Table 1. Summary of typically 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 area	*LA*	cm^2	↓ H	TrB, TeB, BoN	7, 8, 10
			↓ L	TrB, TeB, BoN	7, 8, 3, 10
leaf mass per area (or inverse of specific leaf area)	*LMA (or 1/SLA)*	g cm^{-2}	↑ H	TrB, TeB, TeN, BoN	1, 55, 7, 2, 3, 4, 6
			↑ L	TrB, TeB, TeN, BoN	1, 7, 2, 3, 5, 6
leaf thickness		µm	↑ H	TrB, TeB, TeN	15, 11, 2, 13, 16
			↑ L	TrB, TeB, TeN	11, 15, 2, 5
leaf density		g cm^{-3}	↑ H	TeB	2
			↑ L	TrB, TeB	6, 2
			≈ L	TeN	5
pinnate lobation		cm^2	↑ H	TeB	3
			↓ H	TeB	8
			↑ L	TeB	8, 3
leaf packing		n /cm stem	↑ L	TeN	25, 26
blade inclination angle (vertical)	φB	°	↑ H	TrB, TeB	21, 22, 23
			↑ L	TrB, TeB	21, 24, 23, 22, 48
trichome density		mm^{-2}	↑ H	TrB	17
			↑ L	TrB, TeB	17, 18, 19, 20
stomatal density	$D_{stomata}$	mm^{-2}	↑ H	TrB, TeB, TeN	11, 12, 3, 13, 4
			↑ L	TrB, TeB	12, 11, 3
total vein density	*VLA*	mm mm^{-2}	↑ H	TeB	46
			↑ L	TeB	46, 47
minor vein density	VLA_{min}	mm mm^{-2}	↑ H	TeB	14
			↑ L	TeB	14, 47
upper cuticle thickness	*CT*	µm	↑ H	TrB, TeN	27, 4
			↑ L	TrB, TeB	27, 28
Traits related to metabolic capacity and efficiency					
nitrogen content	*N*	g m^{-2}	↑ H	TrB, TeB, TeN, BoN	55, 7, 29, 30, 32, 31, 9
		mg g^{-1}	≈↓ H	TrB, TeB, TeN	55, 15, 7, 29, 30, 32, 34
			≈↓ L	TrB, TeB, TeN	7, 35, 29, 30, 32, 5
phosphorous content	*P*	g m^{-2}	↑ H	TrB, TeB, TeN	55, 15, 36, 1, 37
			↑ L	TrB, TeB, TeN	15, 5
			≈ L	TrB, TeB	1
		mg g^{-1}	≈↓ H	TrB	55, 15, 35, 1
			≈ L	TrB, TeB	15, 35, 1

Table 1. Summary of typically 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)[‡]
chlorophyll content	*Chl*	mg cm^{-2}	↓ H	TrB, TeB	40, 41
			↓ L	TrB, TeB	42, 41
chlorophyll a/b ratio	*chl a/b*	mol mol^{-1}	↑ H	TrB, TeB, BoN	42, 30, 6
			↑ L	TrB, TeB, BoN	42, 30, 39, 22, 6
carbon isotope ratio	$\delta^{13}C$	‰	↑ H	TrB, TeB, TeN	55, 7, 43, 31
			↑ L	TrB, TeB, TeN	7, 29, 31
intercellular CO_2 concentration	C_i	µmol mol^{-1}	↓ H	TeB, BoN	51, 30, 44
			↓ L	TeB	30, 44
Light absorption or reflectance					
PAR absorptance		%	≈ H	TrB	42, 45
			≈↑ L	TrB	42, 45
absorptance efficiency per unit biomass		% g^{-1}	↓ H	TrB	42, 45
			↓ L	TrB	42, 45
PAR transmittance		%	↓ H	TrB	42, 45
			↓ L	TrB	42, 45
Reflectance		%	≈ H	TrB	42, 45
			↑ H	BoN	6
			≈ L	TrB	42, 45
Biochemical protection against light and heat damage					
β-carotene and lutein		µmol m^{-2}	↑ H	TrB, TeB, BoN	30, 42, 6
			↑ L	TrB, TeB, BoN	30, 38, 6
xanthophyll cycle pigments	*VAZ*	µmol m^{-2}	↑ H	TrB, TeB	38, 30, 22
			↑ L	TrB, TeB	39, 30
isoprene emission ability	*I*	nmol m^{-2} s^{-1}	↑ H (peak in mid-canopy)	TrB	49
			↑ L (peak in mid-canopy)	TrB	49
			↑ L	TeB	50

Table 1. Summary of typically 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)[‡]
VOC production					
isoprene emission (in emitting species)	*I*	nmol m^{-2} s^{-1}	↑ H (peak in mid-canopy)	TrB	49
			↑ L (peak in mid-canopy)	TrB	49
			↑ H	TeB	32, 60
			↑ L	TeB	32, 61, 62
monoterpenoid emissions	*MT*	µg $m^{-2}s^{-1}$	↑ H (peak in mid-canopy)	TeB	63
			↑ L (peak in mid-canopy)	TeB	63
Thermal tolerance					
photosynthetic heat tolerance	T_{50}	˚C	↓ H**	TrS	52
			≈↑ L	TrB, TeB	53, 54
critical temperature beyond which Fv/Fm declines	T_{crit}	˚C	≈↑ L	TrB, TeB	53
Phenology					
bud break		day of year	↓ H	TeB	56
leaf lifespan		months	↓ H	TrB	57
			↓ L		
drought deciduous leaf habit		%	↑ H	TrB	58, 59

1. Mau et al. 2018; **2.** Coble and Cavaleri 2014; **3.** Sack et al. 2006; **4.** Chin and Sillett 2019; **5.** Wyka et al. 2012; **6.** Atherton et al. 2017; **7.** Kenzo et al. 2015; **8.** Kusi and Karasi 2020; **9.** Dang et al. 1997; **10.** Gebauer et al. 2015; **11.** Marenco et al. 2017; **12.** Kafuti et al. 2020; **13.** Van Wittenberghe et al. 2012; **14.** Zhang et al. 2019; **15.** Weerasinghe et al. 2014; **16.** Oldham et al. 2010; **17.** Ichie et al. 2016; **18.** Gregoriou et al. 2007; **19.** Levizou et al. 2005; **20.** Liakoura 1997; **21.** Fauset et al. 2018; **22.** Niinemets et al. 1998, **23.** Ishida et al. 1998; **24.** Millen and Clendon 1979; **25.** Smith and Carter, 1988; **26**. Hadley and Smith 1987; **28.** Baltzer and Thomas 2005; **29.** Coble et al. 2016; **30.** Scartazza et al. 2016; **31.** Duursma and Marshall, 2006; **32.** Harley et al. 1996; **33.** Hernandez et al. 2020; **34.** Turnbull et al. 2003; **35.** Chen et al. 2020; **36.** van de Weg et al. 2012; **37.** M.A Cavaleri et al. 2008; **38.** Koniger et al. 1995; **39.** Mastubara et al. 2009; **40.** Harris and Medina 2013; **41.** Hansen et al. 2001; **42.** Poorter et al. 1995; **43.** Coble et al. 2016; **44.** Niinemets et al. 2004; **45.** Poorter et al. 2000; **46.** Zwieniecki et al. 2004; **47.** Sack and Scoffoni, 2013; **48.** Ball et al., 1988; **49.** Taylor et al. 2021; **50.** Niinemets et al. 2010; **51.** Brooks et al. 1997; **52.** Curtis et al. 2019; **53.** Slot et al. 2019; **54.** Hamerlynck and Knapp 1994; **55.** Lloyd et al. 2010; **56.** Augspurger and Bartlett, 2003; **57.** Osada et al. 2001; **58.** Meakem et al. 2018; **59.** Condit et al. 2000; **60.** Harley et al. 1997; **61.** Niinemets and Sun, 2014; **62.** Sharkey and Monson, 2014; **63.** Simpraga et al. 2013