

# Net photosynthesis rate and chlorophyll content of Caucasian and white clover leaves under different temperature regimes.



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## Conclusions

- Higher net photosynthesis rates (Pn) for Caucasian clover (Cc) leaves were attributed to their higher chlorophyll content than white clover (wc).
- Thus, for any given canopy leaf area index, Cc canopy Pn is expected to exceed that for wc and give more assimilate per unit leaf area.
- This could explain higher growth rates for Cc over wc observed in intensive temperate pastures.

## Background

- Caucasian or Kura clover (*Trifolium ambiguum*) was more productive than white clover (*T. repens*) in New Zealand pastures.
- Examining the physiological basis for this difference can provide greater insight into the suitability of Cc for inclusion in temperate pastures.
- Leaf photosynthesis rate drives seasonal growth and is regulated by temperature and chlorophyll content.
- Thus, Pn and chlorophyll content of Cc and wc leaves were compared under different temperature regimes.

## Methods

- Cc and wc were grown under irrigation at Lincoln University, Canterbury, New Zealand.
- Pn and chlorophyll were measured at either 12 °C (T<sub>lim</sub>) or 23 °C (T<sub>opt</sub>) air temperatures.
- Pn was measured on 10 leaves at 7 light intensities using a photosynthesis system (LI-6400 LiCor).
- Chlorophyll content was estimated using a chlorophyll meter (SPAD-502 Minolta).

## Results

- Pn responses to light intensity followed non-rectangular hyperbolas (Figure 1).
- Cc Pn<sub>max</sub> was 32 μmol CO<sub>2</sub>/m<sup>2</sup>/s at 23 °C but decreased to 17 μmol CO<sub>2</sub>/m<sup>2</sup>/s at 12 °C.
- These rates were ~6 μmol CO<sub>2</sub>/m<sup>2</sup>/s higher than wc Pn<sub>max</sub>.
- Chlorophyll contents were higher for Cc than wc at both temperatures (Table 1).

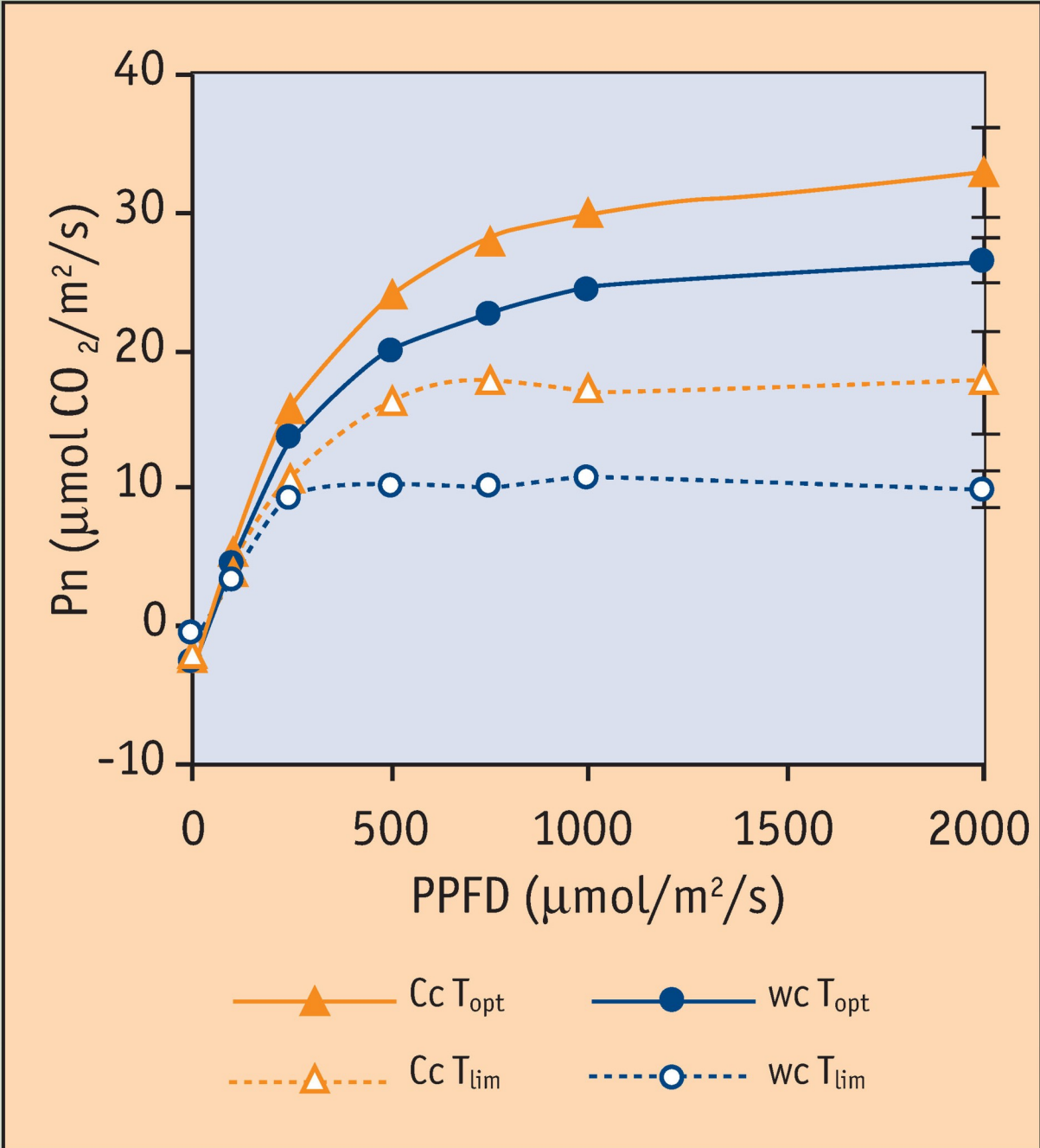


Figure 1. Pn response to light intensity at either 12 °C (T<sub>lim</sub>) or 23 °C (T<sub>opt</sub>). Bars indicate se for Pn<sub>max</sub>

	T <sub>lim</sub>		T <sub>opt</sub>		
	Cc	wc	Cc	wc	sed
Chlorophyll a	2.01	1.79	1.90	1.74	0.033
Chlorophyll b	0.32	0.25	0.29	0.24	0.010
Total chlorophyll	2.33	2.05	2.20	1.99	0.044

Table 1. Chlorophyll contents (mg/g) for Cc and wc at 12 °C and 23 °C.

