Interception of PAR and RUE of irrigated sweet potato (*Ipomea batatas* L.) grown in a temperate climate

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Introduction & Objectives

Background…

•Crop growth is determined by how much solar radiation is intercepted by the crop (RI) and how efficiently radiation is used to produce dry matter (RUE).

•Understanding how environmental conditions affect these aspects of growth can help maximise production and optimise management for given growing conditions.

•However, there is little published information on RI or RUE for sweet potato crops, or of how these vary with for cultivars that have different canopy architecture.

Objectives…

Quantify RI and RUE:

- for non-limiting growth conditions
- for erect and spreading canopy architectures
- to obtain initial parameters for further model development of sweet potato growth

Materials and Methods

- Data was gathered from crops planted 2005-2009 (Table 1) at the Hawkes Bay Research site, NZ.
- Varieties used were Owairaka Red (OR) with a spreading canopy and Purple Star (PS) with an erect canopy (Figure 1).

Best management practices were implemented to ensure that yield was not limited by nutrients, water, pests or diseases.

Sequential measurements of:

- light interception,
- leaf area and biomass from a sample of 6 plants

were collected until the first frosts.

Season	Cultivar	Sowing Date	Density /m^2
2005-06	OR	14 Nov 05 10 Jan 06	4.0
2007-08	OR PS	19 Nov 07 17 Dec 07	4.4, 6.7,13.3
2009-10	PS	24 Nov 09 17 Dec 09 12 Jan 10	6.7

Table 1. Planting dates and densities of sweet potato

Fig 1. Erect (Purple Star)and spreading (Owiaraka Red) canopies of sweet potato.

Results

LAI growth did not differ between cultivars, but did differ between seasons (Fig. 2)

From LAI and the fraction of light intercepted (*f*) we calculated the extinction coefficient *k,* using the equation: Ln(1-*f*)=-kLAI

k did not vary between seasons, planting dates or densities, but did vary between cultivars (Fig. 3)

k was lower for PS (0.65$^{+}/_{-}$ 0.03) due to am ore erect canopy than OR (0.79$^{+}/_{-}$ 0.04)

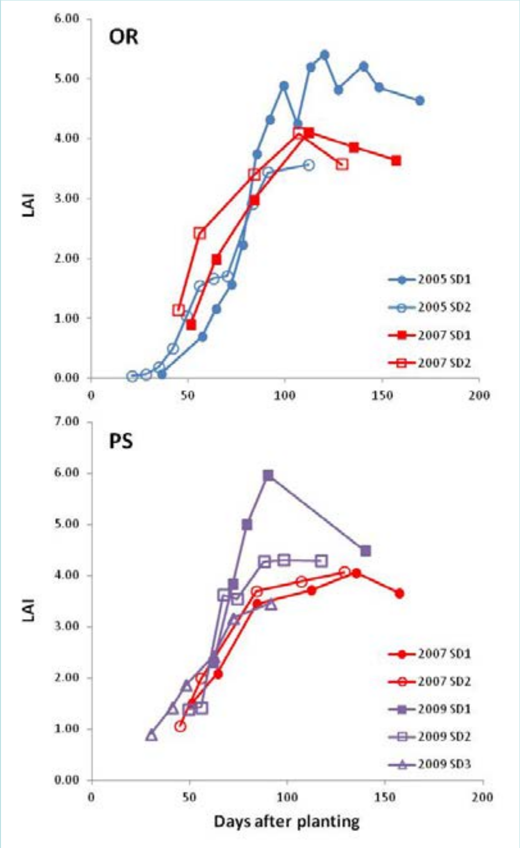

Figure. 2. Change in LAI for cultivar OR and PS of sweet potato

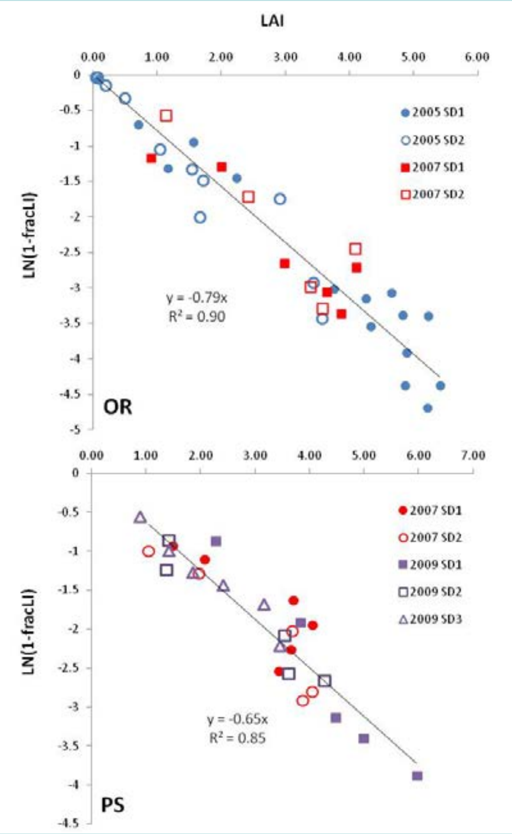

Figure. 3. Change in *k* for cultivar OR and PS of sweet potato

Accumulated PAR was regressed against dry matter biomass to calculate RUE.

PAR was accumulated after crops recovered from transplant shock, not from planting date.

RUE varied between cultivars, but not between seasons, planting dates or planting densities (Fig. 4).

RUE was greater for PS ($2.51^{+}/_{-}$ 0.06) than OR ($2.39^{+}/_{-}$ 0.04).

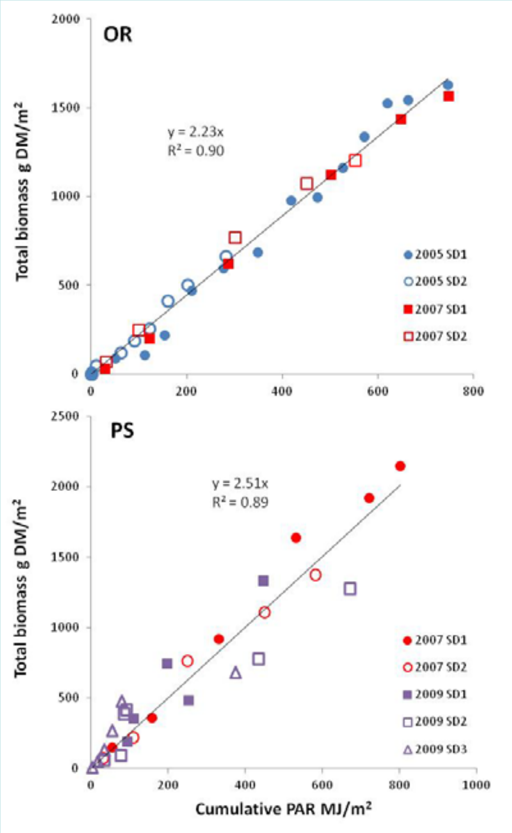

Figure. 4. RUE of cultivars OR and PS of sweet potato

Conclusions

Cultivars differed in *k* and RUE.

Season and planting density did not seem to cause differences in *k* or RUE for these fully irrigated and fertilised crops.

Crop models of sweet potato will need to take account of cultivar differences in *k* and RUE.

Breeding efforts to produce varieties with high *k* and RUE would improve production.

References

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