

Table 1. Summary of observed variation in thermally-relevant leaf traits with canopy height and/or between sun and shade leaves

trait	symbol	units	response	forest type(s)	reference(s)
Leaf anatomy and morphological traits					
leaf mass per area (or inverse of specific leaf area)	LMA (or $1/SLA$)	$g \cdot cm^{-2}$	increases with height	temperate, tropical	Mau et al. 2018, Coble et al. 2017
			sun>shade	global	Hernandez et al. 2019, Mastubara et al. 2009, Martin et. al 2020, Coble et al. 2017, Slot et al. 2019
specific leaf area (or leaf area)	SLA (or LA)	$cm^{-2} \cdot g^{-1}, mm^{-2}, mg^{-1}$	decreases with height	conifer-broadleaf, tropical	Sam Beaumont and Burns 2009, Chadrack Kafuti et al. 2019
leaf elongation	γ	m^{-1}	sun<shade increases with height	tropical tropical	Slot et al. 2019 Chadrack Kafuti et al. 2019
			sun>shade	tropical	Chadrack Kafuti et al. 2019
stomatal density	$D_{stomata}$	$m \cdot m^{-2}$	increases with height	tropical	Chadrack Kafuti et al. 2019
			sun>shade	global	Valladares and Niinemets, 2008
Leaf physiology and biochemical traits					
leaf nitrogen	N_{leaf}	$mg \cdot g^{-1}$	sun<shade sun \approx shade sun>shade	temperate broadleaf tropical	Martin et. al 2020 Bolstad et al. 2019 Hernandez et al. 2019
stomatal conductance	gs_{max}	$g \cdot m^{-2}$ $mole m^{-2} s^{-1}$	increases with height	tropical	Chadrack Kafuti et al. 2019
			sun>shade	global	Valladares and Niinemets, 2008
photosynthetic capacity	A_{max}	$\mu mol \cdot m^{-2} \cdot sec^{-1}$	increases with height	temperate, tropical	Mau et al. 2018
			sun>shade	temperate deciduous	Coble et al. 2017, Hikosaka and Terashima 1995, Evans 1989

Table 2. Summary of observed variation in leaf metabolism and thermal responses across the vertical gradient and/or between sun and shade leaves

trait	symbol	units	response	forest type(s)	reference(s)
Stomatal conductance					
stomatal conductance	g_s		sun > shade	tropical	Slot et al. 2019
optimum temperature of g_s	T_{opt} of g_s	°C	sun \approx shade	tropical	Slot et al. 2019
frequency of stomatal closure			increases with height	tropical	Roberts et al. 1990
Photosynthesis					
light-saturated net photosynthesis	A_{sat}		sun > shade	tropical	Slot et al. 2019
optimum temperature of A_{sat}	T_{opt} of A_{sat}	°C	sun \geq shade	tropical	Slot et al. 2019
thermal damage threshold	T_{50}	°C	sun \geq shade	tropical	Slot et al. 2019
			decreases with height*	savanna	Curtis et. al, 2018
light compensation point	LCP		sun > shade	tropical	Slot et al. 2019
Respiration					
dark respiration at reference T	$R_{dark}(T_{ref})$		sun > shade	tropical	Slot et al. 2019
		$\mu\text{mol (kg leaf)}^{-1} \text{ s}^{-1}$	sun > shade	temperate	Bolstad et al. 1999
		$\mu\text{mol (m leaf)}^{-2} \text{ s}^{-1}$	sun > shade	temperate	Bolstad et al. 1999
		$\mu\text{mol (kg N)}^{-1} \text{ s}^{-1}$	sun > shade	temperate	Bolstad et al. 1999
temperature sensitivity of R_{dark}	Q_{10}	°C ⁻¹	sun \leq shade	temperate	Bolstad et al. 1999
VOC production (isoprenes)					

*composite climatic stress variable from canopy temperature, vapour pressure deficit, and relative humidity is higher in lower canopy