| trait  Table 1. Summary of typically observed variation in thermally-relevant leaf traits with canopy height and/or between sun and shade leaves | symbol | units | response\* | forest type(s)† | reference(s)‡ |
| --- | --- | --- | --- | --- | --- |
| **Leaf anatomy and morphological traits** | | | | | |
| leaf area | *LA* | cm2 | ↓ 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 |  | cm2 | ↑ 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 | *Dstomata* | 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 | *VLAmin* | 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 |
| 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 | *δ13C* | ‰ | ↑ H | TrB, TeB, TeN | 55, 7, 43, 31 |
|  |  |  | ↑ L | TrB, TeB, TeN | 7, 29, 31 |
| intercellular CO2 concentration | *Ci* | 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 |
|  |  |  |  |  |  |
| **Thermal tolerance** |  |  |  |  |  |
| photosynthetic heat tolerance | T50 | ˚C | ↓ H\*\* | TrS | 52 |
|  |  |  | ≈↑ L | TrB, TeB | 53, 54 |
| critical temperature beyond which Fv/Fm declines  **Phenology** | *Tcrit* | ˚C | ≈↑ L | TrB, TeB | 53 |
| bud break |  | day of the year | ↓ H | TeB | 56 |
| leaf lifespan |  | months | ↓ H | TrB | 57 |
| 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