

Supplementary Material

Soil water availability influences the temperature response of photosynthesis and respiration in a grass and a woody shrub

Tony Joseph^A, David Whitehead^B and Matthew H. Turnbull^{A,C}

^ASchool of Biological Sciences, University of Canterbury, Private Bag 4800, Christchurch 8041, New Zealand.

^BLandcare Research, PO Box 69040, Lincoln 7640, New Zealand.

^CCorresponding author. Email: matthew.turnbull@canterbury.ac.nz

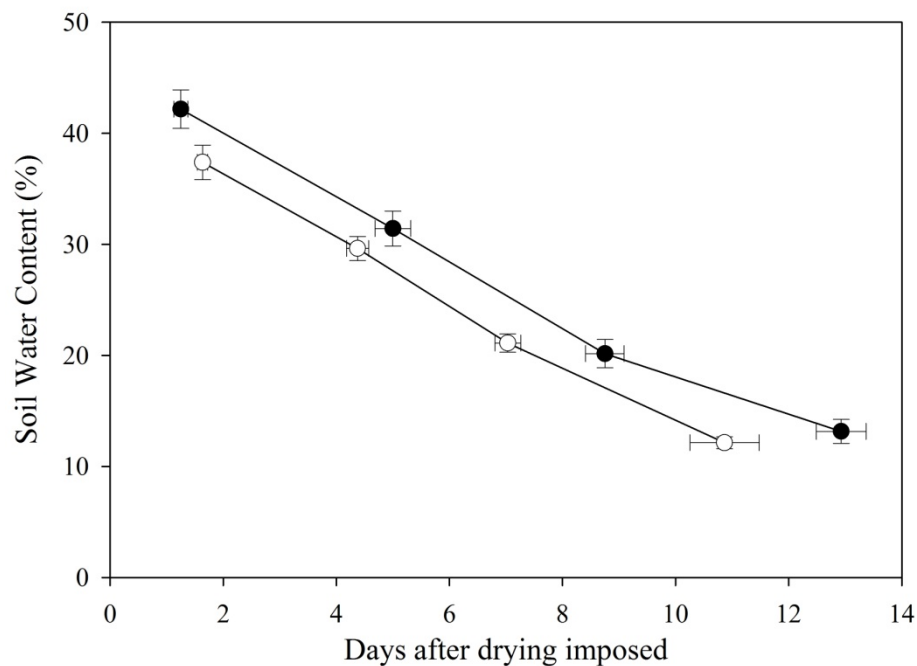


Fig. S1. Changes in the rate of soil water content (%) for brown top grass (open circles) and kānuka (closed circles) with time, after imposing the drying event.

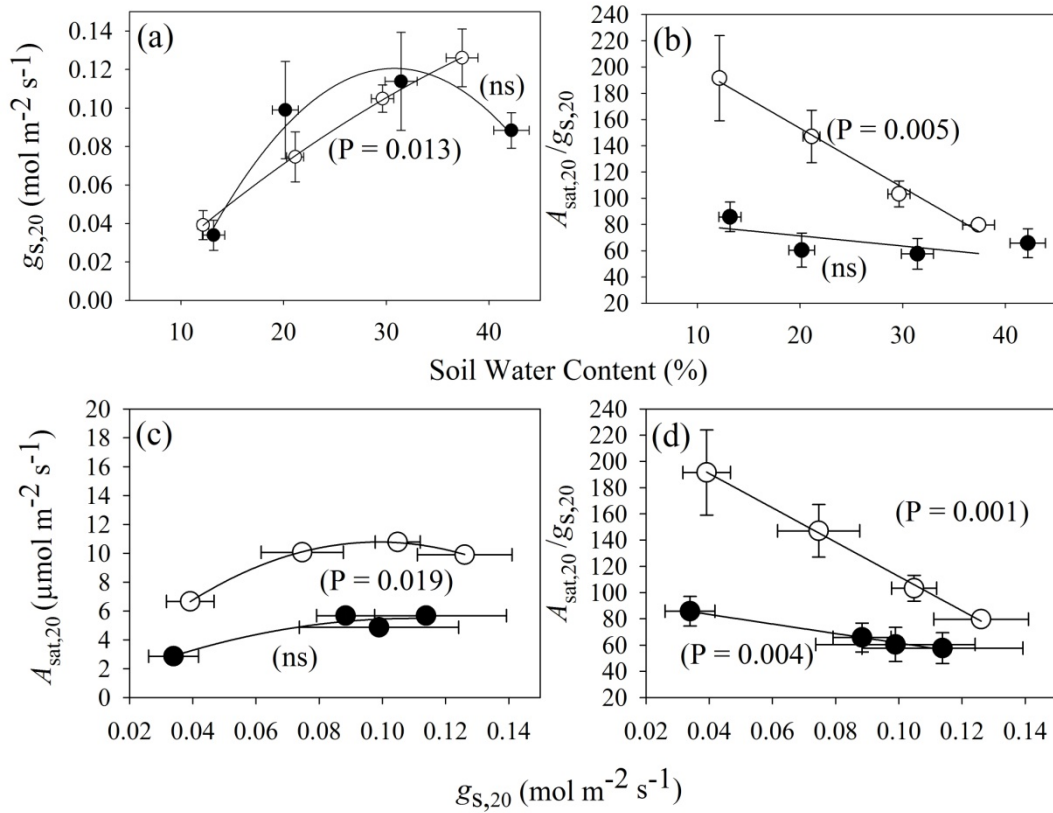


Fig. S2. Relationship between soil water content and (a) stomatal conductance ($g_{s,20}$) of brown top grass ($g_{s,20} = -4 \times 10^{-3} \theta^2 + 0.005 \theta - 0.018$, $r^2 = 0.99$) and kānuka (ns) and (b) intrinsic water use efficiency ($A_{\text{sat},20} : g_{s,20}$) of the grass ($A_{\text{sat},20} : g_{s,20} = -4.517 \theta + 243.6$, $r^2 = 0.99$) and kānuka (ns). Dependence of (c) light saturated net CO₂ assimilation rate ($A_{\text{sat},20}$) of the grass ($A_{\text{sat},20} = -1165 g_{s,20}^2 + 230.1 g_{s,20} - 0.587$, $r^2 = 0.99$) and kānuka (ns) and (d) intrinsic water use efficiency ($A_{\text{sat},20} : g_{s,20}$) of the grass ($A_{\text{sat},20} : g_{s,20} = -1048 g_{s,20} + 211.8$, $r^2 = 0.99$) and kānuka ($A_{\text{sat},20} : g_{s,20} = -422.5 g_{s,20} + 97.57$, $r^2 = 0.91$) on stomatal conductance ($g_{s,20}$). Measurements were taken at 20°C and at an external concentration of 370 $\mu\text{mol mol}^{-1}$. Open symbols, grass; closed symbols, kānuka.

Table S1. Parameters obtained by fitting the data to the mixed effect models for V_{cmax} and J_{max} , and respiration response data using leaf temperature and soil water content as variables for brown top grass and kānuka

Plant type	Variables	$V_{\text{cmax},20}$ ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	H_{av} (kJ mol^{-1})	θ_c (%)	P -value
Grass	Leaf temperature and soil water content	39.72	53.9	17.0	<0.001
Kānuka	Leaf temperature and soil water content	35.31	49.4	23.6	<0.001
		$J_{\text{max},20}$ ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	H_{aj} (kJ mol^{-1})	θ_c (%)	P -value
Grass	Leaf temperature and soil water content	97.72	28.8	18.0	<0.001
Kānuka	Leaf temperature and soil water content	78.67	28.1	23.6	<0.001
		R_{10} ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	E_0 (kJ mol^{-1})	θ_c (%)	P -value
Grass	Leaf temperature	0.29	38.2		<0.001
Kānuka	Leaf temperature and soil water content	0.62	43.5	15	<0.001