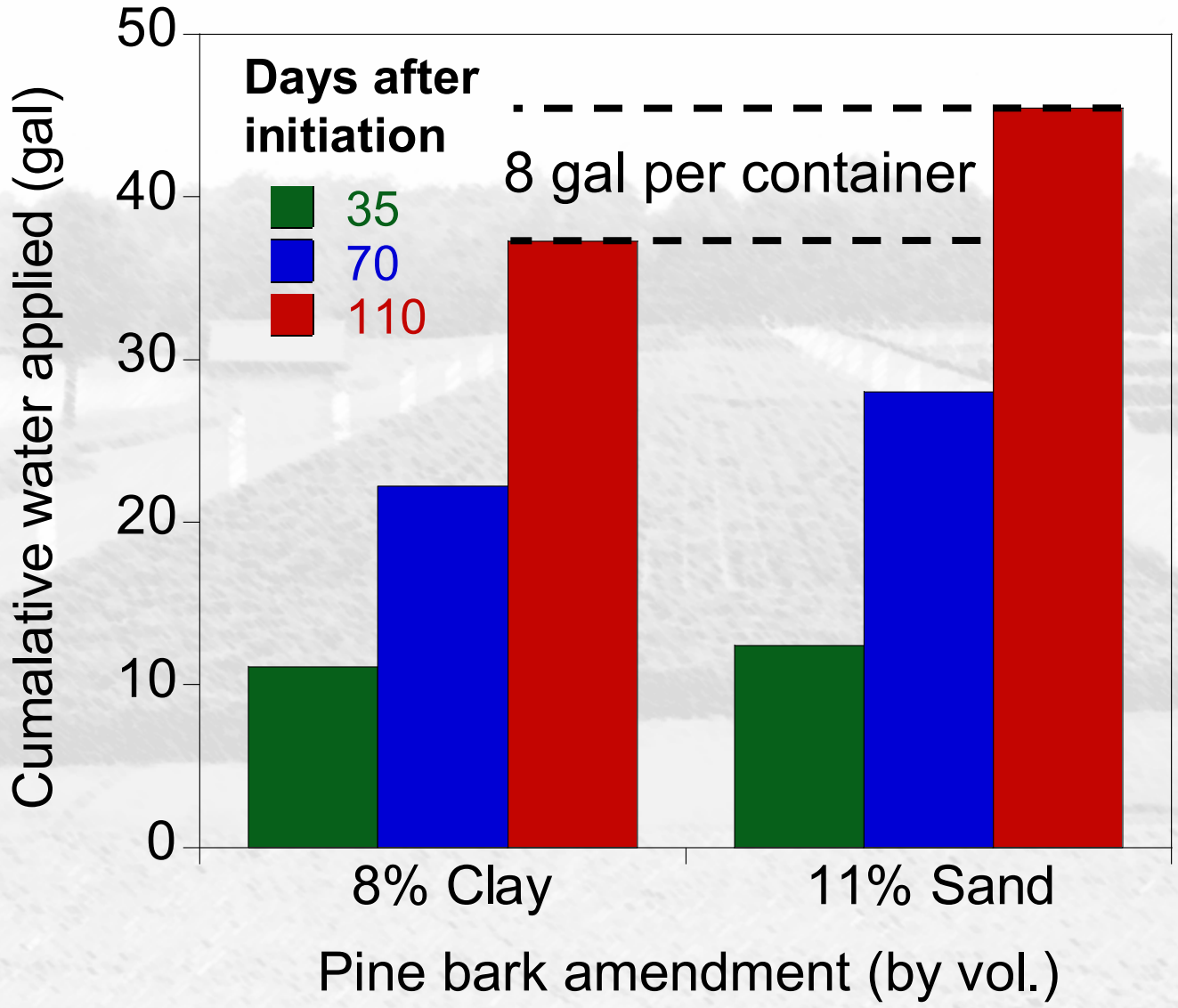


Substrate Amendment



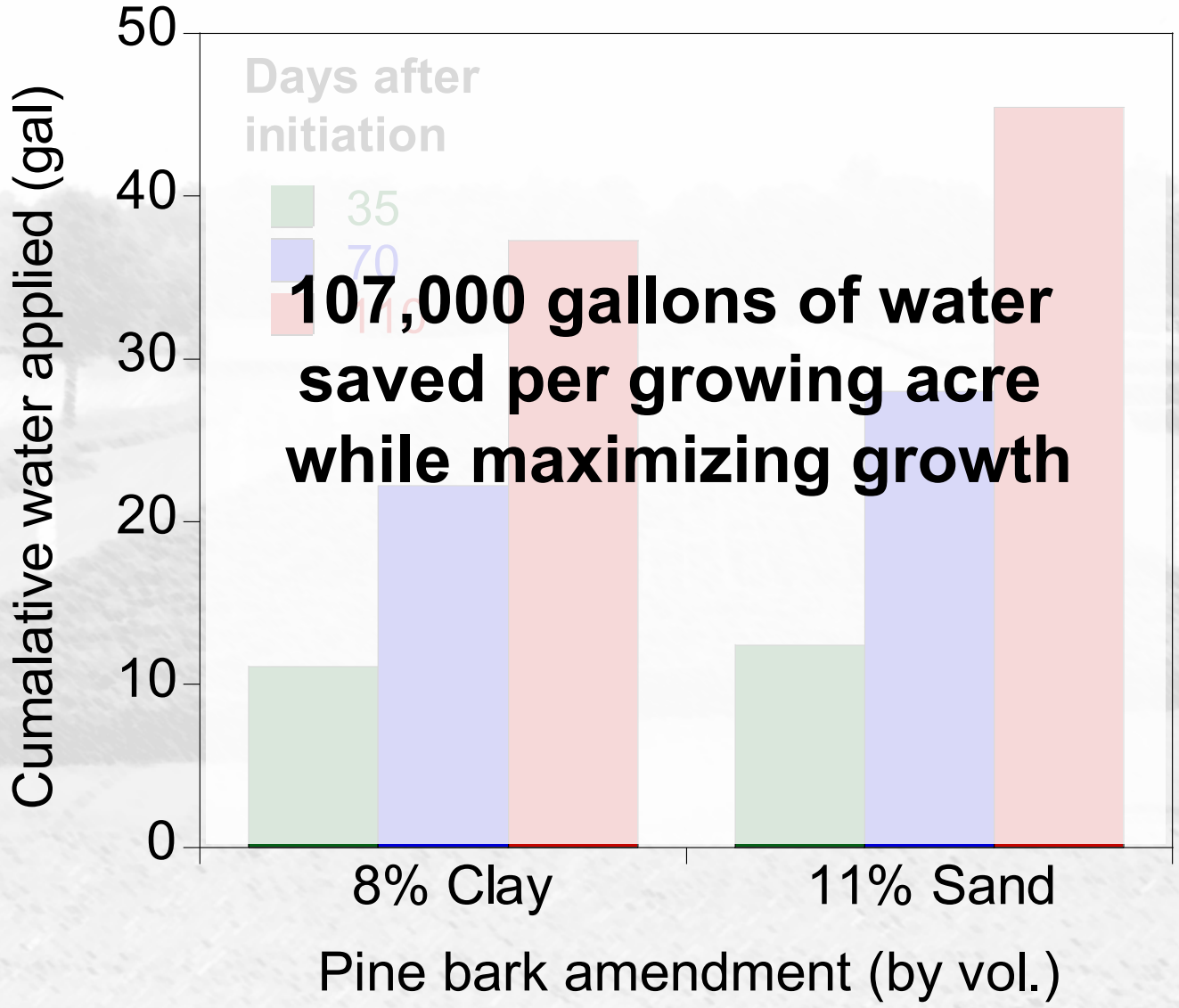
Owen. 2006

Substrate Amendment



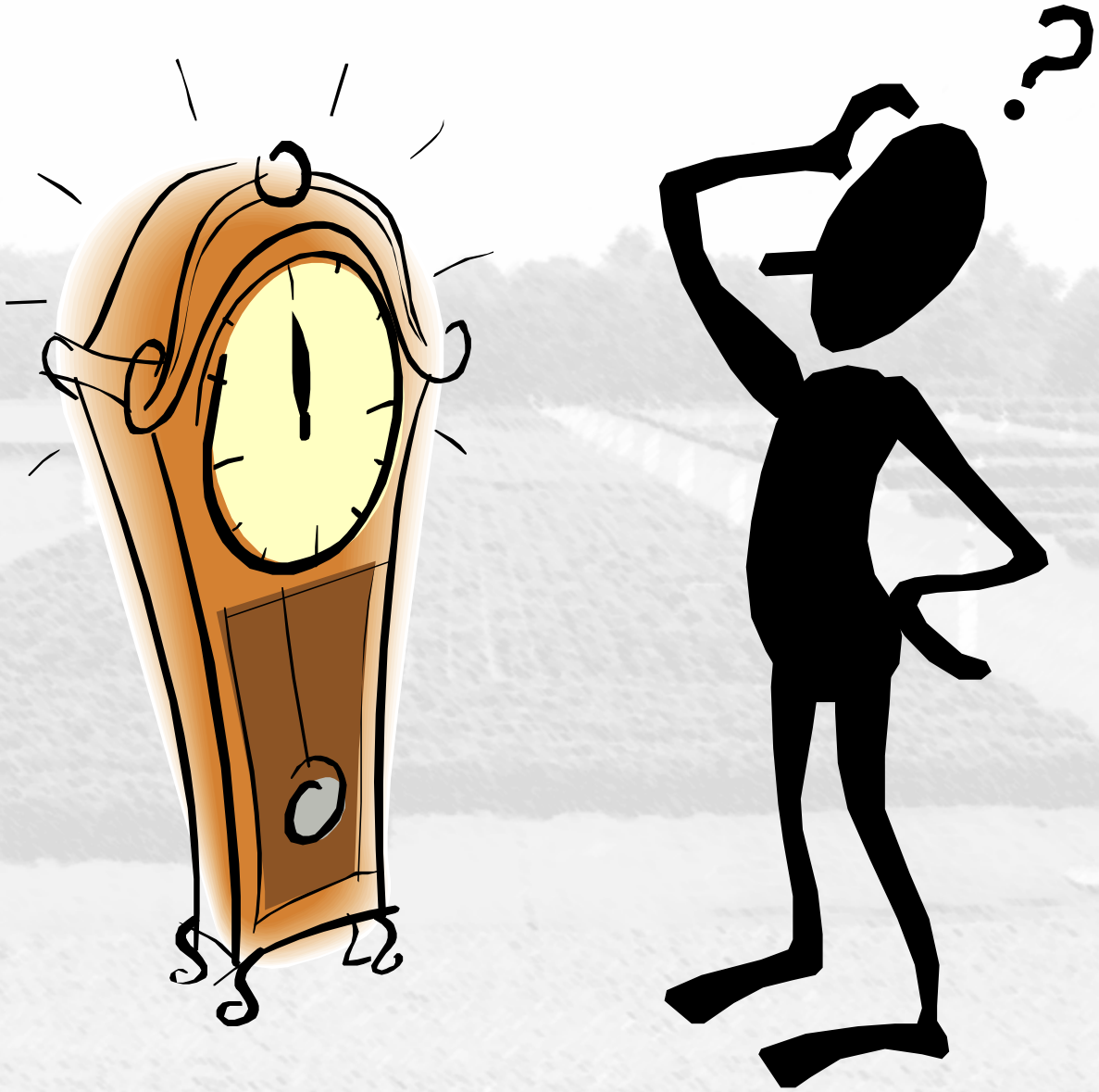
Owen. 2006

Substrate Amendment



Owen. 2006

When?

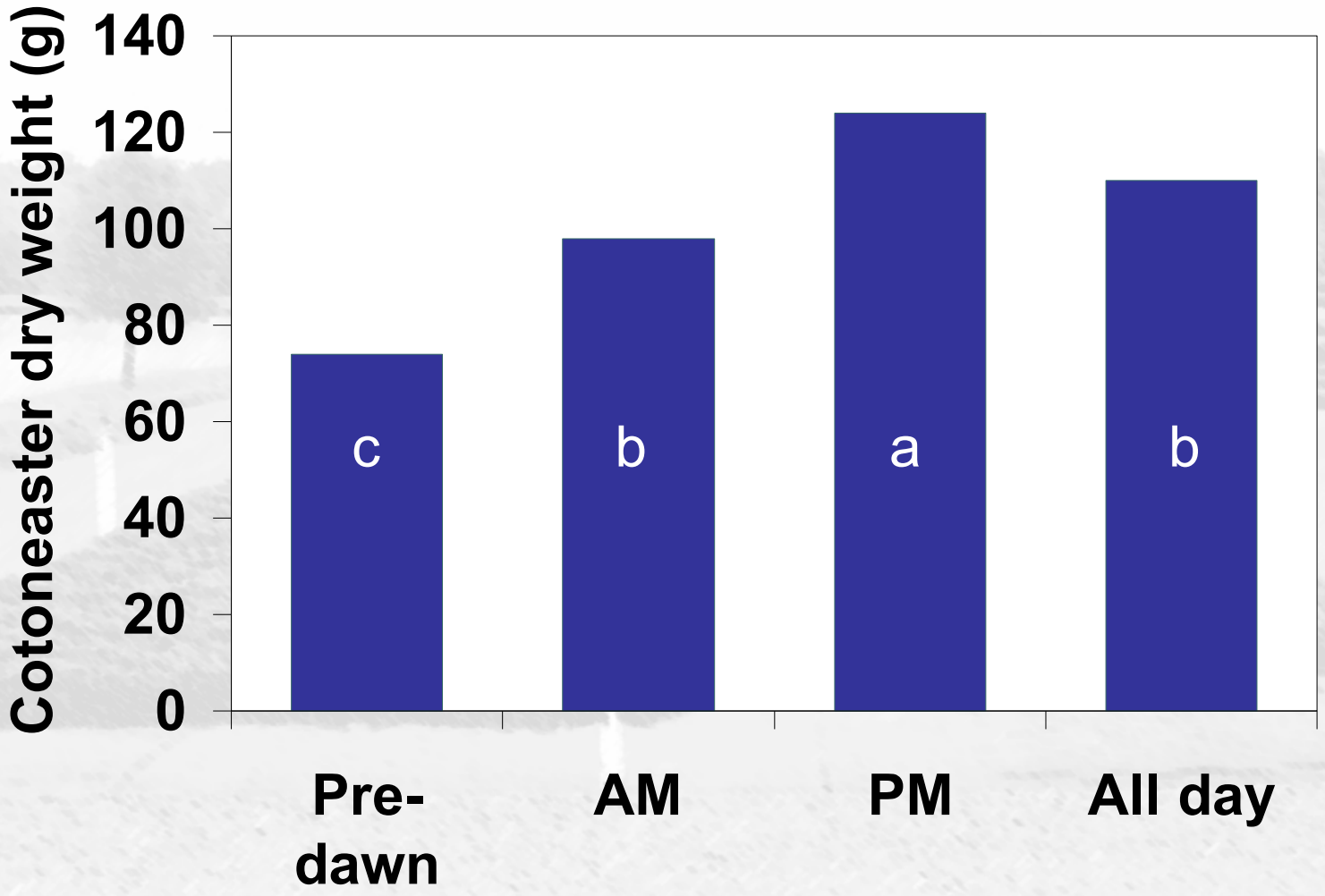


Irrigation timing

- What time of day to apply irrigation
  - Pre-dawn
  - AM
  - PM
  - All day

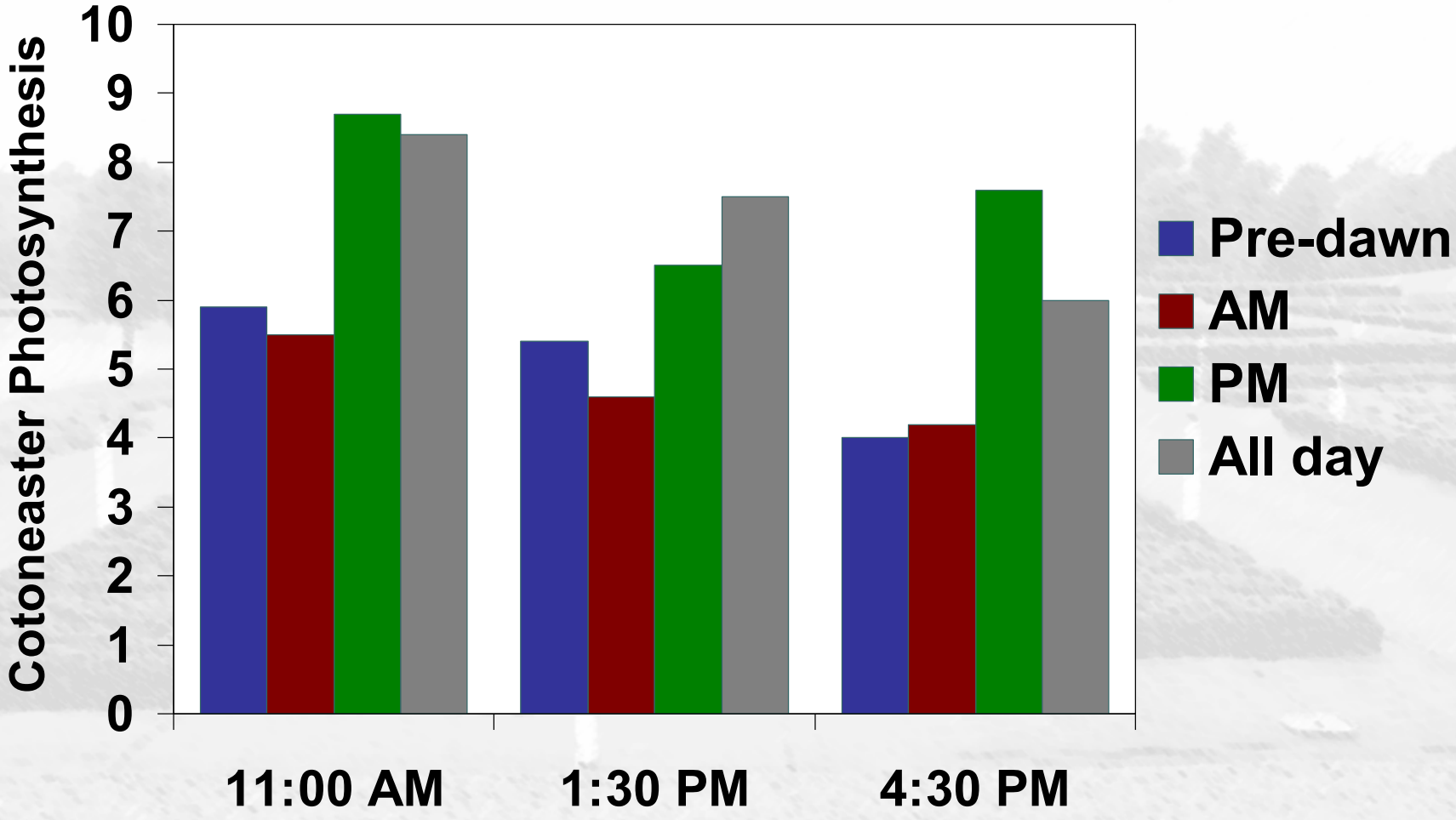
Irrigation timing

Irrigation timing – micro-irrigation



Warren and Bilderback. 2002. J. Environ. Hort

Irrigation timing – micro-irrigation



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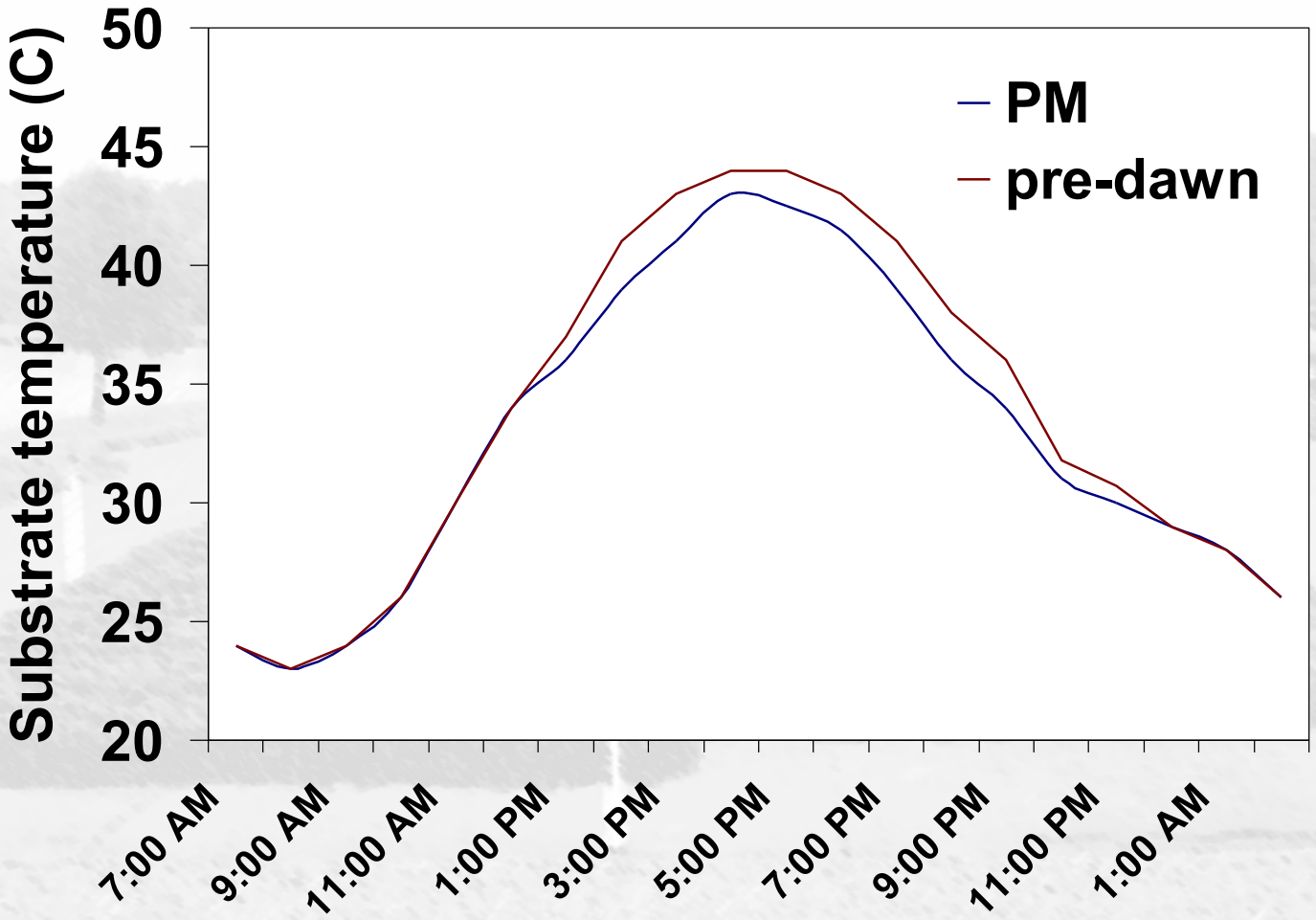
Irrigation timing – micro-irrigation



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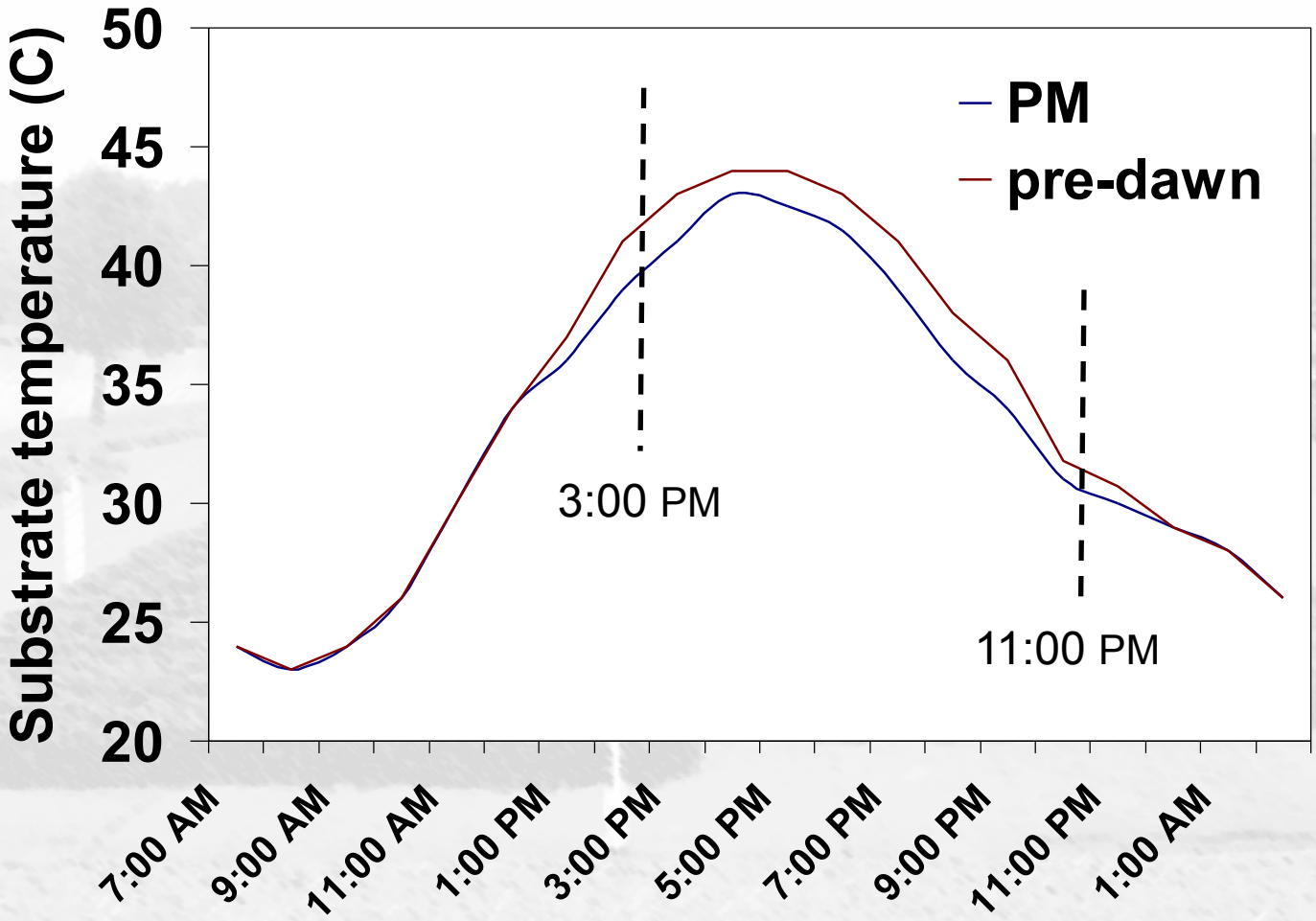
Irrigation timing – micro-irrigation



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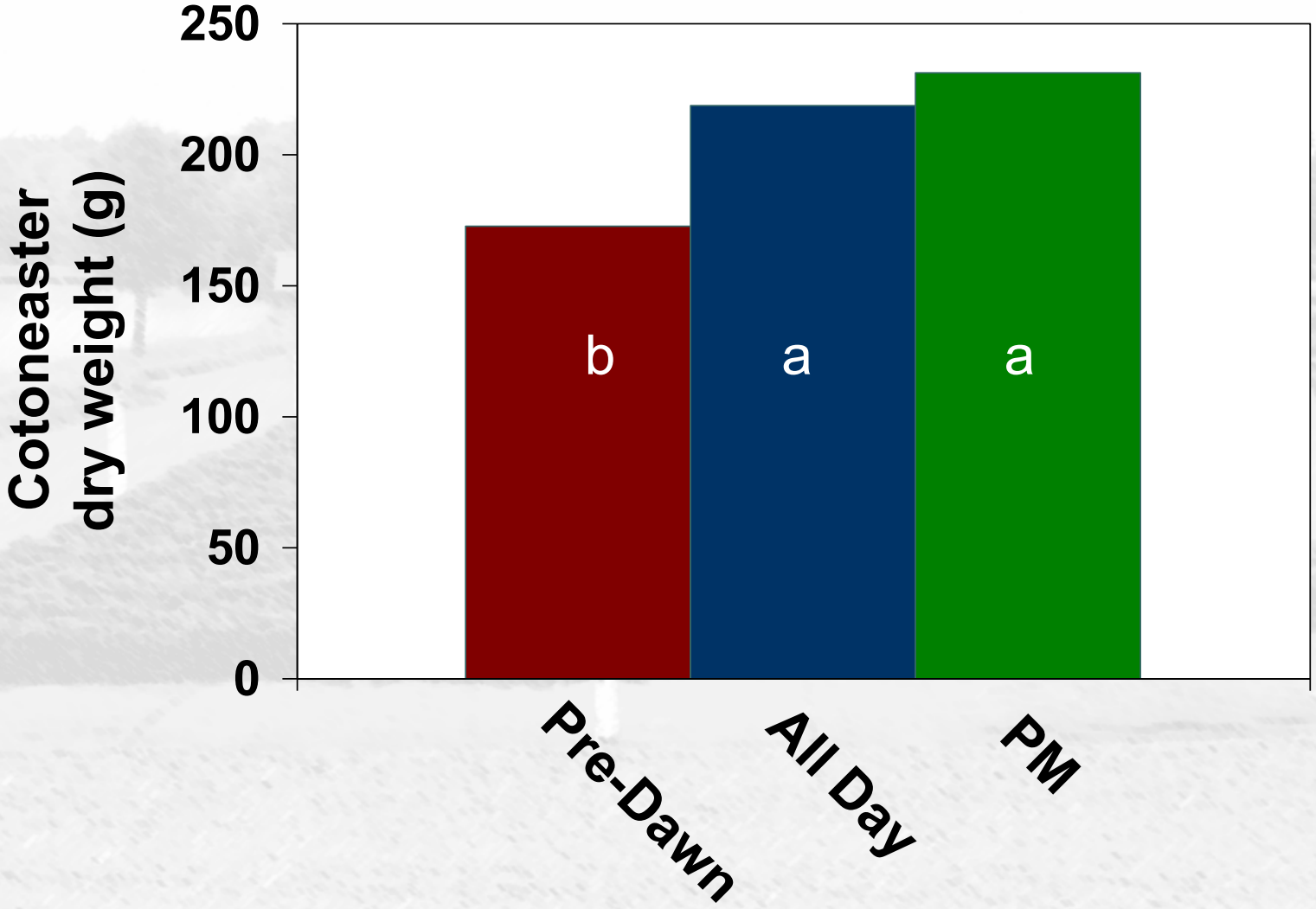
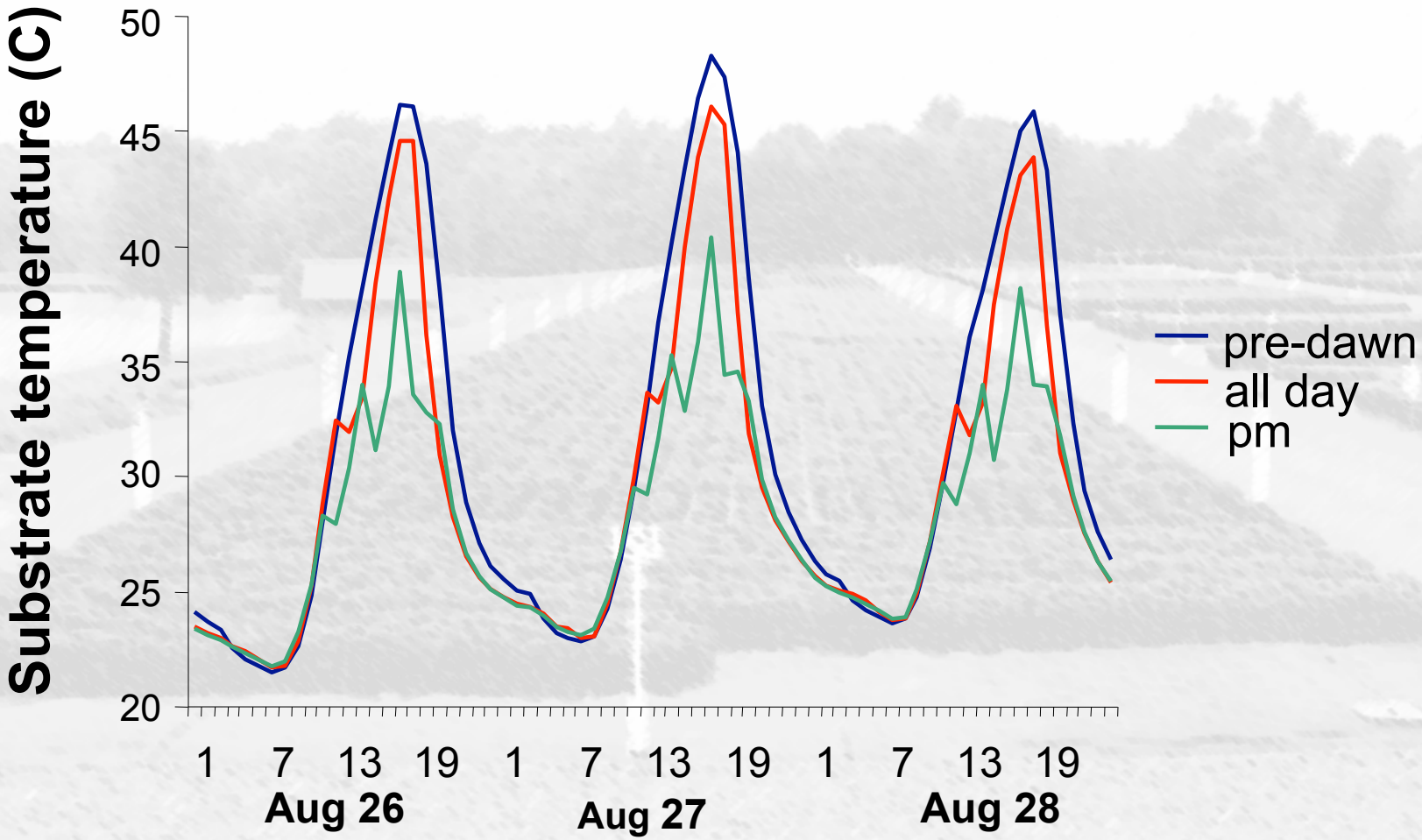
Irrigation timing

Irrigation timing - overhead



Williamson et al. 2005. SNA

Irrigation timing - overhead



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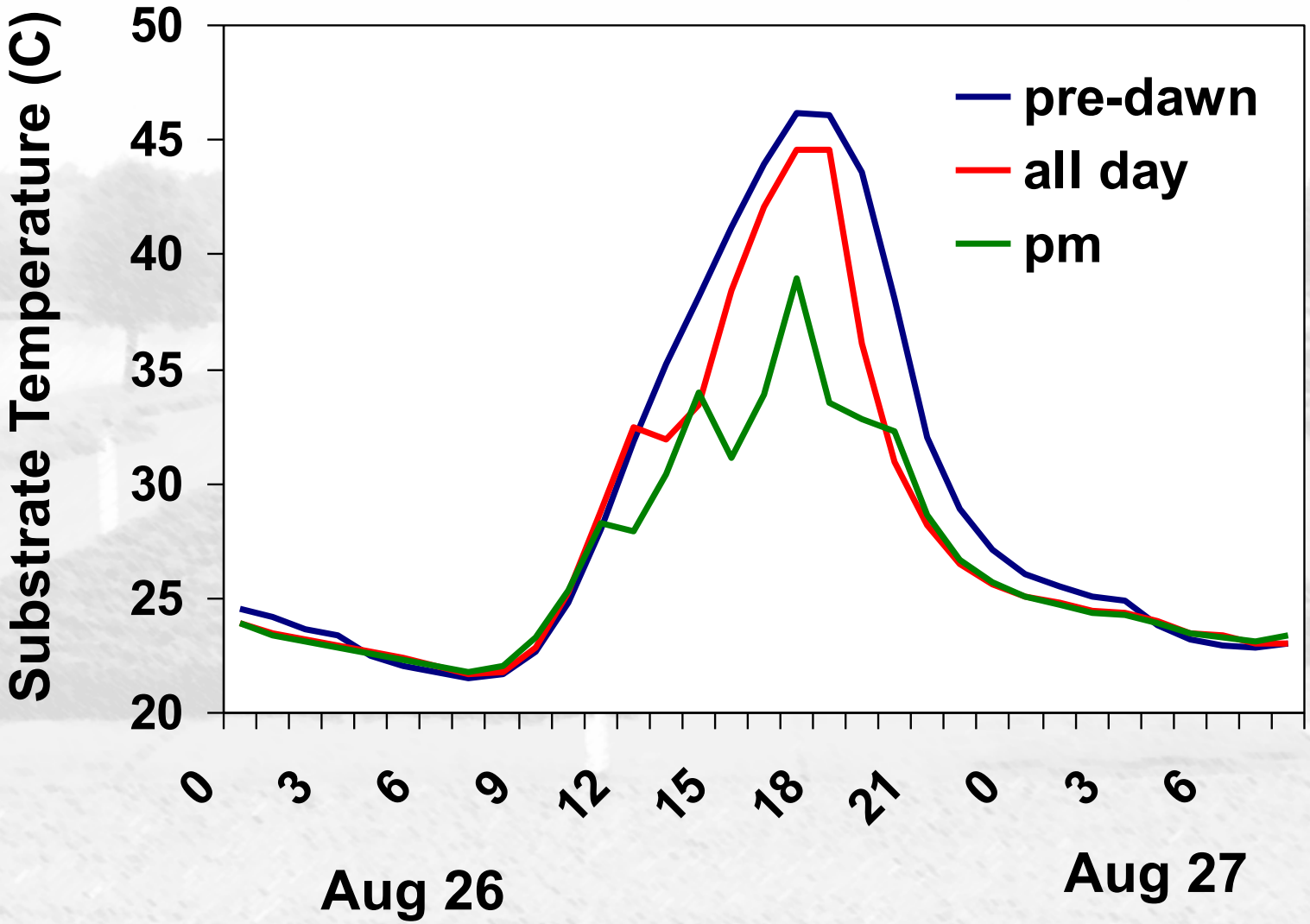
Irrigation timing - overhead



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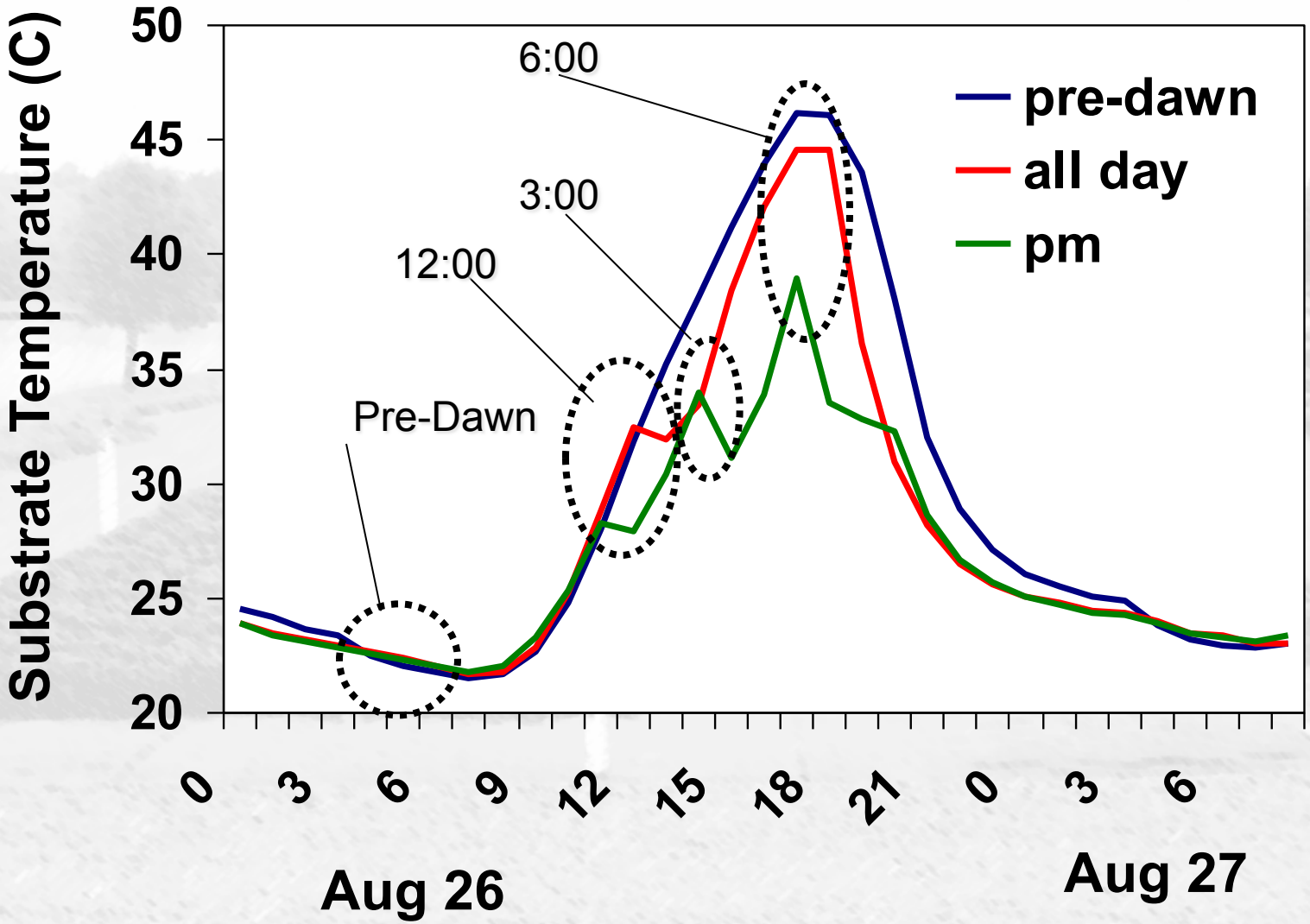
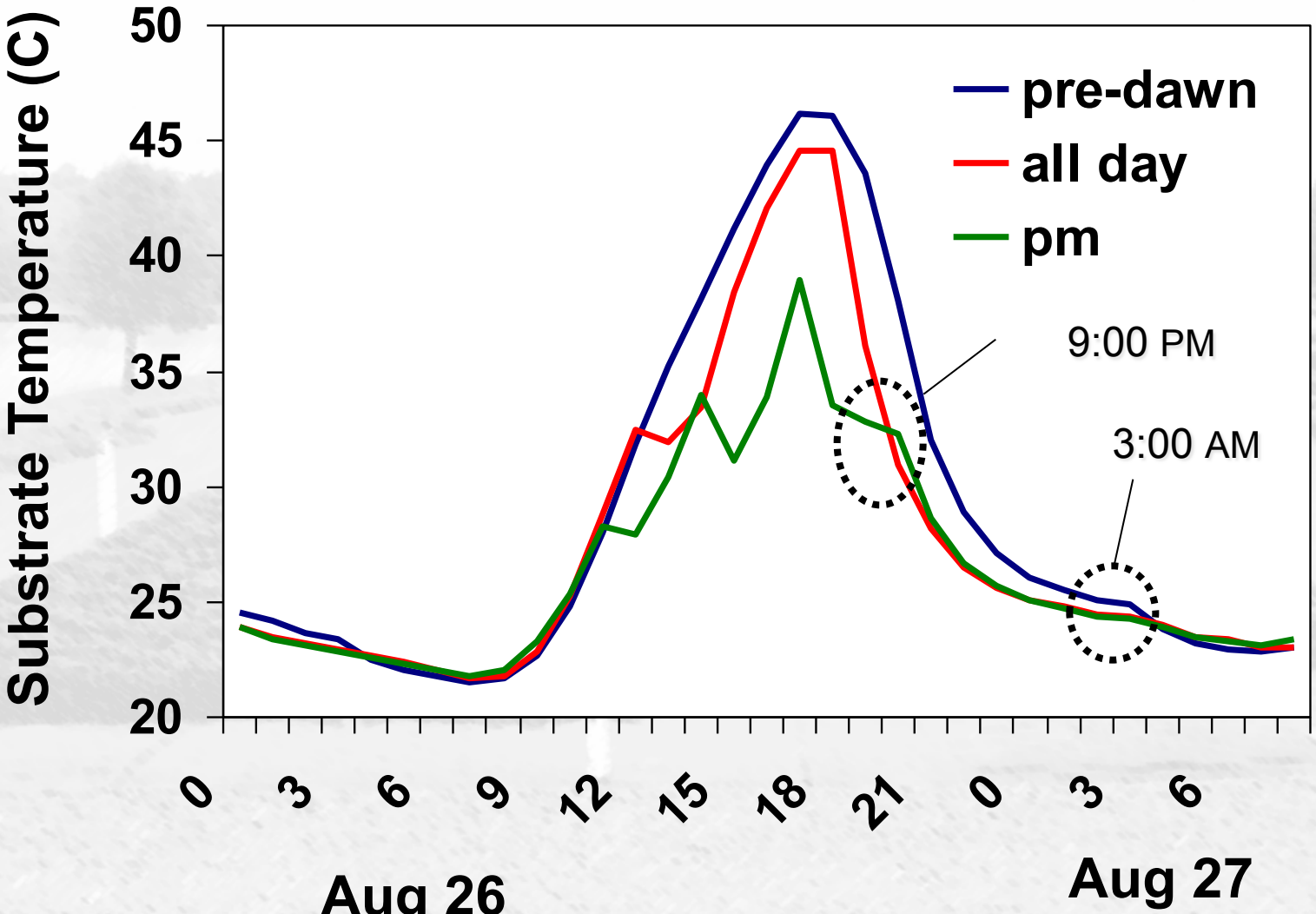
Irrigation timing - overhead



Williamson et al. 2005. SNA

Irrigation timing - overhead



Williamson et al. 2005. SNA

Irrigation timing

- Advantages
  - Increases plant growth
  - Regulate substrate temperature
  - Increase water use efficiency
- Disadvantages
  - Irrigation timing
  - Management

Plant Grouping

- Group plants by similar water use to increase irrigation efficiency

Plant Grouping

- Group by:
  - Size
    - Container
    - Plant
  - Species
    - Plant type
    - Water needs
  - Architecture

Plant Architecture

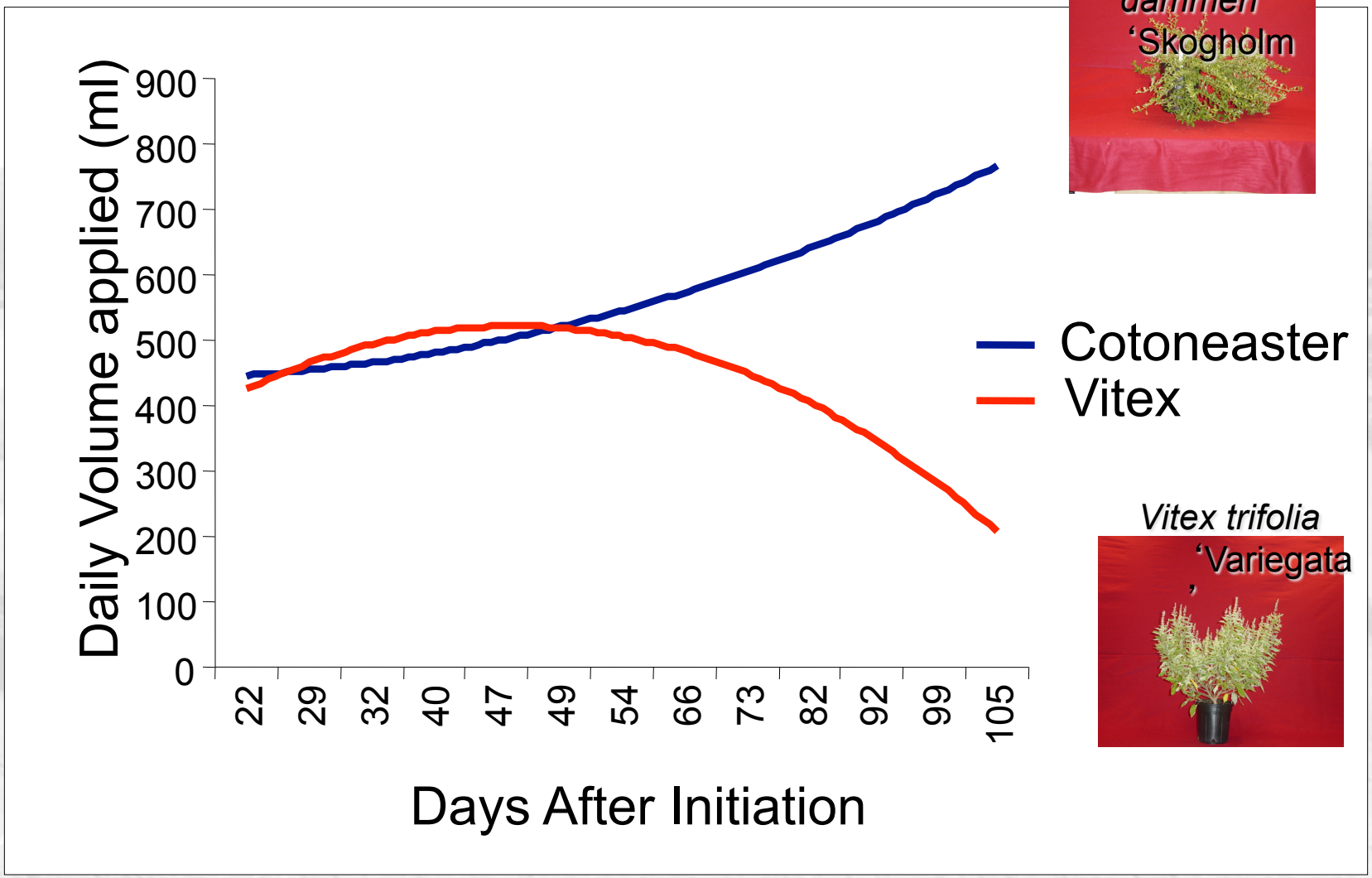
- How does the architecture of a plant's canopy affect its demands for overhead irrigation?

Williamson et al. 2005. SNA

Plant Architecture

Williamson et al. 2005. SNA

Plant Architecture

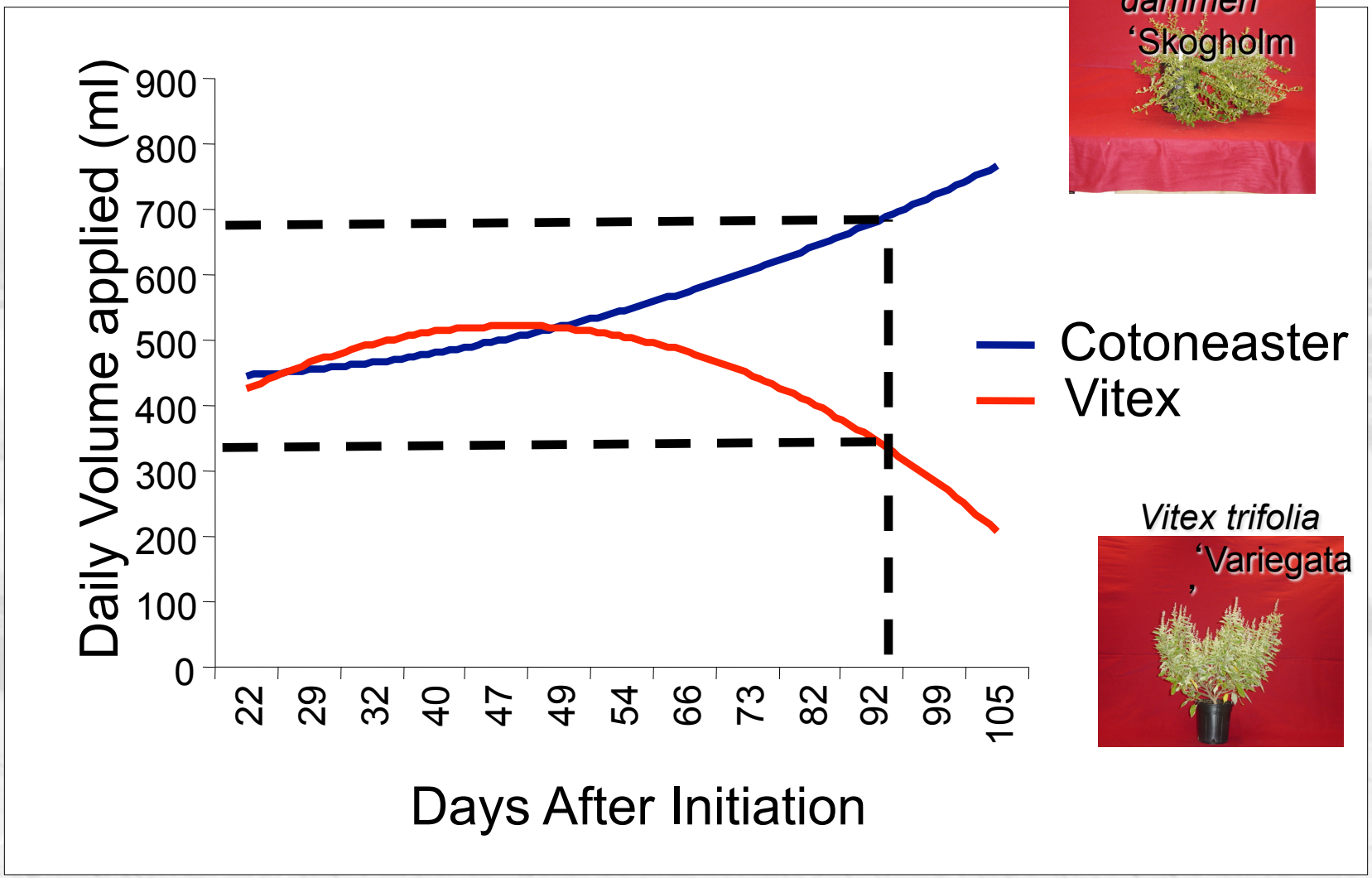


Cotoneaster dammeri 'Skogholm'

Vitex trifolia 'Variegata'

Williamson et al. 2005. SNA

Plant Architecture



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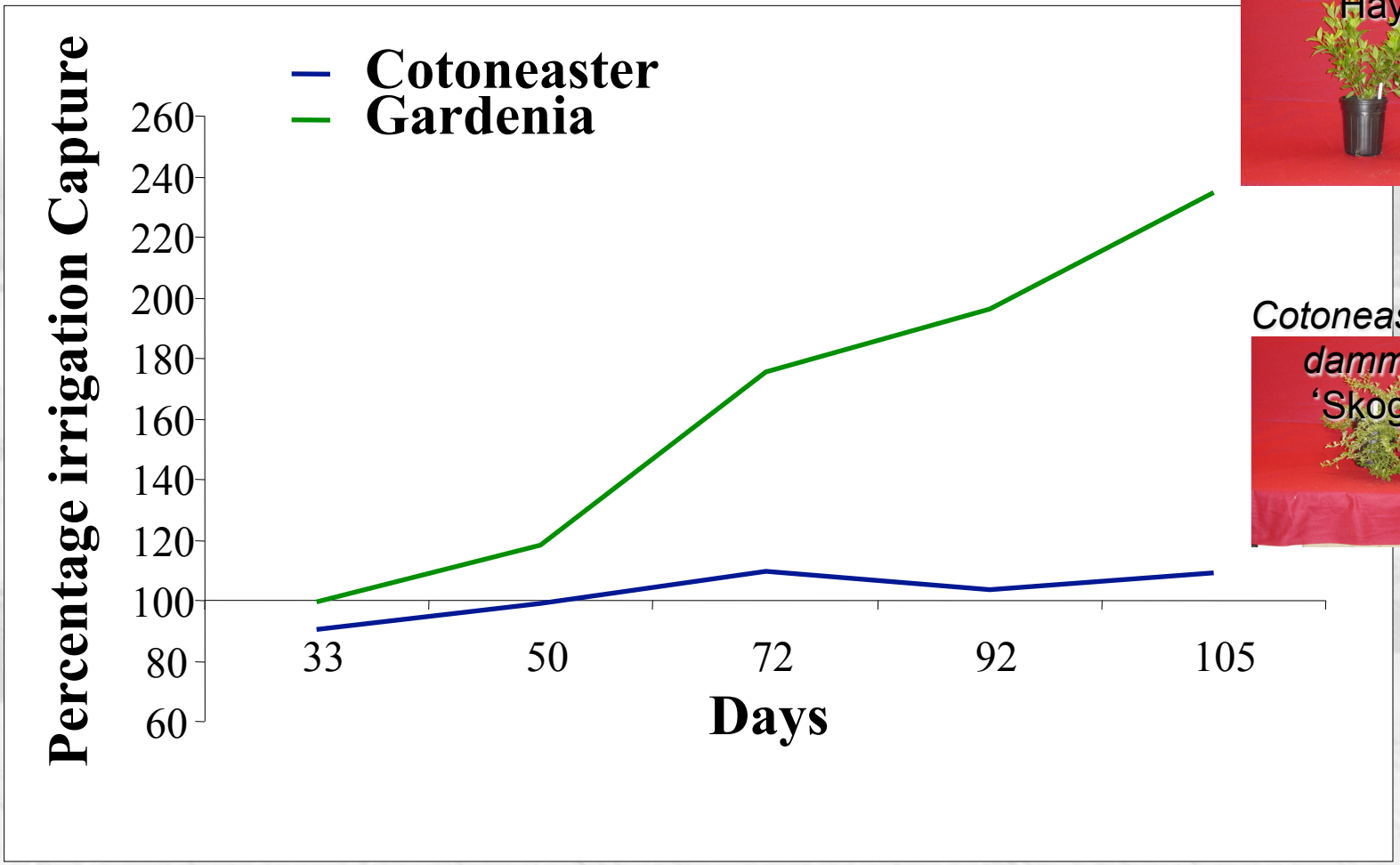
Plant Architecture

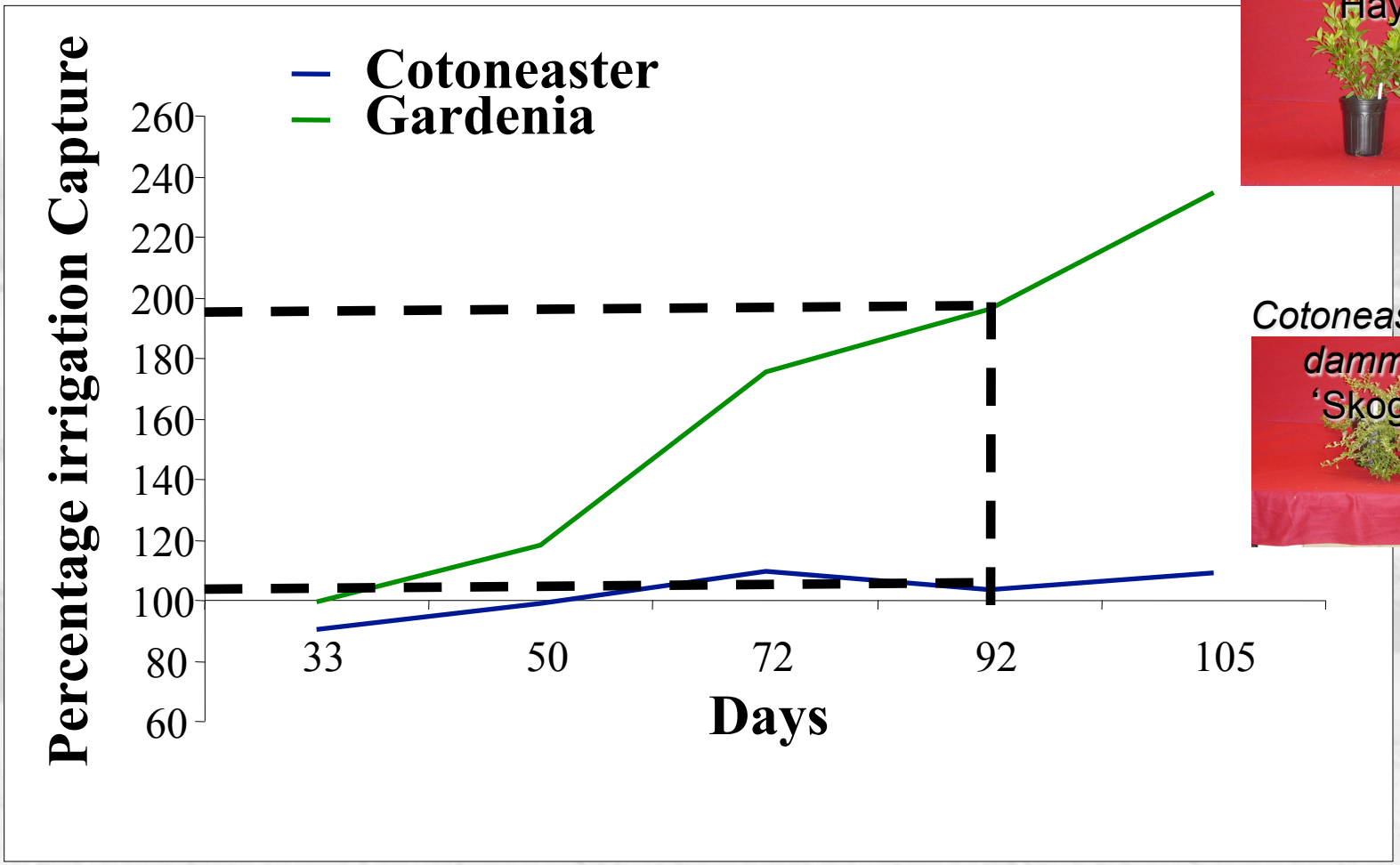


Gardenia augusta 'Chuck Hayes'

Cotoneaster dammeri 'Skogholm

Williamson et al. 2005. SNA

Plant Architecture



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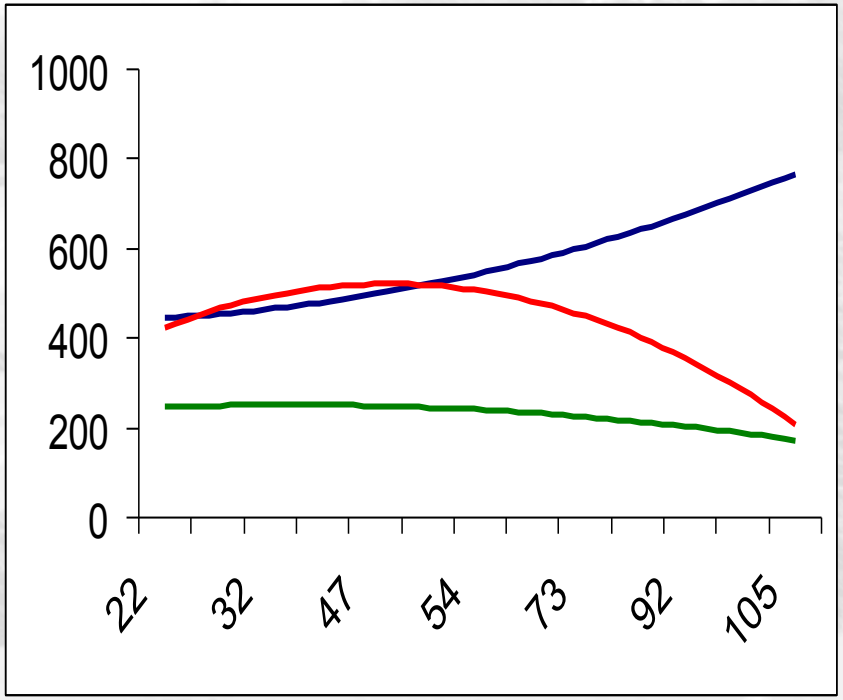
Cotoneaster dammeri 'Skogholm

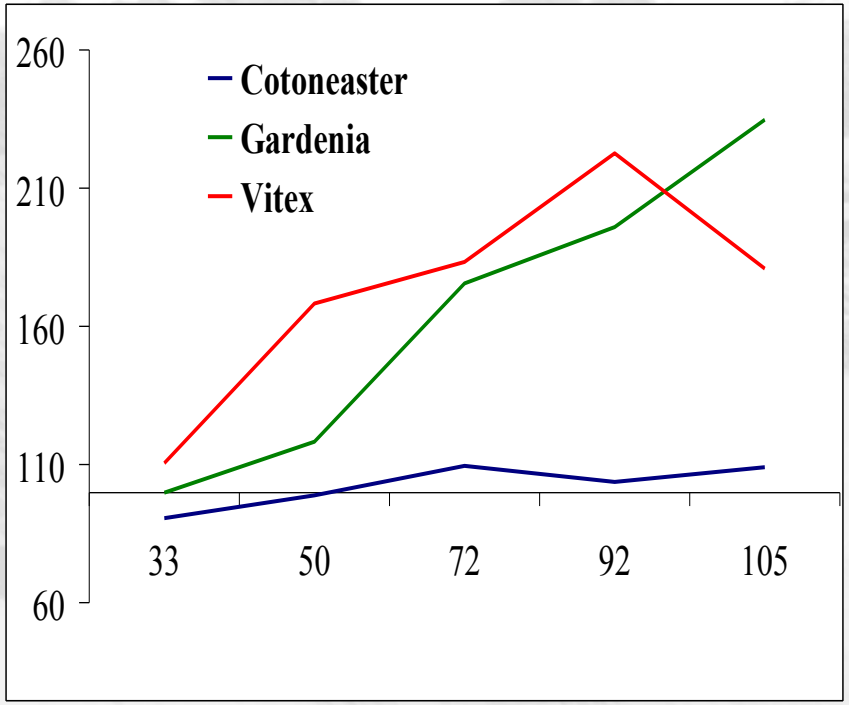
Williamson et al. 2005. SNA

Plant Architecture

Daily Volume Applied (L)



Percentage Capture (%)



Williamson et al. 2005. SNA

FIELD QUANTIFICATION OF SUBSTRATE PHYSICAL PROPERTIES

Plastic bag method

Cook, A., T. Bilderback, and M. Lorscheider. 2004. Physical Property Measurements in Container Substrates: A Field Quantification Strategy. Southern Nursery Association Research Proceedings 49:102-104

Field Quantification

- Why?
  - Check Bark supply
  - Experiment with new components
  - Affect of how you pot

Cook et al. 2004. SNA

Field Quantification

Known container volume

Cook et al. 2004. SNA

Field Quantification

Fill, pack, remove excess

Cook et al. 2004. SNA

Field Quantification

Saturate with known volume = total porosity
(weight can also be used)

Cook et al. 2004. SNA

Field Quantification

Drain a known volume = air space

Cook et al. 2004. SNA

Field Quantification

Container Capacity = total porosity - air space

Cook et al. 2004. SNA

Field Quantification

Bulk Density = dry weight / container volume

Cook et al. 2004. SNA

Field Quantification

- Why
  - Check Bark supply
  - Experiment with new components
  - Affect of how you pot

http://www.sna.org/research/04proceedings/04proceedingspdfs/ResProcSec01.pdf

Cook et al. 2004. SNA

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http://oregonstate.edu/dept/NWREC/