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Supplementary Material

Different water relations between flower and leaf periods: a case study in flower-before-leaf-emergence *Magnolia* species

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Table S1. Morphological and ecophysiological traits with significant differences among three tepal whorls or four leaf growth stages of *M. denudata* and *M. soulangeana*

Data are mean ± s.e.m. Sample sizes (*n*) are given in brackets after each value; results of multiple comparisons are reported. Abbreviations are the same as in Table 1

	Flower whorl	Leaf stage	*Magnolia denudata*		*Magnolia soulangeana*	
			Flower (*n*)	Leaf (*n*)	Flower (*n*)	Leaf (*n*)
Single tepal or leaf area (cm^2)	1st	1st		44.69 ± 5.01 (6) a	34.55 ± 5.34 (6) a	51.29 ± 6.89 (6) a
	2nd	2nd		72.07 ± 2.26 (6) b	49.13 ± 4.93 (6) b	70.92 ± 2.72 (6) b
	3rd	3rd		65.39 ± 3.26 (6) b	43.94 ± 4.71 (6) b	70.79 ± 3.82 (6) b
		4th		50.85 ± 1.17 (6) a		42.87 ± 1.35 (6) a
Tepal or leaf thickness (mm)	1st	1st	1.56 ± 0.17 (6) a	0.14 ± 0.01 (6) a	1.35 ± 0.02 (6) a	0.12 ± 0.01 (6) a
	2nd	2nd	2.18 ± 0.11 (6) b	0.15 ± 0.01 (6) b	2.12 ± 0.19 (6) b	0.15 ± 0.01 (6) b
	3rd	3rd	2.63 ± 0.15 (6) c	0.15 ± 0.01 (6) b	3.04 ± 0.23 (6) c	0.15 ± 0.00 (6) b
		4th		0.16 ± 0.01 (6) b		0.15 ± 0.01 (6) b
Tepal thinnest thickness (mm)	1st				0.17 ± 0.00 (6) a	
	2nd				0.18 ± 0.00 (6) a	
	3rd				0.28 ± 0.00 (6) b	
LDMC (%)	1st		6.29 ± 0.05 (6) b		6.61 ± 0.15 (6) b	
	2nd		6.01 ± 0.08 (6) a		6.13 ± 0.10 (6) a	
	3rd		5.98 ± 0.15 (6) a		5.99 ± 0.08 (6) a	
g_s (mol m^{-2} s^{-1})	1st	1st	0.018 ± 0.001 (40) a	0.121 ± 0.009 (30) c	0.038 ± 0.006 (40) a	0.108 ± 0.008 (30) c
	2nd	2nd	0.019 ± 0.004 (40) a	0.096 ± 0.008 (30) b	0.028 ± 0.007 (40) a	0.055 ± 0.006 (30) b
	3rd	3rd	0.025 ± 0.005 (40) b	0.052 ± 0.005 (30) a	0.058 ± 0.015 (40) b	0.044 ± 0.002 (30) a
		4th		0.043 ± 0.004 (30) a		0.045 ± 0.002 (30) a
E (mmol m^{-2} s^{-1})	1st	1st	0.25 ± 0.02 (40) a	1.89 ± 0.12 (30) d	0.49 ± 0.05 (40) a	1.41 ± 0.11 (30) c
	2nd	2nd	0.26 ± 0.04 (40) a	1.56 ± 0.08 (30) c	0.39 ± 0.07 (40) a	0.87 ± 0.06 (30) b
	3rd	3rd	0.34 ± 0.04 (40) b	0.94 ± 0.04 (30) b	0.69 ± 0.09 (40) b	0.73 ± 0.04 (30) a
		4th		0.82 ± 0.06 (30) a		0.73 ± 0.04 (30) a

Ψ_{am} (MPa)	1st		-0.22 ± 0.02 (6) a		-0.19 ± 0.04 (6) a	
	2nd		-0.10 ± 0.03 (6) b		-0.11 ± 0.02 (6) b	
	3rd		-0.10 ± 0.03 (6) b		-0.08 ± 0.03 (6) b	
Ψ_{pm} (MPa)	1st		-0.20 ± 0.04 (6) a		-0.16 ± 0.04 (6) a	
	2nd		-0.08 ± 0.02 (6) b		-0.05 ± 0.00 (6) b	
	3rd		-0.05 ± 0.01 (6) b		-0.05 ± 0.00 (6) b	
Ψ_{tlp} (MPa)	1st				-0.30 ± 0.03 (6) a	
	2nd				-0.23 ± 0.04 (6) a	
	3rd				-0.15 ± 0.02 (6) b	
HSM (MPa)	1st		0.04 ± 0.01 (6) a		0.07 ± 0.02 (6) a	
	2nd		0.14 ± 0.02 (6) b		0.14 ± 0.01 (6) b	
	3rd		0.18 ± 0.02 (6) b		0.10 ± 0.01 (6) a	
Cft (mol m^{-2} MPa^{-1})	1st				3.58 ± 0.74 (6) a	
	2nd				4.98 ± 0.96 (6) a	
	3rd				12.83 ± 1.27 (6) b	
K_{leaf} or K_{tepal}	1st	1st	4.26 ± 0.65 (6) a	8.57 ± 1.09 (3) a	3.96 ± 0.76 (6) a	6.79 ± 0.88 (3) a
(mmol m^{-2} s^{-1} MPa^{-1})	2nd	2nd	3.29 ± 0.71 (6) a	19.85 ± 3.79 (3) c	4.54 ± 1.01 (6) ab	15.80 ± 2.87 (3) c
	3rd	3rd	4.84 ± 0.43 (6) b	14.95 ± 2.63 (3) bc	5.91 ± 0.84 (6) b	13.79 ± 2.76 (3) bc
		4th		12.99 ± 1.96 (3) b		11.45 ± 1.64 (3) b

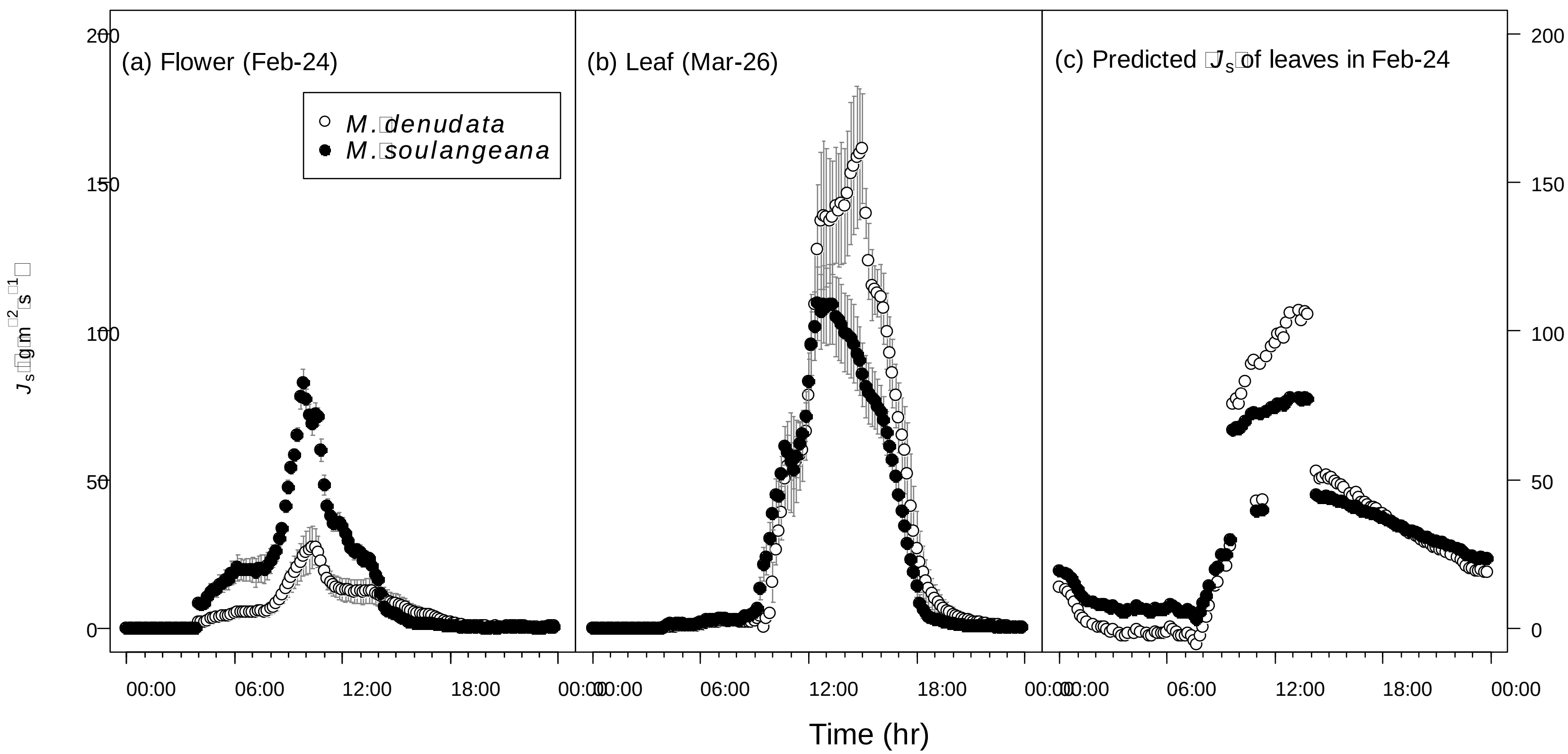

Fig. S1. J_S of (a) flowers and (b) leaves measured during two sunny days during flowering and vegetative periods for *M. denudata* and *M. soulangeana*. Since *D* in leaf period overlapped with the whole range of *D* during the flowering period (Fig. 2a), (c) predicted J_S of leaves during flowering period were calculated based on the relationships between J_S and *D* in two light levels (Fig. 4c d) and the *D* values on Feb-24.

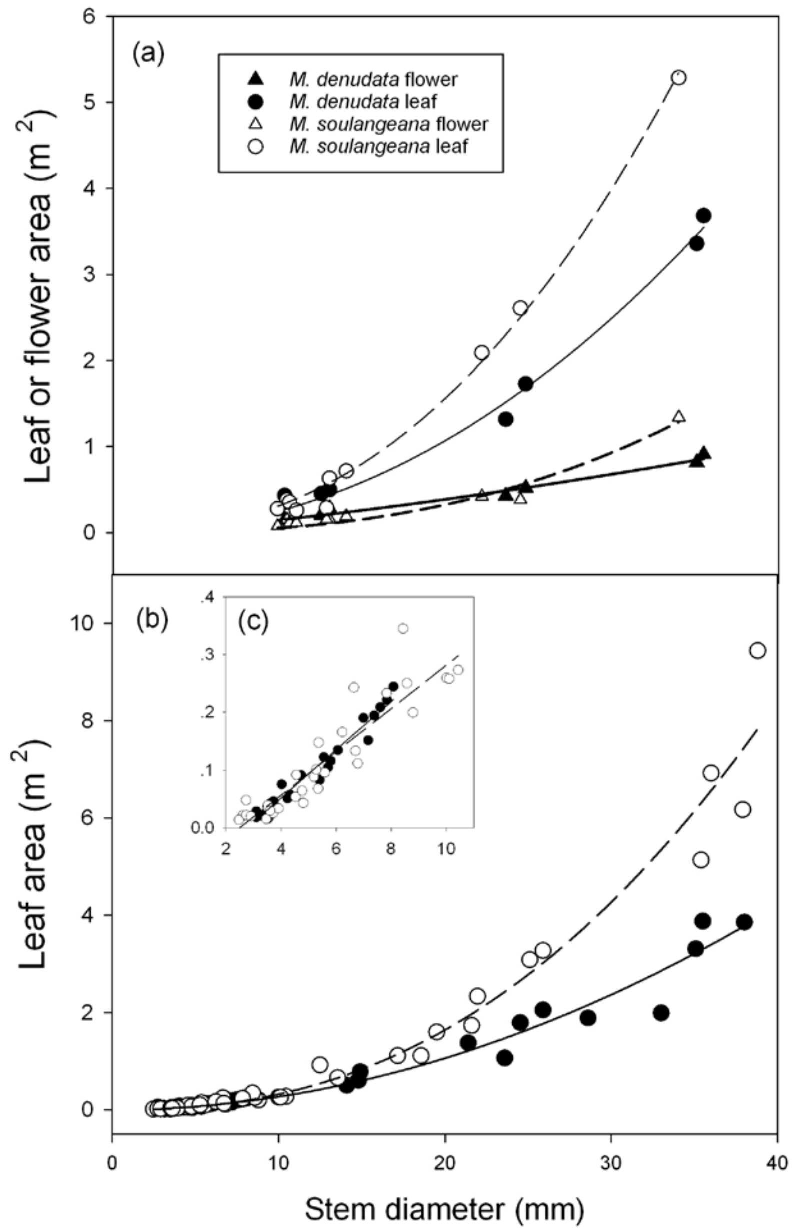

Fig. S2. Flower and leaf areas (*S*) versus stem diameters (*d*) for *M. denudata* (close symbols) and *M. soulangeana* (open symbols). (a) Total flower (triangles) or leaf (circles) areas for each of the 16 branches with sap flow monitoring (*n*=6 for *M. denudata* and 10 for *M. soulangeana*). Flower areas on each branch are calculated as mean single flower area × total flower numbers, while leaf areas on each branch are predicted by models in (b) and (c). (b) Leaf area for larger branches (*d*=2~40 mm, *n*=35 for *M. denudata* and 44 for *M. soulangeana*) based on diameters of all the smaller branches (d<10 mm) on each branch, and (c) carefully measured leaf areas on small branches (d<10 mm). Relationships are: (a) *M. soulangeana* leaf, $S=0.0016\times d^{2.3085}$ ($R^2=0.99^{***}$); *M. denudata* leaf, $S=0.0021\times d^{2.0818}$ ($R^2=0.99^{***}$); *M. soulangeana* flower, $S=0.0001\times d^{2.5765}$ ($R^2=0.96^{***}$); *M. denudata* flower, $S=0.0061\times d^{1.386}$ ($R^2=0.98^{***}$); (b) *M. soulangeana* leaf, $S=0.0014\times d^{2.3563}$ ($R^2=0.97^{***}$); *M. denudata* leaf, $S=0.0028\times d^{1.9781}$ ($R^2=0.96^{***}$); and (c) *M. soulangeana* leaf, $S=0.0376\times d$-0.923 ($R^2=0.89^{***}$); *M. denudata* leaf, $S=0.0417\times d$-0.1151 ($R^2=0.96^{***}$).

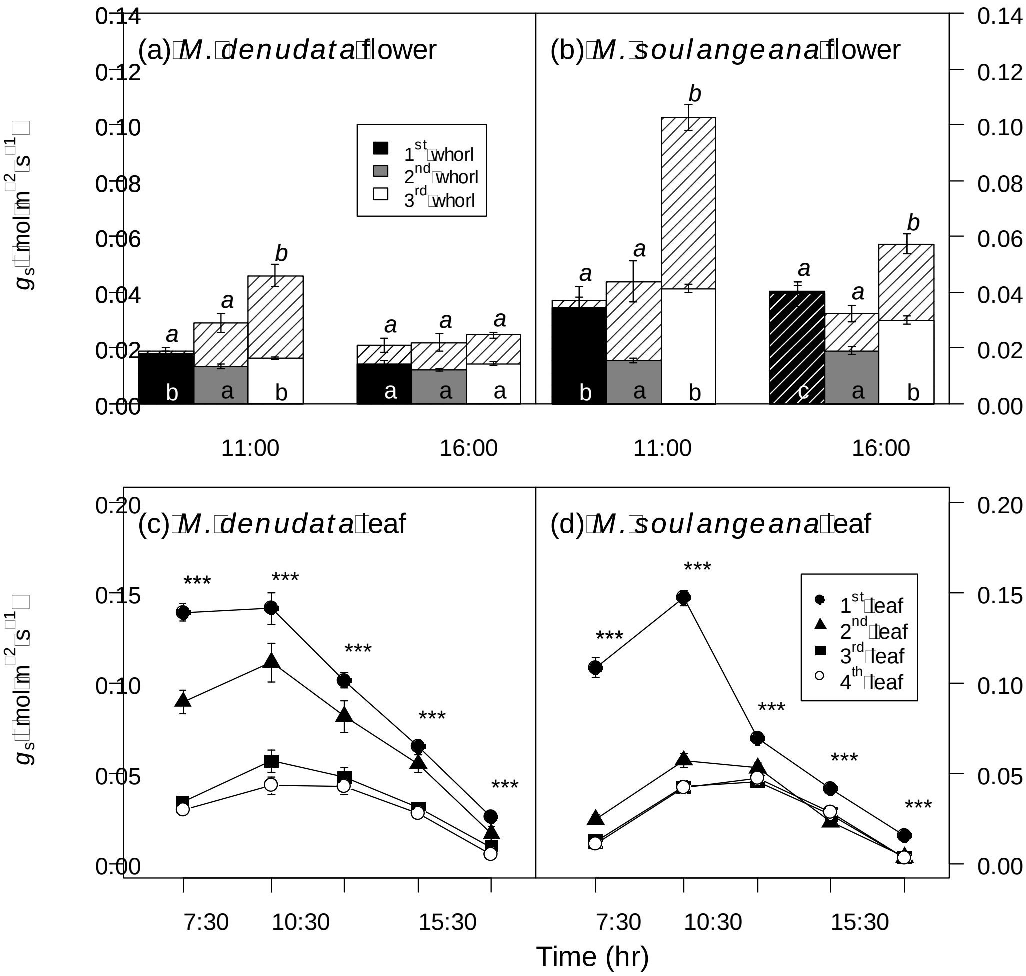

Fig. S3. Daily changes in flower and leaf stomatal conductance (g_s) of *M. denudata* and *M. soulangeana* during two sunny days. Flowers of (a) *M. denudata* and (b) *M. soulangeana* have tepals in three whorls (1st outer whorl, black; 2nd middle whorl, grey; 3rd inner whorl, white), and are divided into fully-open (bars without dashes) and half-open (bars with dashes, bars with higher values are put as the background) groups. Leaves of (c) *M. denudata* and (d) *M. soulangeana* are divided into four growth stages in each cluster (1st half-expanded leaves: closed circles; 2nd fully-expanded leaves: closed triangles; 3rd mature leaves: closed square; 4th small basal leaves: open circles). In (a) and (b), italic letters on the top of each bar indicate the multiple comparison results among three whorls in half-open flowers, while regular letters at the bottom of each bar indicate comparisons in fully-open flowers; in (c) and (d), results of statistical analysis using ANOVA on leaf growth stages are labelled (***, P<0.001).

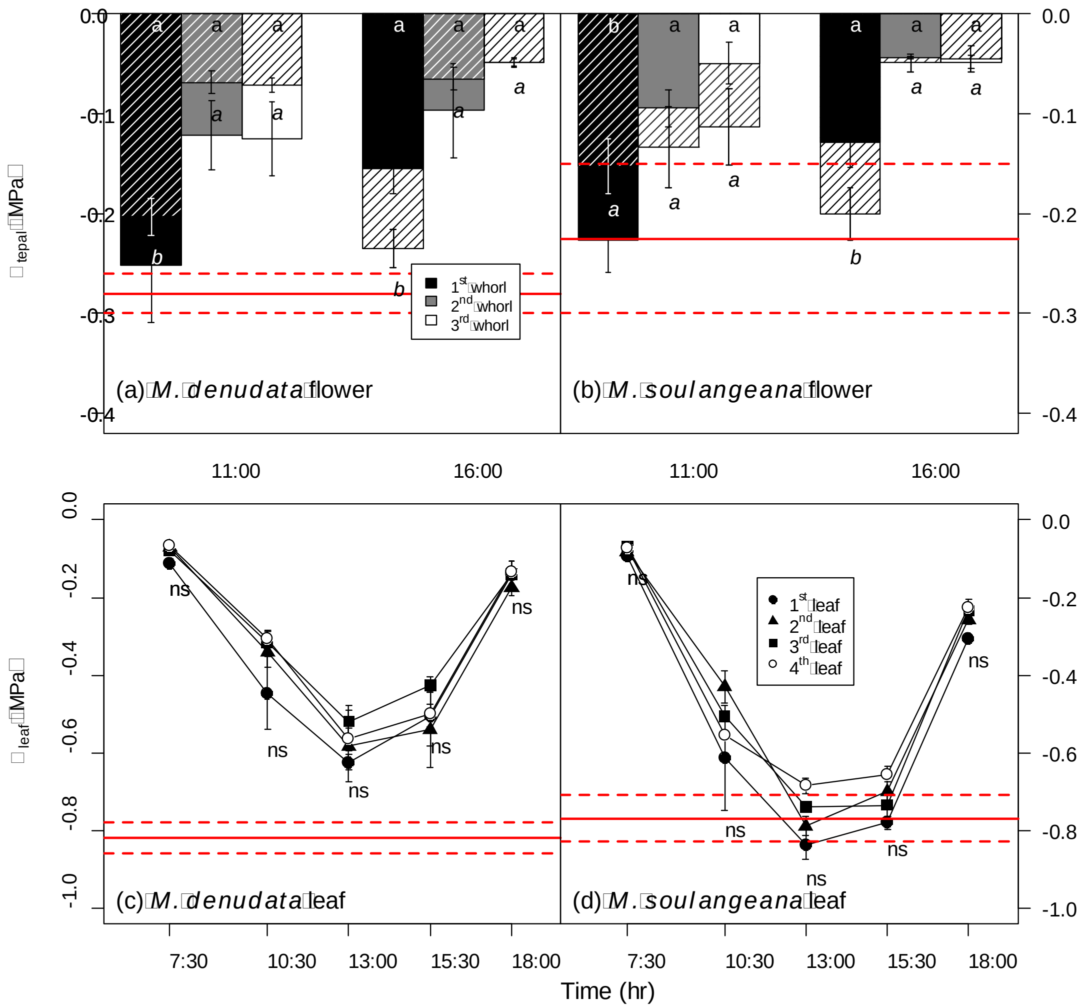

Fig. S4. Daily changes in flower and leaf water potential (Ψ) of *M. denudata* and *M. soulangeana* during two sunny days. Colours and symbols for different flower whorls, fully-open and half-open flowers, and leaf growth stages are the same as in Fig. S3. In (a) and (b), bars with higher values are put as the background, with italic letters on the top of each bar indicate the multiple comparison results among three whorls in half-open flowers, while regular letters at the bottom of each bar indicate comparisons in fully-open flowers; in (c) and (d), results of statistical analysis using ANOVA on leaf growth stages are labelled (ns, $P>0.05$). Red lines indicate mean Ψ_{tlp} (dashed red lines are minimum and maximum Ψ_{tlp} values among tepal whorls or leaf growth stages). The differences between minimum Ψ and Ψ_{tlp} are hydraulic safety margins.