Table 2. Summary of typically 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)[‡]
Conductance					
boundary-layer conductance	g_b	mmol^{-2} s^{-1}	↑ H	TrB	3
		mm s^{-1}	↑ H	TeN	12
			≈ L	TeN	12
leaf hydraulic conductance	K_{leaf}	m^{-2} s^{-1} MPa^{-1}	↑ L	TeB	41
cuticle conductance	g_{min}	mmol m^{-2} s^{-1}	↑ L	TrB	47
max stomatal conductance	$g_{s\ max}$	mol m^{-2} s^{-1}	↑ H	TrB, TeB, BoN	1, 2, 4
			↑ L	TrB, TeB, TeN, BoN	8, 9, 10, 7, 4
stomatal conductance limitation	g_s	mol m^{-2} s^{-1}	↑ H	TrB, TeN	9, 40, 5, 6, 7
			↑ L	TrB, TeN	9, 40, 7
stomatal conductance at optimal temperature	g_s *at* T_{opt}	mol m^{-2} s^{-1}	≈↑ H	TeB	11
			↓ H	TrB	40
			≈↑ L	TrB	8
Photosynthesis					
maximum photosynthetic capacity	A_{max}	mol m^{-2} s^{-1}	↑ H	TrB, TeB, BoN	14, 11, 15, 4
			≈↓ H	TeB	16
			↑ L	TrB, TeB, TeN, BoN	14, 17, 18, 19, 10, 4
		nmol g^{-1} s^{-1}	≈ H	TrB	20, 21
			≈ L	TrB, TeB, TeN	20, 21, 19
maximum light-saturated net photosynthesis	A_{sat}	µmol m^{-2} s^{-1}	↑ H	TrB, TeB	22, 23
			↑ L	TrB, TeB	8, 23
A_{sat} at optimum temperature	A_{opt}	µmol m^{-2} s^{-1}	≈↑ H	TrB, TeB	13, 11
			↑ H	TrB	40
			↑ L	TrB	8, 13

trait	symbol	units	response*	forest type(s)[†]	reference(s)[‡]
optimum temperature for photosynthesis	T_{opt}	˚C	≈ H	TrB, TeB	24, 11, 13
			↓ H	TrB	40
			≈ L	TrB, TeB	9, 8, 11
photosynthetic light compensation point	*LCP*	$\mu mol\ m^{-2}$	↑ H	TrB, TeB, TeN	25, 16
			↑ L	TrB, TeB, TeN	8, 17, 16
maximal carboxylation rate	V_{cmax}	$\mu mol\ m^{-2}\ s^{-1}$	↑ H	TrB, TeB	2, 23, 14
			↑ L	TrB, TeB, BoN	9, 23, 14, 10
		$nmol\ g^{-1}\ s^{-1}$	≈ H	TrB, TeB	2, 23
			≈ L	TrB, TeB	2, 23
		$nmol\ CO_2\ g^{-1}\ s^{-1}$	≈↓ L	TeB	26
optimum temperature for V_{cmax}	$V_{cmax}\ (T_{opt})$	$\mu\ mol\ m^{-2}\ s^{-1}$	≈↑ H	TeB	11
			≈ L	TrB	9
electron transport rate	J_{max}	$\mu mol\ m^{-2}\ s^{-1}$	↑ H	TrB, TeB	2, 40, 23, 14
			↑ L	TrB, TeB	9, 23, 27, 14
		$nmol\ g^{-1}\ s^{-1}$	≈ H	TrB, TeB	2, 23
			≈ L	TrB, TeB	2, 23
		$nmol\ e^{-1}\ g^{-1}\ s^{-1}$	≈↓ L	TeB	26
optimal temperature of J_{max}	T_{optETR}	˚C	↓ H	TrB	40
	$J_{max}(T_{opt})$	$\mu mol\ m^{-2}\ s^{-1}$	≈ L	TrB	9
high-temperature CO_2 compensation point	T_{max}	˚C	≈ H	TrB	22
			≈ L	TrB	8
photosynthetic heat tolerance	T_{50}	˚C	↓ H**	TrS	31
			≈↑ L	TrB, TeB	8, 17
critical temperature beyond which Fv/Fm declines	T_{crit}	˚C	≈↑ L	TrB, TeB	8

trait	symbol	units	response*	forest type(s)[†]	reference(s)[‡]
Respiration					
respiration rate at 25 ˚C	*R*	μmol CO_2 $m^{-2}s^{-1}$	↑ H	TrB, TeB, TeN	40, 32, 33, 34
		μmol CO_2 kg^{-1} s^{-1}	≈ H	TrB, TeB, TeN	32, 33
			↑ L	TrB, TeN	32, 34,
light respiration	R_L	μmol m^{-2} s^{-1}	↑ H	TrB	22
			↑ L	TrB	22
dark respiration	R_{dark}	μmol m^{-2} s^{-1}	↑ H	TrB, TeB, BoN	22, 14, 35, 23, 39
			↑ L	TrB, TeB, TeN, BoN	22, 14, 23, 17, 10, 39
		nmol g^{-1} s^{-1}	≈↑ H	TrB	2, 36
			≈ L	TrB	2, 36
R_{dark} at reference *T*	R_{dark} *at reference T*	μmol m^{-2} s^{-1}	↑ H	TrB, TeB, TeN	22, 14, 35, 33
		μmol (kg leaf)$^{-1}$ s^{-1}	↑ H	TrB, TeB, TeN	22, 14, 35, 33
		μmol (kg N)$^{-1}$ s^{-1}	↑ H	TeB,TeN	35, 33
		μmol m^{-2} s^{-1}	↑ L	TrB, TeB	22, 8, 35.
temperature sensitivity of R_{dark}	Q_{10}	˚C^{-1}	≈ H	TrB, TeB, TeN	22, 40, 35, 34
		˚C^{-1}	≈ ↑ H	TeB, TeN	37, 33
			≈ ↓ L	TrB, TeB, TeN	22, 35, 34
			↑ L	TeB	37
activation energy of R_{dark}	E_0	kJ mol^{-1} K^{-1}	≈ H	TrB, TeB, TeN	22, 38, 33
			≈ L	TrB	22, 8
VOC production					
isoprene emission (in emitting species)	*I*	nmol m^{-2} s^{-1}	↑ H (peak in mid-canopy)	TrB	42
			↑ L (peak in mid-canopy)	TrB	42
			↑ H	TeB	37, 43
			↑ L	TeB	37, 44, 45
monoterpenoid emissions	*MT*	*μg $m^{-2}s^{-1}$*	↓ H	TeB	46
			↓ L	TeB	46

1. Kafuti et al. 2020; **2.** Van Wittenberghe et al. 2012; **3.** Roberts et al. 1990; **4.** Dang et al. 1997; **5.** Marenco et al. 2017; **6.** Ambrose et al. 2015; **7.** Zweifel et al. 2001; **8.** Slot et al. 2019; **9.** Hernandez et al. 2020; **10.** Urban et al. 2007; **11.** Carter and

Cavaleri 2018; **12.** Martin et al. 1999; **13.** Mau et al. 2018; **14.** Kosugi et al. 2012; **15.** Niinemets et al. 2015; **16.** Bachofen et al. 2020; **17.** Hamerlynck and Knapp 1994; **18.** Coble et al. 2017; **19.** Wyka et al. 2012; **20.** Rijkerse et al. 2000; **21.** Ishida et al. 1999; **22.** Weerasinghe et al. 2014; **23.** Scartazza et al. 2016; **24.** Miller et al. 2021; **25.** Harris and Medina 2013; **26.** Legner et al. 2014; **27.** Kitao et al. 2012; **28.** Fauset et al. 2018; **29.** Rey-Sanchez et al. 2016; **30.** Muller et al. 2021; **31.** Curtis et al. 2019; **32.** Mier et al. 2001; **33.** Turnbull et al. 2003; **34.** Araki et al. 2017; **35.** Bolstad et al. 1999; **36.** Kenzo et al. 2015; **37.** Harley et al. 1996; **38.** Xu and Griffin 2006; **39.** Atherton et al. 2017; **40.** Carter et al. 2021; **41.** Sack et al. 2003; **42.** Taylor et al. 2021; **43.** Harley et al. 1997; **44.** Niinemets and Sun, 2014; **45.** Sharkey and Monson, 2014; **46.** Saimpraga et al. 2013; **47.** Slot et al. 2021