



HAL
open science

Decline of leaf hydraulic conductance with dehydration: relationship to leaf size and venation architecture

Christine C. Scoffoni, Michael M. Rawls, Athena A. Mckown, Hervé H. Cochard,
Lawren L. Sack

► **To cite this version:**

Christine C. Scoffoni, Michael M. Rawls, Athena A. Mckown, Hervé H. Cochard, Lawren L. Sack. Decline of leaf hydraulic conductance with dehydration: relationship to leaf size and venation architecture. *Plant Physiology*, 2011, 156 (2), pp.832-843. <10.1104/pp.111.173856>. <hal-00964560>

HAL Id: hal-00964560

<https://hal.science/hal-00964560v1>

Submitted on 28 May 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

Table S1. Species means ± standard errors for 25 morphological, anatomical and phy

Trait type		Size
Units		cm
Species	Moist/dry	Thickness
<i>Cercocarpus betuloides</i>	Dry	0.304 ± 0.017
<i>Comarostaphylos diversifolia</i>	Dry	0.331 ± 0.018
<i>Hedera canariensis</i>	Dry	0.325 ± 0.010
<i>Heteromeles arbutifolia</i>	Dry	0.227 ± 0.016
<i>Quercus agrifolia</i>	Dry	0.246 ± 0.002
<i>Camellia sasanqua</i>	Moist	0.393 ± 0.022
<i>Helianthus annuus</i>	Moist	0.130 ± 0.006
<i>Lantana camara</i>	Moist	0.198 ± 0.022
<i>Magnolia grandiflora</i>	Moist	0.408 ± 0.023
<i>Platanus racemosa</i>	Moist	0.234 ± 0.008
ANOVAs	Dry/ moist	**
	Species	***
t-test	Raw data	
	Logged data	
	Ranked data	

biological traits and results of analysis of variance for the difference between moist an

Shape cm cm ⁻¹ Length:width	Shape Perimeter ² :area	Composition cm ² g ⁻² Density	Vein number Number of 2°veins
1.22 ± 0.104	23.6 ± 3.49	514	12.7 ± 0.667
2.25 ± 0.084	25.6 ± 1.40	797	35.3 ± 3.93
0.880 ± 0.022	18.6 ± 1.03	240	26.3 ± 2.03
2.73 ± 0.176	28.6 ± 3.21	645	23.3 ± 1.76
1.43 ± 0.066	17.5 ± 0.541	678	12.7 ± 0.667
2.07 ± 0.137	25.0 ± 2.87	366	18.0 ± 1.16
1.35 ± 0.068	20.1 ± 0.121	432	43.3 ± 1.45
1.80 ± 0.063	22.3 ± 1.45	398	9.75 ± 0.629
2.11 ± 0.291	15.9 ± 0.59	441	25.3 ± 2.40
0.882 ± 0.057	40.8 ± 6.87	463	64.0 ± 16.8
***	0,457 ***	0,353	* ***
		0,184	
		0,325	
		0,144	

d dry area species and among species nested within those categories. *** $P < 0.001$; ** $P < 0.01$

Vein diameters mm Midrib diameter	Vein diameters mm 2° diameter	Vein diameters mm 3° diameter	Vein diameters mm minor vein diameter
0.545 ± 0.100	0.187 ± 0.034	0.066 ± 0.011	0.029 ± 0.005
0.968 ± 0.105	0.211 ± 0.012	0.082 ± 0.012	0.030 ± 0.006
0.374 ± 0.046	0.154 ± 0.018	0.119 ± 0.004	0.04 ± 0.004
0.960 ± 0.135	0.187 ± 0.032	0.120 ± 0.010	0.045 ± 0.003
0.500 ± 0.063	0.189 ± 0.037	0.064 ± 0.011	0.027 ± 0.003
0.776 ± 0.101	0.222 ± 0.038	0.100 ± 0.001	0.032 ± 0.003
1.329 ± 0.014	0.367 ± 0.032	0.135 ± 0.041	0.025 ± 0.002
0.530 ± 0.139	0.174 ± 0.060	0.070 ± 0.010	0.023 ± 0.006
0.821 ± 0.051	0.163 ± 0.013	0.066 ± 0.005	0.029 ± 0.005
0.572 ± 0.083	0.181 ± 0.015	0.057 ± 0.008	0.019 ± 0.001
	0,127	0,243	0,715 **
***	***	**	*

; * $P < 0.05$; NS, $P > 0.05$.

Vein density mm ⁻¹ Midrib density	Vein density mm ⁻¹ 1° density	Vein density mm ⁻¹ 2° density	Vein density mm ⁻¹ 3° density	Vein density mm ⁻¹ Free vein endings per area
0.053 ± 0.009	0.053 ± 0.009	0.271 ± 0.044	1.065 ± 1.32	3.79 ± 0.801
0.068 ± 0.008	0.068 ± 0.008	0.435 ± 0.057	1.068 ± 1.78	1.66 ± 0.090
0.017 ± 0.002	0.017 ± 0.002	0.131 ± 0.020	0.384 ± 0.551	2.99 ± 0.179
0.054 ± 0.007	0.054 ± 0.007	0.247 ± 0.036	0.583 ± 0.418	5.65 ± 0.586
0.040 ± 0.001	0.040 ± 0.001	0.163 ± 0.015	0.865 ± 0.685	6.78 ± 0.675
0.053 ± 0.003	0.053 ± 0.003	0.231 ± 0.013	0.495 ± 0.402	3.87 ± 0.565
0.022 ± 0.001	0.048 ± 0.002	0.123 ± 0.007	0.312 ± 0.277	17.4 ± 0.982
0.051 ± 0.006	0.051 ± 0.006	0.167 ± 0.021	0.758 ± 1.18	21.7 ± 1.13
0.022 ± 0.003	0.022 ± 0.003	0.124 ± 0.009	0.336 ± 0.144	3.64 ± 0.565
0.014 ± 0.003	0.042 ± 0.006	0.098 ± 0.007	0.263 ± 0.556	4.08 ± 0.205
**		0,722 ***	***	***
***	***	***	***	***

Vein density mm ⁻¹	PV parameters - Mpa	PV parameters - Mpa	PV parameters Mpa
Total vein density	Turgor loss point	Osmotic potential	Modulus of elasticity
9.14 ± 0.642	2.59 ± 0.025	1.64 ± 0.041	10.1 ± 0.701
5.75 ± 0.290	3.45 ± 0.341	2.51 ± 0.341	17.3 ± 2.23
3.53 ± 0.154	1.98 ± 0.095	1.49 ± 0.067	12.8 ± 0.787
5.51 ± 0.149	2.53 ± 0.096	2.09 ± 0.096	16.4 ± 0.486
8.37 ± 0.161	3.00 ± 0.119	2.31 ± 0.123	17.9 ± 1.28
4.09 ± 0.220	2.12 ± 0.176	1.61 ± 0.133	7.98 ± 1.11
9.80 ± 0.458	1.10 ± 0.117	0.875 ± 0.124	5.49 ± 0.792
10.7 ± 0.304	1.37 ± 0.044	1.10 ± 0.044	4.85 ± 0.331
5.64 ± 0.301	2.06 ± 0.053	1.43 ± 0.023	13.3 ± 1.31
5.37 ± 0.150	2.03 ± 0.056	1.54 ± 0.042	9.14 ± 0.525
0,74	***	***	***
***	***	***	***

PV parameters MPa ⁻¹ Capacitance at Full Turgor	PV parameters MPa ⁻¹ Capacitance at Turgor loss point	PV parameters g g ⁻¹ Saturated water content
0.059 ± 0.003	0.079 ± 0.008	0.793 ± 0.019
0.044 ± 0.006	0.103 ± 0.032	0.705 ± 0.015
0.057 ± 0.003	0.123 ± 0.036	2.81 ± 0.092
0.050 ± 0.001	0.126 ± 0.006	1.38 ± 0.066
0.043 ± 0.003	0.081 ± 0.015	0.926 ± 0.012
0.103 ± 0.008	0.262 ± 0.037	1.74 ± 0.031
0.155 ± 0.019	0.558 ± 0.169	11.2 ± 0.789
0.166 ± 0.013	0.511 ± 0.097	2.73 ± 0.153
0.053 ± 0.004	0.073 ± 0.010	1.50 ± 0.074
0.082 ± 0.004	0.155 ± 0.021	1.34 ± 0.027
***	*	***
***	***	***

Kleaf mmol m ⁻² s ⁻¹ MPa ⁻¹ Kmax	PLC - MPa P50	PLC -MPa P80
4,37	2,76	5,25
2,96	2,85	4,56
5,74	0,640	1,18
20,7	2,57	4,12
3,96	2,40	3,83
5,99	1,78	2,84
6,45	0,830	1,16
11,4	0,800	1,41
5,24	0,420	2,06
34,1	0,090	0,348

0,457	*	*
0,325		0,064
0,127	*	*

0,065

Table S2. Correlation matrix (spearman, pearson on raw and log-transform

Traits	Leaf area
Leaf area	
Leaf thickness	-0.12,-0.05,-0.14
Length: area	-0.28,-0.49,-0.51
Perimeter ² : area	-0.18,0.46,0.06
Leaf mass per area	-0.35,-0.31,-0.44
Leaf density	-0.28,-0.36,-0.46
Number of 2° veins	0.59,0.79**,0.67*
Midrib diameter	-0.02,-0.1,-0.06
2° vein diameter	-0.43,-0.08,-0.06
3° vein diameter	-0.13,-0.19,-0.02
Minor veins diameter	-0.1,-0.34,-0.26
Midrib density	-0.82**, -0.84**, -0.96***
1° vein density	-0.7*, -0.52, -0.64*
2° vein density	-0.88***, -0.64*, -0.87***
3° vein density	-0.87**, -0.74*, -0.92***
Major vein density	-0.89***, -0.75*, -0.95***
Minor vein density	-0.1,-0.2,-0.15
Major: minor vein density	-0.7*, -0.53, -0.67*
Free ending veinlets per area	0.08,-0.15,0.04
Total leaf vein density	-0.38,-0.31,-0.3
Turgor loss point	0.55,0.34,-0.44
Osmotic potential at full turgor	0.49,0.35,-0.43
Modulus of elasticity	-0.04,-0.19,-0.13
Capacitance at full turgor	0.04,0,0.14
Capacitance at turgor loss point	0.09,-0.08,0.06
Saturated water content	0.43,0.1,0.42
Cuticular conductance	0.14,0.1,0.06
Kmax	0.5,0.65*,0.47
P50	0.84**, 0.79**, -0.9***
P80	0.78**, 0.73*, -0.85**

ed data). Correlations are significant only when spearman and pearson (on raw or l

Leaf thickness	Length: area	Perimeter ² : area
-0.12,-0.05,-0.14	-0.28,-0.49,-0.51	-0.18,0.46,0.06
	0.2,0.23,0.18	-0.21,-0.2,-0.14
0.2,0.23,0.18		0.16,-0.09,-0.1
-0.21,-0.2,-0.14	0.16,-0.09,-0.1	
0.6,0.56,0.68*	0.58,0.52,0.51	-0.02,-0.01,0.05
-0.03,-0.1,-0.09	0.42,0.48,0.5	0.27,0.15,0.21
0,-0.24,-0.16	-0.16,-0.32,-0.27	0.28,0.64*,0.44
-0.07,-0.27,-0.29	0.58,0.47,0.59	0.32,-0.02,0.08
-0.19,-0.52,-0.61	0.31,-0.04,0.08	0.27,-0.08,0.02
-0.25,-0.27,-0.28	0.2,0.15,0.16	0.07,-0.19,-0.14
0.26,0.19,0.22	0.37,0.43,0.38	0.07,-0.13,-0.16
0.09,0.14,0.15	0.72*,0.64*,0.7*	0.38,0,0.02
-0.08,-0.25,-0.31	0.61,0.44,0.42	0.7*,0.4,0.53
0.24,0.27,0.31	0.52,0.53,0.58	0.31,0.07,0.12
0.15,0.07,0.17	0.36,0.22,0.36	0.05,-0.14,-0.1
0.04,0.11,0.18	0.31,0.32,0.42	0.09,-0.08,-0.03
-0.6,-0.69*,-0.68*	-0.09,-0.18,-0.04	-0.26,-0.22,-0.17
0.47,0.48,0.63*	0.47,0.44,0.38	0.36,0.05,0.1
-0.82**, -0.72*, -0.8**	-0.03,-0.05,-0.01	-0.02,-0.19,-0.16
-0.53,-0.65*,-0.64*	0.09,-0.12,0.04	-0.22,-0.23,-0.16
-0.45,-0.42,0.61	-0.43,-0.3,0.24	-0.2,-0.07,0.12
-0.31,-0.31,0.51	-0.36,-0.38,0.3	-0.37,-0.12,0.17
0.39,0.33,0.5	0.35,0.34,0.21	-0.12,-0.13,-0.1
-0.39,-0.55,-0.57	-0.35,-0.13,-0.12	0.12,0,0.11
-0.64*,-0.62,-0.65*	-0.1,-0.06,0	0.35,-0.07,0.12
-0.3,-0.6,-0.64*	-0.25,-0.23,-0.21	-0.36,-0.22,-0.23
-0.72*,-0.76*,-0.69*	0.04,-0.11,0.19	0.32,0,0.24
-0.58,-0.36,-0.37	-0.12,-0.12,-0.14	0.45,0.87**,0.7*
-0.03,-0.1,0.12	-0.44,-0.45,0.54	-0.25,0.08,-0.29
-0.33,-0.26,0.34	-0.52,-0.46,0.62	-0.12,0.15,-0.33

og-transformed) are both significant. *** $P < 0.001$; ** $P < 0.01$; * $P < 0.05$

Leaf mass per area	Leaf density	Number of 2° veins
-0.35,-0.31,-0.44	-0.28,-0.36,-0.46	0.59,0.79**,0.67*
0.6,0.56,0.68*	-0.03,-0.1,-0.09	0,-0.24,-0.16
0.58,0.52,0.51	0.42,0.48,0.5	-0.16,-0.32,-0.27
-0.02,-0.01,0.05	0.27,0.15,0.21	0.28,0.64*,0.44
	0.73*,0.76*,0.67*	-0.2,-0.12,-0.12
0.73*,0.76*,0.67*		-0.01,0,0
-0.2,-0.12,-0.12	-0.01,0,0	
0.16,0.09,0.09	0.3,0.29,0.42	0.5,0.32,0.41
0.05,-0.28,-0.34	0.31,0.03,0.16	0.11,0.31,0.32
-0.45,-0.39,-0.43	-0.32,-0.24,-0.29	0.18,0.08,0.21
-0.02,0.09,0.1	-0.14,0.02,-0.09	0.16,-0.16,0.02
0.45,0.58,0.51	0.44,0.59,0.55	-0.37,-0.52,-0.6
0.28,0.37,0.25	0.42,0.62,0.65*	-0.12,-0.02,-0.09
0.52,0.76*,0.65*	0.42,0.67*,0.56	-0.48,-0.21,-0.3
0.58,0.59,0.53	0.54,0.64*,0.56	-0.61,-0.54,-0.66*
0.48,0.66*,0.57	0.53,0.68*,0.59	-0.57,-0.47,-0.59
-0.14,-0.38,-0.32	0.12,0.04,0.26	-0.36,-0.2,-0.32
0.48,0.75*,0.7*	0.27,0.52,0.3	-0.28,-0.18,-0.25
-0.48,-0.62,-0.71*	-0.09,-0.23,-0.15	-0.32,-0.14,-0.29
0.02,-0.26,-0.21	0.27,0.15,0.36	-0.39,-0.27,-0.37
-0.87**, -0.88***, 0.9***	-0.78**, -0.77**, 0.59	0.26,0.16,-0.12
-0.71*, -0.82**, 0.84**	-0.76*, -0.8**, 0.62	0.16,0.13,-0.09
0.75*, 0.71*, 0.74*	0.71*, 0.67*, 0.49	0,-0.12,0.06
-0.75*, -0.68*, -0.75*	-0.71*, -0.46,-0.45	0,0.05,-0.01
-0.78**, -0.65*, -0.75*	-0.47,-0.36,-0.35	0.2,0.05,0.04
-0.82**, -0.62,-0.89***	-0.85**, -0.32,-0.55	0.13,0.3,0.24
-0.38,-0.57,-0.31	0.01,-0.16,0.28	0.16,0.26,0.13
-0.66*, -0.28,-0.36	-0.39,-0.04,-0.11	0.23,0.62,0.34
-0.48,-0.64*,0.43	-0.61,-0.72*,0.46	0.34,0.47,-0.57
-0.73*, -0.71*, 0.64*	-0.61,-0.69*,0.53	0.52,0.52,-0.57

Midrib diameter	2° vein diameter	3° vein diameter
-0.02,-0.1,-0.06	-0.43,-0.08,-0.06	-0.13,-0.19,-0.02
-0.07,-0.27,-0.29	-0.19,-0.52,-0.61	-0.25,-0.27,-0.28
0.58,0.47,0.59	0.31,-0.04,0.08	0.2,0.15,0.16
0.32,-0.02,0.08	0.27,-0.08,0.02	0.07,-0.19,-0.14
0.16,0.09,0.09	0.05,-0.28,-0.34	-0.45,-0.39,-0.43
0.3,0.29,0.42	0.31,0.03,0.16	-0.32,-0.24,-0.29
0.5,0.32,0.41	0.11,0.31,0.32	0.18,0.08,0.21
	0.6,0.8**,0.74*	0.42,0.54,0.42
0.6,0.8**,0.74*		0.36,0.56,0.49
0.42,0.54,0.42	0.36,0.56,0.49	
0.31,0.21,0.23	0.19,-0.03,0.05	0.79**,0.75*,0.8**
0.38,0.12,0.21	0.53,-0.07,0.05	0.35,-0.07,0.02
0.54,0.41,0.47	0.59,0.34,0.47	0.32,0,-0.03
0.09,0.22,0.24	0.25,-0.03,0.03	0.2,-0.01,0.09
-0.14,-0.18,-0.14	0.18,-0.19,-0.15	-0.05,-0.35,-0.23
-0.1,-0.07,-0.03	0.27,-0.14,-0.08	0.03,-0.27,-0.16
0.03,0.14,0.13	0.07,0.41,0.36	-0.21,-0.14,-0.27
0.03,0.04,-0.12	0.22,-0.19,-0.32	0.24,0.04,0.06
-0.03,0.22,0.12	0.25,0.45,0.4	0.05,0.17,0.14
0.15,0.13,0.16	0.24,0.38,0.37	-0.05,-0.18,-0.27
-0.04,0.16,-0.18	-0.26,0.39,-0.44	0.3,0.34,-0.34
0.01,0.11,-0.14	-0.28,0.36,-0.4	0.2,0.23,-0.24
-0.02,-0.08,-0.09	-0.02,-0.4,-0.42	-0.21,-0.11,-0.1
0.02,0.26,0.18	0.02,0.54,0.49	0.21,0.23,0.21
0.21,0.4,0.29	0.37,0.65*,0.58	0.49,0.38,0.41
-0.03,0.62,0.3	-0.12,0.88***,0.6	0.55,0.64*,0.62
0.47,0.55,0.56	0.15,0.73*,0.54	0.12,0.28,-0.1
0.09,-0.08,-0.02	-0.13,-0.16,-0.13	0.18,-0.14,-0.04
-0.26,-0.11,0.19	-0.56,0.01,0.16	-0.27,-0.01,0.28
-0.09,-0.05,0.17	-0.24,0.14,-0.02	0.01,0.13,0.08

Minor veins diameter	Midrib density	1° vein density
-0.1,-0.34,-0.26	-0.82**, -0.84**, -0.96***	-0.7*, -0.52, -0.64*
0.26,0.19,0.22	0.09,0.14,0.15	-0.08,-0.25,-0.31
0.37,0.43,0.38	0.72*, 0.64*, 0.7*	0.61,0.44,0.42
0.07,-0.13,-0.16	0.38,0,0.02	0.7*, 0.4, 0.53
-0.02,0.09,0.1	0.45,0.58,0.51	0.28,0.37,0.25
-0.14,0.02,-0.09	0.44,0.59,0.55	0.42,0.62,0.65*
0.16,-0.16,0.02	-0.37,-0.52,-0.6	-0.12,-0.02,-0.09
0.31,0.21,0.23	0.38,0.12,0.21	0.54,0.41,0.47
0.19,-0.03,0.05	0.53,-0.07,0.05	0.59,0.34,0.47
0.79**, 0.75*, 0.8**	0.35,-0.07,0.02	0.32,0,-0.03
	0.42,0.24,0.28	0.28,0.01,-0.08
0.42,0.24,0.28		0.9***, 0.8**, 0.71*
0.28,0.01,-0.08	0.9***, 0.8**, 0.71*	
0.37,0.33,0.44	0.92***, 0.87**, 0.9***	0.77**, 0.74*, 0.63
0.07,-0.05,0.09	0.76*, 0.81**, 0.86**	0.54,0.59,0.52
0.08,0.04,0.16	0.77**, 0.87**, 0.91***	0.58,0.67*, 0.6
-0.66*, -0.59, -0.6	-0.1,0.02,0.11	-0.07,0.2,0.32
0.58,0.49,0.56	0.81**, 0.73*, 0.66*	0.66*, 0.51, 0.26
-0.39,-0.33,-0.33	-0.08,-0.04,-0.04	-0.01,0.14,0.15
-0.49,-0.57,-0.55	0.2,0.16,0.26	0.18,0.3,0.43
-0.13,-0.21,0.22	-0.61,-0.55,0.43	-0.45,-0.32,0.16
-0.2,-0.3,0.29	-0.6,-0.54,0.45	-0.49,-0.34,0.2
0.26,0.4,0.4	0.24,0.24,0.14	0.01,-0.04,-0.18
-0.26,-0.33,-0.32	-0.24,-0.11,-0.13	-0.01,0.17,0.21
0.02,-0.2,-0.11	-0.02,-0.07,-0.03	0.21,0.21,0.29
0.22,-0.02,0.07	-0.42,-0.38,-0.44	-0.41,-0.04,-0.2
-0.37,-0.35,-0.5	-0.05,-0.2,0.04	0.24,0.21,0.51
-0.08,-0.15,-0.21	-0.3,-0.31,-0.35	-0.01,0.04,0.07
-0.35,-0.34,0.53	-0.88***, -0.84**, 0.86**	-0.75*, -0.64*, 0.45
-0.27,-0.26,0.45	-0.81**, -0.79**, 0.83**	-0.6,-0.52,0.35

2° vein density	3° vein density	Major vein density
-0.88***, -0.64*, -0.87***	-0.87**, -0.74*, -0.92***	-0.89***, -0.75*, -0.95***
0.24, 0.27, 0.31	0.15, 0.07, 0.17	0.04, 0.11, 0.18
0.52, 0.53, 0.58	0.36, 0.22, 0.36	0.31, 0.32, 0.42
0.31, 0.07, 0.12	0.05, -0.14, -0.1	0.09, -0.08, -0.03
0.52, 0.76*, 0.65*	0.58, 0.59, 0.53	0.48, 0.66*, 0.57
0.42, 0.67*, 0.56	0.54, 0.64*, 0.56	0.53, 0.68*, 0.59
-0.48, -0.21, -0.3	-0.61, -0.54, -0.66*	-0.57, -0.47, -0.59
0.09, 0.22, 0.24	-0.14, -0.18, -0.14	-0.1, -0.07, -0.03
0.25, -0.03, 0.03	0.18, -0.19, -0.15	0.27, -0.14, -0.08
0.2, -0.01, 0.09	-0.05, -0.35, -0.23	0.03, -0.27, -0.16
0.37, 0.33, 0.44	0.07, -0.05, 0.09	0.08, 0.04, 0.16
0.92***, 0.87**, 0.9***	0.76*, 0.81**, 0.86**	0.77**, 0.87**, 0.91***
0.77**, 0.74*, 0.63	0.54, 0.59, 0.52	0.58, 0.67*, 0.6
	0.89***, 0.77**, 0.81**	0.88***, 0.87**, 0.89***
0.89***, 0.77**, 0.81**		0.99***, 0.98***, 0.99***
0.88***, 0.87**, 0.89***	0.99***, 0.98***, 0.99***	
-0.18, -0.23, -0.16	0.05, 0.22, 0.22	0.09, 0.12, 0.16
0.89***, 0.91***, 0.84**	0.71*, 0.61, 0.65*	0.68*, 0.72*, 0.71*
-0.3, -0.34, -0.41	-0.18, -0.09, -0.13	-0.1, -0.15, -0.18
0.13, -0.08, 0.01	0.36, 0.37, 0.37	0.41, 0.27, 0.32
-0.7*, -0.71*, 0.62	-0.73*, -0.67*, 0.58	-0.68*, -0.71*, 0.59
-0.67*, -0.67*, 0.61	-0.68*, -0.59, 0.55	-0.66*, -0.64*, 0.57
0.32, 0.43, 0.36	0.43, 0.36, 0.29	0.37, 0.38, 0.3
-0.32, -0.35, -0.36	-0.43, -0.28, -0.33	-0.37, -0.29, -0.33
-0.26, -0.28, -0.24	-0.38, -0.25, -0.28	-0.27, -0.26, -0.25
-0.54, -0.37, -0.54	-0.62, -0.44, -0.59	-0.58, -0.43, -0.59
-0.25, -0.31, -0.14	-0.31, -0.25, -0.11	-0.25, -0.26, -0.09
-0.45, -0.33, -0.44	-0.65*, -0.44, -0.5	-0.61, -0.42, -0.48
-0.88***, -0.81**, 0.82**	-0.84**, -0.82**, 0.81**	-0.88***, -0.86**, 0.83**
-0.9***, -0.78**, 0.81**	-0.87**, -0.83**, 0.8**	-0.83**, -0.85**, 0.82**

Minor vein density	Major: minor vein densities	Free ending veinlets per area
-0.1,-0.2,-0.15	-0.7*, -0.53, -0.67*	0.08, -0.15, 0.04
-0.6, -0.69*, -0.68*	0.47, 0.48, 0.63*	-0.82**, -0.72*, -0.8**
-0.09, -0.18, -0.04	0.47, 0.44, 0.38	-0.03, -0.05, -0.01
-0.26, -0.22, -0.17	0.36, 0.05, 0.1	-0.02, -0.19, -0.16
-0.14, -0.38, -0.32	0.48, 0.75*, 0.7*	-0.48, -0.62, -0.71*
0.12, 0.04, 0.26	0.27, 0.52, 0.3	-0.09, -0.23, -0.15
-0.36, -0.2, -0.32	-0.28, -0.18, -0.25	-0.32, -0.14, -0.29
0.03, 0.14, 0.13	0.03, 0.04, -0.12	-0.03, 0.22, 0.12
0.07, 0.41, 0.36	0.22, -0.19, -0.32	0.25, 0.45, 0.4
-0.21, -0.14, -0.27	0.24, 0.04, 0.06	0.05, 0.17, 0.14
-0.66*, -0.59, -0.6	0.58, 0.49, 0.56	-0.39, -0.33, -0.33
-0.1, 0.02, 0.11	0.81**, 0.73*, 0.66*	-0.08, -0.04, -0.04
-0.07, 0.2, 0.32	0.66*, 0.51, 0.26	-0.01, 0.14, 0.15
-0.18, -0.23, -0.16	0.89***, 0.91***, 0.84**	-0.3, -0.34, -0.41
0.05, 0.22, 0.22	0.71*, 0.61, 0.65*	-0.18, -0.09, -0.13
0.09, 0.12, 0.16	0.68*, 0.72*, 0.71*	-0.1, -0.15, -0.18
-0.59, -0.54, -0.59	-0.59, -0.54, -0.59	0.7*, 0.83**, 0.77**
0.7*, 0.83**, 0.77**	-0.5, -0.54, -0.7*	-0.5, -0.54, -0.7*
0.92***, 0.99***, 0.98***	-0.31, -0.41, -0.45	0.55, 0.78**, 0.7*
0.28, 0.43, -0.43	-0.71*, -0.76**, 0.79**	0.43, 0.7*, -0.77**
0.41, 0.45, -0.45	-0.75*, -0.75*, 0.79**	0.37, 0.63*, -0.69*
-0.38, -0.48, -0.49	0.42, 0.54, 0.59	-0.45, -0.65*, -0.71*
0.38, 0.62, 0.45	-0.42, -0.49, -0.59	0.45, 0.89***, 0.76*
0.15, 0.63, 0.36	-0.25, -0.43, -0.46	0.61, 0.91***, 0.75*
0.08, 0.48, 0.27	-0.47, -0.48, -0.68*	0.37, 0.62, 0.67*
0.68*, 0.76*, 0.76*	-0.54, -0.57, -0.62	0.61, 0.85**, 0.67*
0.1, -0.11, 0.01	-0.42, -0.34, -0.4	0.54, 0, 0.28
0.03, 0.05, 0.05	-0.73*, -0.71*, 0.65*	0.14, 0.31, -0.1
0.08, 0.06, 0	-0.77**, -0.66*, 0.67*	0.32, 0.4, -0.26

Total leaf vein density	Turgor loss point	Osmotic potential at full turgor
-0.38,-0.31,-0.3	0.55,0.34,-0.44	0.49,0.35,-0.43
-0.53,-0.65*, -0.64*	-0.45,-0.42,0.61	-0.31,-0.31,0.51
0.09,-0.12,0.04	-0.43,-0.3,0.24	-0.36,-0.38,0.3
-0.22,-0.23,-0.16	-0.2,-0.07,0.12	-0.37,-0.12,0.17
0.02,-0.26,-0.21	-0.87**, -0.88***, 0.9***	-0.71*, -0.82**, 0.84**
0.27,0.15,0.36	-0.78**, -0.77**, 0.59	-0.76*, -0.8**, 0.62
-0.39,-0.27,-0.37	0.26,0.16,-0.12	0.16,0.13,-0.09
0.15,0.13,0.16	-0.04,0.16,-0.18	0.01,0.11,-0.14
0.24,0.38,0.37	-0.26,0.39,-0.44	-0.28,0.36,-0.4
-0.05,-0.18,-0.27	0.3,0.34,-0.34	0.2,0.23,-0.24
-0.49,-0.57,-0.55	-0.13,-0.21,0.22	-0.2,-0.3,0.29
0.2,0.16,0.26	-0.61,-0.55,0.43	-0.6,-0.54,0.45
0.18,0.3,0.43	-0.45,-0.32,0.16	-0.49,-0.34,0.2
0.13,-0.08,0.01	-0.7*, -0.71*, 0.62	-0.67*, -0.67*, 0.61
0.36,0.37,0.37	-0.73*, -0.67*, 0.58	-0.68*, -0.59, 0.55
0.41,0.27,0.32	-0.68*, -0.71*, 0.59	-0.66*, -0.64*, 0.57
0.92***, 0.99***, 0.98***	0.28,0.43,-0.43	0.41,0.45,-0.45
-0.31,-0.41,-0.45	-0.71*, -0.76**, 0.79**	-0.75*, -0.75*, 0.79**
0.55,0.78**, 0.7*	0.43,0.7*, -0.77**	0.37,0.63*, -0.69*
	0.08,0.3,-0.32	0.2,0.34,-0.34
0.08,0.3,-0.32		0.95***, 0.97***, 0.98***
0.2,0.34,-0.34	0.95***, 0.97***, 0.98***	
-0.24,-0.4,-0.42	-0.78**, -0.85**, 0.87**	-0.77**, -0.89***, 0.88***
0.24,0.56,0.38	0.78**, 0.83**, -0.89***	0.77**, 0.79**, -0.86**
0.12,0.57,0.32	0.65*, 0.79**, -0.83**	0.48,0.72*, -0.74*
-0.05,0.39,0.18	0.89***, 0.7*, -0.92***	0.84**, 0.66*, -0.86**
0.58,0.7*, 0.73*	0.5,0.72*, -0.56	0.5,0.69*, -0.54
-0.15,-0.17,-0.09	0.65*, 0.19,-0.3	0.49,0.09,-0.21
-0.28,-0.09,0.18	0.73*, 0.76*, 0.46	0.72*, 0.74*, 0.47
-0.16,-0.08,0.13	0.85**, 0.77**, 0.6	0.76*, 0.71*, 0.57

Modulus of elasticity	Capacitance at full turgor	Capacitance at turgor loss point
-0.04,-0.19,-0.13	0.04,0,0.14	0.09,-0.08,0.06
0.39,0.33,0.5	-0.39,-0.55,-0.57	-0.64*, -0.62, -0.65*
0.35,0.34,0.21	-0.35,-0.13,-0.12	-0.1,-0.06,0
-0.12,-0.13,-0.1	0.12,0,0.11	0.35,-0.07,0.12
0.75*,0.71*,0.74*	-0.75*, -0.68*, -0.75*	-0.78**, -0.65*, -0.75*
0.71*,0.67*,0.49	-0.71*, -0.46, -0.45	-0.47, -0.36, -0.35
0,-0.12,0.06	0,0.05,-0.01	0.2,0.05,0.04
-0.02,-0.08,-0.09	0.02,0.26,0.18	0.21,0.4,0.29
-0.02,-0.4,-0.42	0.02,0.54,0.49	0.37,0.65*,0.58
-0.21,-0.11,-0.1	0.21,0.23,0.21	0.49,0.38,0.41
0.26,0.4,0.4	-0.26,-0.33,-0.32	0.02,-0.2,-0.11
0.24,0.24,0.14	-0.24,-0.11,-0.13	-0.02,-0.07,-0.03
0.01,-0.04,-0.18	-0.01,0.17,0.21	0.21,0.21,0.29
0.32,0.43,0.36	-0.32,-0.35,-0.36	-0.26,-0.28,-0.24
0.43,0.36,0.29	-0.43,-0.28,-0.33	-0.38,-0.25,-0.28
0.37,0.38,0.3	-0.37,-0.29,-0.33	-0.27,-0.26,-0.25
-0.38,-0.48,-0.49	0.38,0.62,0.45	0.15,0.63,0.36
0.42,0.54,0.59	-0.42,-0.49,-0.59	-0.25,-0.43,-0.46
-0.45,-0.65*, -0.71*	0.45,0.89***,0.76*	0.61,0.91***,0.75*
-0.24,-0.4,-0.42	0.24,0.56,0.38	0.12,0.57,0.32
-0.78**, -0.85**, 0.87**	0.78**, 0.83**, -0.89***	0.65*, 0.79**, -0.83**
-0.77**, -0.89***, 0.88***	0.77**, 0.79**, -0.86**	0.48, 0.72*, -0.74*
-1***, -0.89***, -0.98***	-1***, -0.89***, -0.98***	-0.73*, -0.8**, -0.88***
-0.73*, -0.8**, -0.88***	0.73*, 0.98***, 0.95***	0.73*, 0.98***, 0.95***
-0.64*, -0.55, -0.69*	0.64*, 0.67*, 0.75*	0.62, 0.77**, 0.79**
-0.6, -0.68*, -0.62	0.6, 0.84**, 0.62	0.54, 0.88***, 0.57
-0.59, -0.15, -0.26	0.59, 0.08, 0.3	0.68*, 0, 0.28
-0.42, -0.55, 0.33	0.42, 0.45, -0.32	0.21, 0.37, -0.18
-0.55, -0.57, 0.48	0.55, 0.55, -0.5	0.56, 0.5, -0.42

Saturated water content	Cuticular conductance	Kmax
0.43,0.1,0.42	0.14,0.1,0.06	0.5,0.65*,0.47
-0.3,-0.6,-0.64*	-0.72*,-0.76*,-0.69*	-0.58,-0.36,-0.37
-0.25,-0.23,-0.21	0.04,-0.11,0.19	-0.12,-0.12,-0.14
-0.36,-0.22,-0.23	0.32,0,0.24	0.45,0.87**,0.7*
-0.82**, -0.62, -0.89***	-0.38,-0.57,-0.31	-0.66*,-0.28,-0.36
-0.85**, -0.32, -0.55	0.01,-0.16,0.28	-0.39,-0.04,-0.11
0.13,0.3,0.24	0.16,0.26,0.13	0.23,0.62,0.34
-0.03,0.62,0.3	0.47,0.55,0.56	0.09,-0.08,-0.02
-0.12,0.88***,0.6	0.15,0.73*,0.54	-0.13,-0.16,-0.13
0.55,0.64*,0.62	0.12,0.28,-0.1	0.18,-0.14,-0.04
0.22,-0.02,0.07	-0.37,-0.35,-0.5	-0.08,-0.15,-0.21
-0.42,-0.38,-0.44	-0.05,-0.2,0.04	-0.3,-0.31,-0.35
-0.41,-0.04,-0.2	0.24,0.21,0.51	-0.01,0.04,0.07
-0.54,-0.37,-0.54	-0.25,-0.31,-0.14	-0.45,-0.33,-0.44
-0.62,-0.44,-0.59	-0.31,-0.25,-0.11	-0.65*,-0.44,-0.5
-0.58,-0.43,-0.59	-0.25,-0.26,-0.09	-0.61,-0.42,-0.48
0.08,0.48,0.27	0.68*,0.76*,0.76*	0.1,-0.11,0.01
-0.47,-0.48,-0.68*	-0.54,-0.57,-0.62	-0.42,-0.34,-0.4
0.37,0.62,0.67*	0.61,0.85**,0.67*	0.54,0,0.28
-0.05,0.39,0.18	0.58,0.7*,0.73*	-0.15,-0.17,-0.09
0.89***,0.7*,-0.92***	0.5,0.72*,-0.56	0.65*,0.19,-0.3
0.84**,0.66*,-0.86**	0.5,0.69*,-0.54	0.49,0.09,-0.21
-0.64*,-0.55,-0.69*	-0.6,-0.68*,-0.62	-0.59,-0.15,-0.26
0.64*,0.67*,0.75*	0.6,0.84**,0.62	0.59,0.08,0.3
0.62,0.77**,0.79**	0.54,0.88***,0.57	0.68*,0,0.28
	0.22,0.83**,0.39	0.49,-0.11,0.16
0.22,0.83**,0.39		0.62,0.12,0.35
0.49,-0.11,0.16	0.62,0.12,0.35	
0.56,0.36,-0.3	0.16,0.36,-0.19	0.53,0.37,-0.59
0.7*,0.46,-0.5	0.32,0.43,-0.23	0.61,0.42,-0.62

P50	P80
0.84**, 0.79**, -0.9***	0.78**, 0.73*, -0.85**
-0.03, -0.1, 0.12	-0.33, -0.26, 0.34
-0.44, -0.45, 0.54	-0.52, -0.46, 0.62
-0.25, 0.08, -0.29	-0.12, 0.15, -0.33
-0.48, -0.64*, 0.43	-0.73*, -0.71*, 0.64*
-0.61, -0.72*, 0.46	-0.61, -0.69*, 0.53
0.34, 0.47, -0.57	0.52, 0.52, -0.57
-0.26, -0.11, 0.19	-0.09, -0.05, 0.17
-0.56, 0.01, 0.16	-0.24, 0.14, -0.02
-0.27, -0.01, 0.28	0.01, 0.13, 0.08
-0.35, -0.34, 0.53	-0.27, -0.26, 0.45
-0.88***, -0.84**, 0.86**	-0.81**, -0.79**, 0.83**
-0.75*, -0.64*, 0.45	-0.6, -0.52, 0.35
-0.88***, -0.81**, 0.82**	-0.9***, -0.78**, 0.81**
-0.84**, -0.82**, 0.81**	-0.87**, -0.83**, 0.8**
-0.88***, -0.86**, 0.83**	-0.83**, -0.85**, 0.82**
0.03, 0.05, 0.05	0.08, 0.06, 0
-0.73*, -0.71*, 0.65*	-0.77**, -0.66*, 0.67*
0.14, 0.31, -0.1	0.32, 0.4, -0.26
-0.28, -0.09, 0.18	-0.16, -0.08, 0.13
0.73*, 0.76*, 0.46	0.85**, 0.77**, 0.6
0.72*, 0.74*, 0.47	0.76*, 0.71*, 0.57
-0.42, -0.55, 0.33	-0.55, -0.57, 0.48
0.42, 0.45, -0.32	0.55, 0.55, -0.5
0.21, 0.37, -0.18	0.56, 0.5, -0.42
0.56, 0.36, -0.3	0.7*, 0.46, -0.5
0.16, 0.36, -0.19	0.32, 0.43, -0.23
0.53, 0.37, -0.59	0.61, 0.42, -0.62
	0.88***, 0.96***, 0.94***
0.88***, 0.96***, 0.94***	