Supplementary Materials

Seasonal leaf functional trait responses of *Quercus frainetto Ten.* to urban and natural forest environments and a comparison with *Quercus cerris L.* in a Mediterranean municipality

Table S1. Mean values (± standard deviation) of leaf functional traits of *Quercus cerris* and *Quercus frainetto* in the natural (NF) and urban (UF) forest stands across the three sampling months. n = 70 leaves per group (7 trees × 10 leaves).

Species	Stand	Month	SLA	LDMC	LTH	CHL	ANTH	FLV
Q. cerris	NF	June	150.77 ± 25.54	0.41 ± 0.02	0.27 ± 0.03	36.58 ± 2.98	0.06 ± 0.01	0.84 ± 0.15
		July	139.90 ± 19.40	0.41 ± 0.03	0.28 ± 0.03	37.47 ± 2.34	0.02 ± 0.01	0.95 ± 0.14
		September	124.04 ± 18.80	0.47 ± 0.02	0.27 ± 0.03	38.47 ± 2.07	0.02 ± 0.01	1.07 ± 0.08
Q. cerris	UF	June	166.73 ± 19.96	0.40 ± 0.03	0.28 ± 0.04	39.35 ± 2.87	0.05 ± 0.02	0.69 ± 0.12
		July	142.25 ± 15.77	0.43 ± 0.02	0.26 ± 0.03	41.74 ± 2.10	0.03 ± 0.01	0.88 ± 0.13
		September	130.96 ± 21.68	0.50 ± 0.03	0.25 ± 0.03	38.50 ± 2.82	0.03 ± 0.02	0.98 ± 0.16
Q. frainetto	NF	June	150.79 ± 19.05	0.42 ± 0.03	0.25 ± 0.03	38.77 ± 2.90	0.07 ± 0.01	0.69 ± 0.13
		July	115.07 ± 17.22	0.42 ± 0.03	0.30 ± 0.05	41.24 ± 2.01	0.03 ± 0.01	0.99 ± 0.18
		September	117.30 ± 14.53	0.45 ± 0.02	0.29 ± 0.03	40.11 ± 3.39	0.02 ± 0.02	1.10 ± 0.13
Q. frainetto	UF	June	150.50 ± 16.76	0.37 ± 0.03	0.28 ± 0.04	38.21 ± 3.71	0.04 ± 0.02	0.68 ± 0.11
		July	132.26 ± 13.25	0.40 ± 0.03	0.26 ± 0.03	40.84 ± 3.24	0.04 ± 0.02	0.77 ± 0.11
		September	123.27 ± 13.05	0.45 ± 0.02	0.31 ± 0.04	40.05 ± 3.59	0.03 ± 0.03	0.88 ± 0.17

SLA, specific leaf area; LDMC, leaf dry matter content; LTH, leaf thickness; CHL, chlorophyll content; ANTH, anthocyanin content; FLV, flavonol content. Units as defined in the Materials and Methods.

Table S2: Fixed-effect results of the linear mixed-effects models fitted to the six leaf functional traits of *Quercus frainetto* (trait ~ Stand × Month + (1|Tree)). NumDF and DenDF are the numerator and denominator degrees of freedom (Satterthwaite approximation).

Trait	Effect	NumDF	DenDF	*F*	*p*
SLA	*Stand*	1	12	9,63	0,009
	Month	2	402	162,81	<0,001
	Stand x Month	2	402	11,53	<0,001
LDMC	*Stand*	1	12	10,63	0,007
	Month	2	402	196,15	<0,001
	Stand x Month	2	402	25,8	<0,001
LTH	*Stand*	1	12	0,27	0,61
	Month	2	402	35,49	<0,001
	Stand x Month	2	402	42,54	<0,001
CHL	*Stand*	1	12	0,19	0,673
	Month	2	402	26,98	<0,001
	Stand x Month	2	402	0,26	0,768
FLV	*Stand*	1	12	24,05	<0,001
	Month	2	402	186,74	<0,001
	Stand x Month	2	402	27,37	<0,001
ANTH	*Stand*	1	12	1,24	0,288
	Month	2	402	100,84	<0,001
	Stand x Month	2	402	52,76	<0,001

Table S3. Phytosociological relevés of the sampling stands. EIVE 1.0 indicator values for niche position of L (light), T (temperature), M (moisture), R (reaction), and N (nitrogen availability) from Dengler et al. [82] for the 64 taxa. Adapted from Quaranta et al. [26].

					Slope (%)	10	10
					Aspect	E	N/E
					Elevation m a.s.l.	875	657
					Soil surface aspect, rocky outcrops (%)	-	-
					Soil surface aspect, stoniness (%)	-	5
					Canopy layer cover (%)	70	80
					Shrubs layer cover (%)	85	75
					Herbaceous layer cover (%)	80	70
					Forest stand acronym: NF natural; UF urban forest	NF	UF
					Total species	59	36
L	**T**	**M**	**R**	**N**	**Roso arvensis-Quercetum cerridis** Ubaldi 2003		
6.1	5.7	3.6	5.5	4.4	*Quercus cerris* L.	4	4
5.2	4.4	4.2	6.9	5.0	*Rosa arvensis* Huds.	1	1
5.9	5.3	4.2	7.4	4.3	*Lonicera caprifolium* L.	+	1
					Crataego laevigatae-Quercion cerridis Arrigoni 1997		
6.4	5.7	5.1	6.1	4.6	*Quercus frainetto* Ten.	3	3
6.3	4.9	3.9	7.4	4.1	*Ligustrum vulgare* L.	2	3
8.2	4.6	4.2	8.8	5.3	*Digitalis michranta* Roth ex Schweigg.	+	.
7.3	4.5	4.3	4.9	2.3	*Genista tinctoria* L.	1	.
					Fagetalia sylvaticae Pawłowski in Pawłowski, Sokołowski & Wallisch 1928		
5.7	3.8	4.8	4.2	3.9	*Sorbus aucuparia* L.	+	1
7.0	7.2	3.4	7.4	8.1	*Allium pendulinum* Ten.	+	1
4.5	3.9	4.3	7.7	6.3	*Asperula taurina* L. subsp. *taurina*	+	.
3.5	2.8	5.0	6.5	6.5	*Geranium versicolor* L.	1	.
1.5	4.1	4.5	7.1	5.2	*Neottia nidus-avis* (L.) Rich.	+	.
3.8	3.9	5.2	6.1	7.1	*Scrophularia nodosa* L.	+	.
3.8	4.2	5.1	5.9	6.9	*Acer pseudoplatanus* L.	1	.

					Carpino-Fagetea Jakucs ex Passarge 1968		
5.6	3.8	4.6	5.4	5.6	*Rubus hirtus* Waldst. & Kit. group	2	1
5.5	3.9	4.4	6.3	5.4	*Vicia sepium* L.	2	+
5.0	5.0	4.2	6.8	5.8	*Acer campestre* L.	1	2
3.0	4.2	4.4	6.2	5.1	*Melica uniflora* Retz.	1	1
6.3	4.8	4.4	7.1	6.4	*Clematis vitalba* L.	1	1
3.4	5.6	3.9	4.8	2.7	*Luzula forsteri* (Sm.) DC.	+	+
3.8	5.3	3.9	7.6	3.9	*Daphne laureola* L.	1	.
3.2	4.6	4.4	8.4	5.0	*Aremonia agrimonoides* (L.) DC. subsp. *agrimonoides*	2	1
3.4	4.2	4.5	6.4	5.5	*Viola reichenbachiana* Jord. ex Boreau	1	+
5.1	5.3	4.9	7.6	6.2	*Ulmus minor* Mill.	.	+
5.8	4.7	4.2	4.8	3.5	*Quercus petraea* (Matt.) Liebl.	3	.
5.4	4.3	4.4	5.7	5.7	*Corylus avellana* L.	1	.
5.9	4.0	4.4	5.7	5.3	*Fragaria vesca* L. subsp. *vesca*	1	.
5.3	4.1	5.0	5.6	5.7	*Ajuga reptans* L.	1	.
5.0	3.7	4.3	4.4	4.2	*Solidago virgaurea* L.	+	.
					Quercetalia pubescenti-petraeae Klika 1933		
					Quercetea pubescentis Doing-Kraft ex Scamoni et Passarge 1959		
6.5	6.0	3.2	7.2	3.9	*Quercus pubescens* Willd.	+	3
3.4	5.5	4.1	5.9	4.8	*Lathyrus venetus* (Mill.) Wohlf.	1	2
6.3	5.9	3.2	8.1	4.1	*Fraxinus ornus* L. subsp. *ornus*	1	.
4.6	5.2	3.9	7.0	4.0	*Sorbus torminalis* (L.) Crantz	+	2
4.0	4.2	4.7	6.6	7.4	*Geum urbanum* L.	+	+
4.9	5.8	3.4	8.0	3.4	*Carpinus orientalis* Mill.	2	.
8.2	5.8	2.6	6.6	6.9	*Echinops sphaerocephalus* L. subsp. *sphaerocephalus*	+	.
6.9	5.7	3.9	7.7	4.9	*Scutellaria columnae* All.	+	.
4.6	6.1	3.5	5.1	5.1	*Sedum cepaea* L.	+	.
5.8	5.4	3.8	7.8	4.6	*Cornus mas* L.	1	.
8.2	7.1	3.8	7.2	3.9	*Acer opalus* Mill. subsp. *obtusatum* (Waldst. & Kit. ex Willd.) Gams	+	.

					Wide ecology forest species		
2.6	4.8	4.4	6.5	5.9	*Brachypodium sylvaticum* (Huds.) P.Beauv. subsp. *sylvaticum*	2	2
4.2	6.3	4.0	6.6	4.4	*Ruscus aculeatus* L.	2	1
4.0	7.5	3.7	5.7	5.1	*Hedera helix* L. subsp. *helix*	1	3
5.5	5.6	4.4	7.5	5.5	*Dioscorea communis* (L.) Caddick & Wilkin	+	.
5.0	3.6	4.0	3.4	3.5	*Veronica officinalis* L.	1	.
					Crataego-Prunetea Tüxen 1962		
6.9	4.7	4.0	6.9	4.5	*Crataegus monogyna* Jacq.	3	1
7.4	4.4	3.4	5.9	5.2	*Prunus spinosa* L. subsp. *spinosa*	1	2
6.0	4.4	4.8	7.3	4.8	*Cornus sanguinea* L. subsp. *hungarica* (Kárpáti) Soó	1	+
6.2	5.4	2.9	8.5	2.6	*Emerus major* Mill.	+	+
7.2	4.3	3.9	6.4	4.3	*Rosa canina* L.	1	.
7.1	5.9	3.9	6.2	4.0	*Pyracantha coccinea* M.Roem.	.	+
					Quercetea ilicis Br.-Bl. in Br.-Bl., Roussine & Nègre 1952		
6.0	6.8	2.0	6.0	4.4	*Asparagus acutifolius* L.	+	.
6.9	3.9	4.3	6.3	9.8	*Lamium album* L. subsp. *album*	.	+
					Trifolio-Geranietea Müller 1962		
5.4	4.1	5.0	6.6	8.7	*Urtica dioica* L.	+	+
7.5	4.5	4.1	6.3	7.6	*Artemisia vulgaris* L.	+	.
5.8	4.4	3.8	6.8	3.7	*Astragalus glycyphyllos* L.	+	.
7.4	4.9	3.3	6.8	5.2	*Geranium columbinum* L.	.	+
8.0	5.9	2.7	6.9	3.9	*Salvia verbenaca* L.	.	+
					Festuco-Brometea Br.-Bl. & Tüxen ex Br.-Bl. 1949		
9.6	4.0	1.6	7.0	2.2	*Festuca circumediterranea* Patzke	1	1
6.7	4.3	5.1	7.7	3.4	*Carex flacca* Schreb. subsp. *eriostachya*	1	1
6.8	4.5	4.3	6.1	6.1	*Dactylis glomerata* L.	1	1
					Molinio-Arrhenatheretea Tüxen 1937		

6.0	4.1	5.7	5.9	6.9	*Poa trivialis* L.	1	1
7.8	4.6	3.4	6.7	3.1	*Ranunculus bulbosus* L.	1	.
6.5	4.2	4.6	6.0	6.3	*Cruciata laevipes* Opiz.	+	.

Discrepancies in nomenclature

In EIVE 1.0: Digitalis lutea subsp. australis

In EIVE 1.0: Fragaria vesca

In EIVE 1.0: Acer obtusatum

In EIVE 1.0: Hippocrepis emerus

In EIVE 1.0: Carex flacca

Table S4. Source and characteristics of the satellite-derived environmental variables used to characterize the study stands. Adapted from Quaranta et al. [26].

Satellite	Satellite data	Description
Landsat 5/6/7/9	Land Surface Temperature (LST)	30 m resolution — 16 days
TerraClimate	Precipitation (PPT)	4 km resolution — monthly
	Soil Moisture (SMOI)	4 km resolution — monthly
	Actual Evapotranspiration (ACTEVP)	4 km resolution — monthly

Table S5. Climatic data for the three stands—natural forest (NF), peri-urban forest (PUF), and urban forest (UF)—in the Campobasso municipality. A-M: April–May 2023; J-J: June–July 2023; J-A: July–August 2023. Adapted from Quaranta et al. [26].

Stand	SMOI (mm)			LST (°C)			PPT (mm)			ACTEVP (mm)		
	A-M	J-J	J-A	A-M	J-J	J-A	A-M	J-J	J-A	A-M	J-J	J-A
NF	62.00	55.00	23.25	18.11	19.70	26.60	13.99	18.01	4.11	77.50	97.75	25.65
UF	48.15	40.20	18.25	22.18	24.84	33.00	14.40	11.67	3.92	80.55	93.15	19.85

Table S6. Relative Distance Plasticity Index (RDPI) between Urban (UF) and Natural (NF) forest stands for six leaf traits of *Quercus cerris* and *Quercus frainetto*, by sampling month and over the whole season, calculated on tree means (n = 7 trees per stand). A 95% CI: bootstrap percentile confidence interval (2000 resamples of trees within stands). Within-stand RDPI: mean relative distance among trees of the same stand. Random expectation: median RDPI across all 3432 allocations of the 14 trees between stands, with 5th–95th percentiles in brackets. Excess: percentage by which RDPI exceeds the random expectation. *p*: one-sided exact permutation test; *p* adj: Benjamini–Hochberg adjustment within species, separately for monthly (18 tests) and whole-season (6 tests) values; * *p* adj < 0.05, ** *p* adj < 0.01. SLA, specific leaf area; LDMC, leaf dry matter content; LTH, leaf thickness; CHL, chlorophyll content; FLV, flavonol content; ANTH, anthocyanin content.

Trait	Period	RDPI	95% CI	Within-stand RDPI	Random expectation [5th–95th]	Excess (%)	*p*	*p* adj
Q. cerris								
SLA	June	0.076	0.047–0.114	0.066	0.071 [0.068–0.080]	7.8	0.117	0.211
	July	0.050	0.031–0.068	0.054	0.051 [0.049–0.057]	−2.2	0.782	0.828
	September	0.070	0.049–0.096	0.073	0.070 [0.068–0.081]	0.0	0.500	0.563
	Whole season	**0.044**	0.027–0.066	0.039	0.041 [0.040–0.046]	7.0	0.140	0.210
LDMC	June	0.034	0.018–0.054	0.033	0.033 [0.032–0.037]	3.4	0.245	0.315
	July	0.029	0.014–0.046	0.030	0.029 [0.028–0.032]	0.5	0.455	0.545
	September	0.036	0.021–0.051	0.021	0.028 [0.027–0.032]	27.3	0.006	0.058
	Whole season	**0.016**	0.009–0.025	0.014	0.015 [0.015–0.017]	8.5	0.133	0.210
LTH	June	0.057	0.035–0.080	0.055	0.055 [0.054–0.061]	3.9	0.231	0.315
	July	0.051	0.031–0.076	0.043	0.046 [0.044–0.052]	9.5	0.084	0.169
	September	0.050	0.026–0.080	0.045	0.047 [0.045–0.051]	6.6	0.145	0.237
	Whole season	**0.033**	0.014–0.055	0.034	0.033 [0.032–0.037]	0.3	0.467	0.560
CHL	June	0.042	0.023–0.064	0.032	0.037 [0.036–0.041]	13.2	0.048	0.143
	July	0.054	0.038–0.070	0.021	0.038 [0.036–0.044]	42.5	0.001	**0.021***
	September	0.024	0.016–0.032	0.027	0.025 [0.024–0.029]	−3.7	0.901	0.901
	Whole season	**0.031**	0.020–0.042	0.014	0.022 [0.022–0.025]	36.6	0.001	**0.007****
FLV	June	0.108	0.063–0.164	0.077	0.092 [0.090–0.104]	18.1	0.024	0.108
	July	0.068	0.046–0.098	0.065	0.065 [0.063–0.075]	4.9	0.212	0.315
	September	0.066	0.039–0.096	0.050	0.058 [0.055–0.067]	14.4	0.065	0.161
	Whole season	**0.063**	0.038–0.092	0.039	0.051 [0.049–0.057]	22.6	0.010	**0.030***
ANTH	June	0.195	0.104–0.299	0.158	0.174 [0.168–0.198]	11.9	0.072	0.161
	July	0.209	0.141–0.277	0.164	0.186 [0.178–0.208]	12.4	0.043	0.143
	September	0.252	0.165–0.344	0.150	0.200 [0.194–0.229]	25.7	0.010	0.059
	Whole season	**0.071**	0.044–0.093	0.076	0.072 [0.069–0.082]	−1.3	0.675	0.675
Q. frainetto								
SLA	June	0.039	0.025–0.053	0.037	0.037 [0.036–0.042]	2.9	0.234	0.423

Trait	Period	RDPI	95% CI	Within-stand RDPI	Random expectation [5th–95th]	Excess (%)	*p*	*p* adj
LDMC	July	0.082	0.049–0.118	0.056	0.069 [0.066–0.078]	18.8	0.021	0.063
	September	0.045	0.029–0.069	0.044	0.043 [0.042–0.049]	3.3	0.325	0.487
	Whole season	**0.032**	0.020–0.048	0.019	0.025 [0.025–0.028]	26.6	0.006	**0.017***
	June	0.056	0.035–0.079	0.032	0.044 [0.043–0.050]	26.9	0.004	**0.024***
	July	0.034	0.019–0.057	0.033	0.033 [0.032–0.037]	3.9	0.245	0.423
	September	0.012	0.008–0.017	0.013	0.012 [0.012–0.014]	−2.9	0.906	0.906
	Whole season	**0.027**	0.016–0.039	0.016	0.021 [0.021–0.024]	26.1	0.011	**0.022***
LTH	June	0.077	0.049–0.110	0.049	0.063 [0.061–0.074]	22.1	0.019	0.063
	July	0.087	0.053–0.129	0.074	0.080 [0.077–0.089]	8.4	0.079	0.202
	September	0.047	0.030–0.066	0.046	0.046 [0.044–0.051]	2.9	0.259	0.423
	Whole season	**0.034**	0.022–0.044	0.034	0.034 [0.032–0.038]	1.2	0.413	0.495
CHL	June	0.039	0.021–0.060	0.040	0.039 [0.037–0.042]	0.0	0.494	0.635
	July	0.032	0.022–0.043	0.032	0.032 [0.030–0.035]	1.6	0.360	0.499
	September	0.033	0.024–0.041	0.037	0.034 [0.033–0.040]	−3.1	0.861	0.906
	Whole season	**0.020**	0.015–0.027	0.022	0.021 [0.020–0.023]	−1.0	0.630	0.630
FLV	June	0.050	0.027–0.072	0.055	0.051 [0.050–0.056]	−2.5	0.779	0.876
	July	0.122	0.070–0.183	0.073	0.099 [0.094–0.110]	24.1	0.003	**0.024***
	September	0.115	0.062–0.169	0.067	0.092 [0.088–0.101]	25.4	0.003	**0.024***
	Whole season	**0.089**	0.057–0.121	0.040	0.065 [0.062–0.075]	36.5	0.001	**0.007****
ANTH	June	0.279	0.166–0.381	0.129	0.203 [0.199–0.234]	37.6	0.006	**0.026***
	July	0.199	0.108–0.309	0.171	0.185 [0.176–0.203]	7.7	0.096	0.216
	September	0.285	0.196–0.359	0.310	0.289 [0.280–0.338]	−1.4	0.726	0.871
	Whole season	**0.107**	0.058–0.167	0.104	0.104 [0.100–0.115]	2.9	0.283	0.425

Table S7. Interspecific difference in the Relative Distance Plasticity Index (RDPI; *Q. frainetto* − *Q. cerris*) for six leaf traits, by sampling month and over the whole season. A 95% CI: bootstrap percentile confidence interval (2000 resamples, with trees resampled independently within each species and stand). Differences were considered supported when the confidence interval excluded zero; confidence intervals were not adjusted for multiple comparisons. Trait abbreviations as in Table S6.

Trait	Period	Difference in RDPI	95% CI	CI excludes zero
SLA	June	−0.038	−0.075 to −0.006	yes
	July	0.032	−0.007 to 0.074	no
	September	−0.025	−0.055 to 0.006	no
	Whole season	**−0.012**	−0.036 to 0.011	no
LDMC	June	0.022	−0.007 to 0.051	no
	July	0.005	−0.018 to 0.032	no
	September	−0.024	−0.040 to −0.009	yes
	Whole season	**0.011**	−0.002 to 0.025	no
LTH	June	0.020	−0.018 to 0.058	no
	July	0.036	−0.007 to 0.082	no
	September	−0.002	−0.038 to 0.030	no
	Whole season	**0.001**	−0.022 to 0.022	no
CHL	June	−0.003	−0.032 to 0.024	no
	July	−0.022	−0.041 to −0.001	yes
	September	0.009	−0.003 to 0.020	no
	Whole season	**−0.010**	−0.022 to 0.003	no
FLV	June	−0.058	−0.121 to −0.004	yes
	July	0.054	−0.006 to 0.116	no
	September	0.049	−0.010 to 0.111	no
	Whole season	**0.026**	−0.015 to 0.067	no
ANTH	June	0.084	−0.061 to 0.226	no
	July	−0.010	−0.128 to 0.111	no
	September	0.033	−0.089 to 0.150	no
	Whole season	**0.037**	−0.020 to 0.103	no

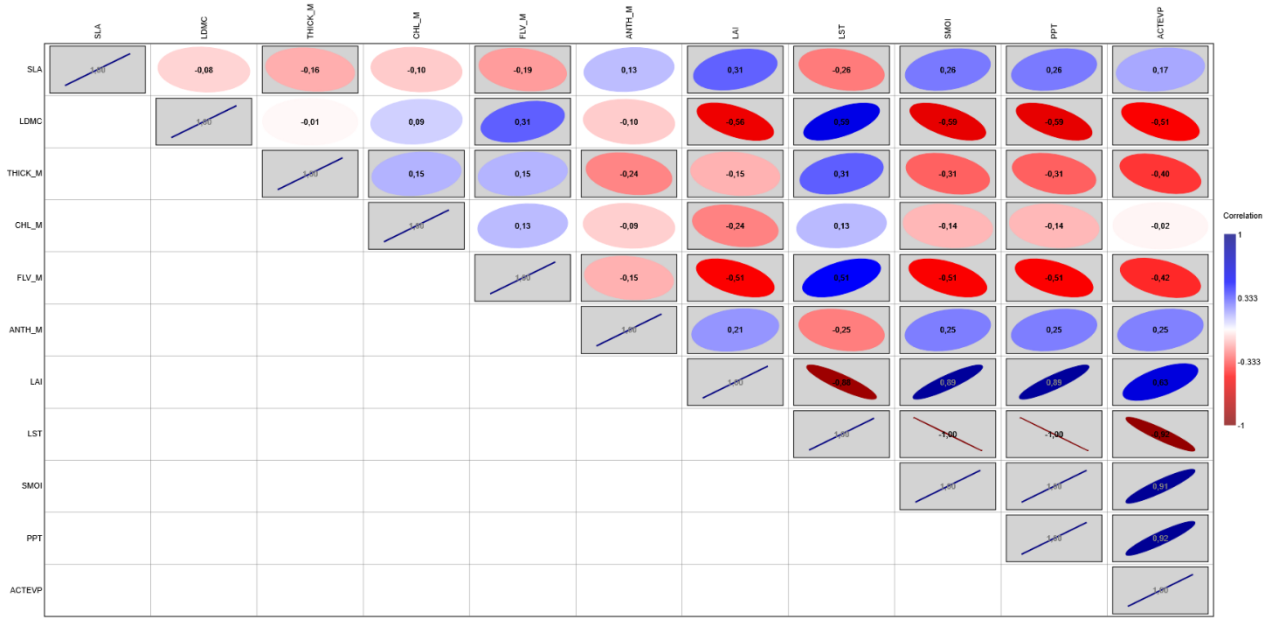


Figure S1. Pearson's correlation matrix plots for the *Quercus frainetto* dataset, based on samples of the urban forest (UF) stand. Correlation coefficients range from −1 (red) to +1 (blue). The shape, width, and colour gradient of the ellipses represent the strength and direction of the correlation, with narrower and more elongated ellipses indicating stronger correlations. Grey boxes highlight statistically significant correlations ($p < 0.05$). Correlations were calculated among six leaf functional traits: SLA (Specific Leaf Area), LDMC (Leaf Dry Matter Content), LTH (leaf thickness), CHL (chlorophyll content), FLV (flavonol content), and ANTH (anthocyanin content); one canopy structural variable: LAI (Leaf Area Index); four climatic variables: LST (Land Surface Temperature), SMOI (Soil Moisture), PPT (Precipitation), and ACTEVP (Actual Evapotranspiration).

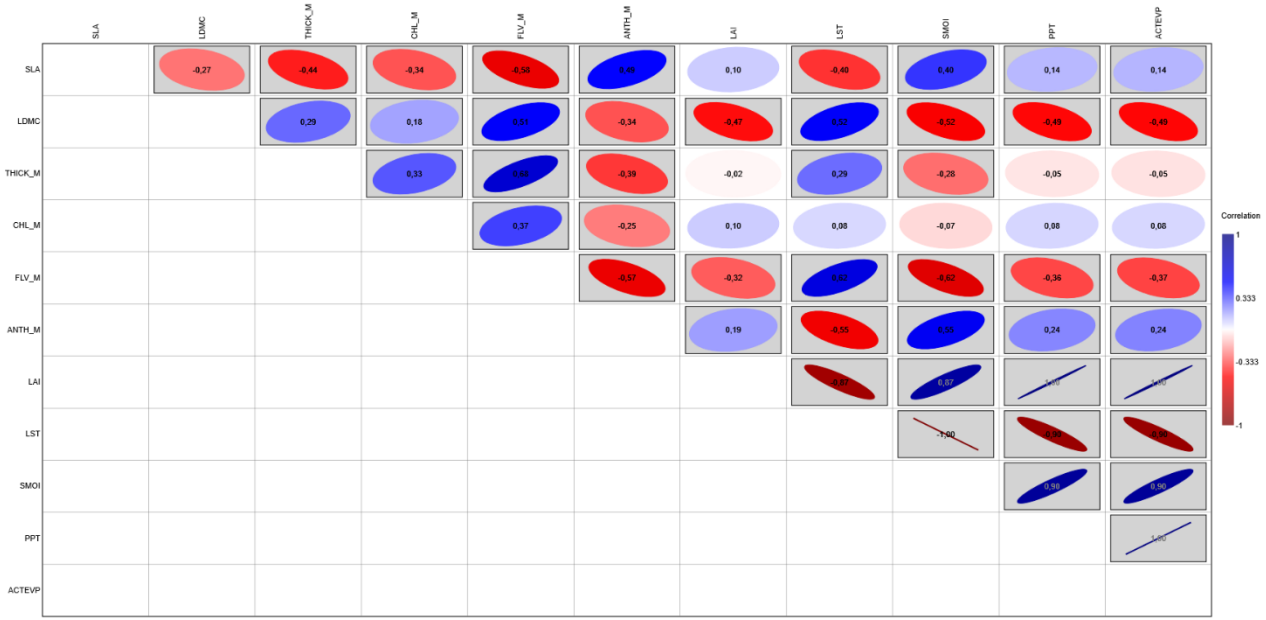
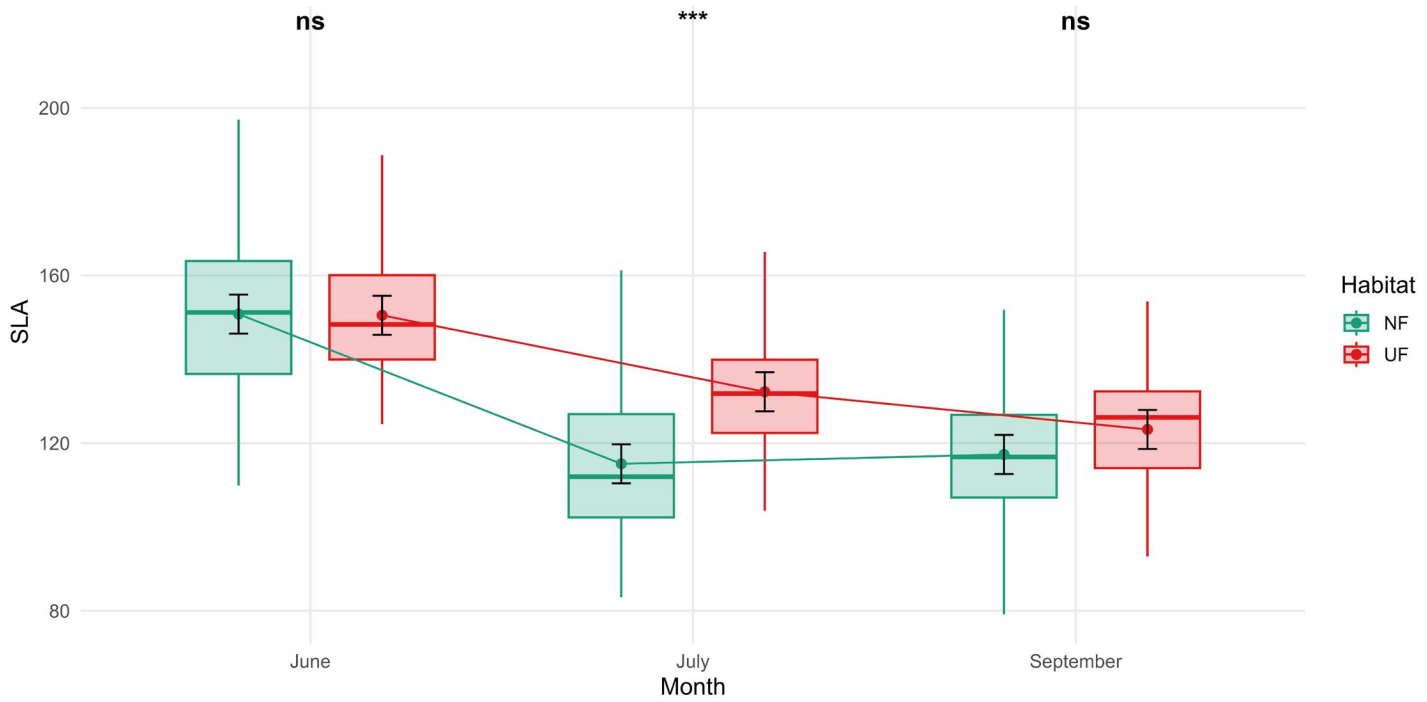
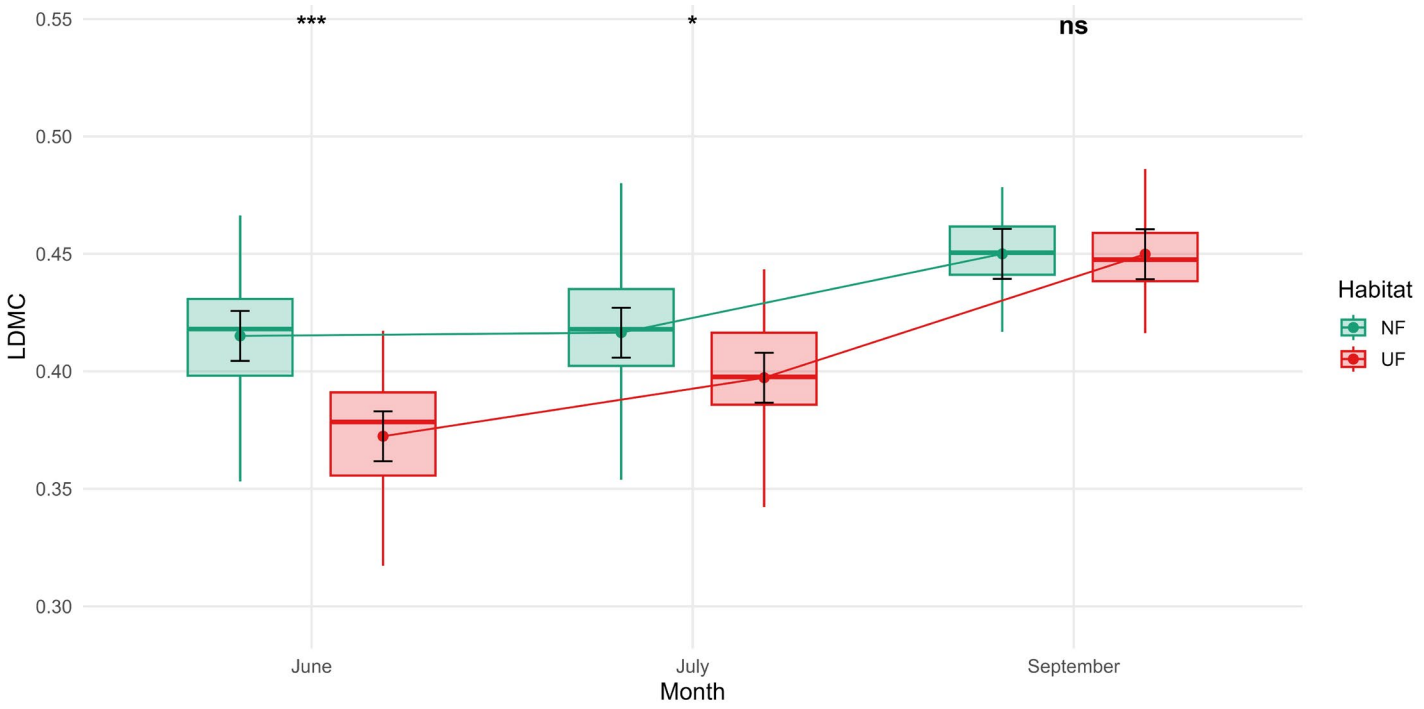


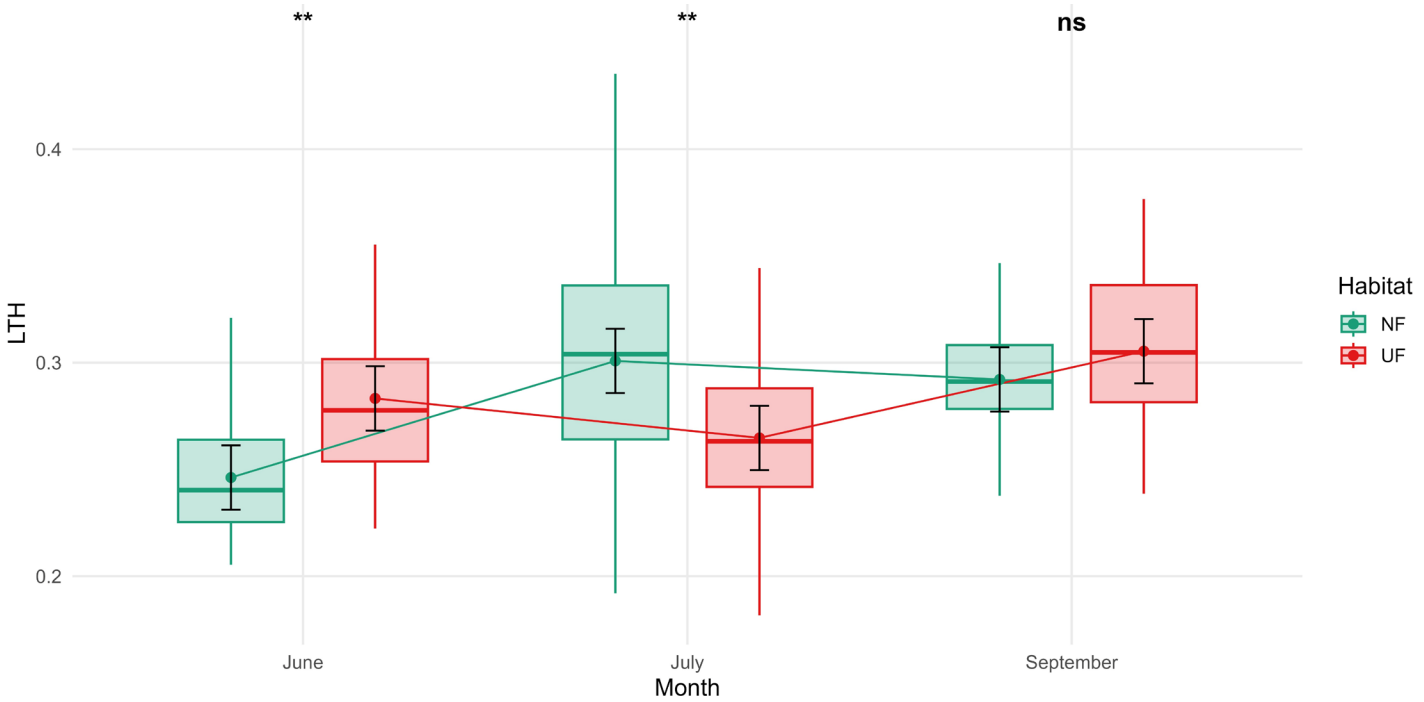
Figure S2. Pearson's correlation matrix plots for the *Quercus frainetto* dataset, based on samples of the natural forest (NF) stand. Correlation coefficients range from −1 (red) to +1 (blue). The shape, width, and colour gradient of the ellipses represent the strength and direction of the correlation, with narrower and more elongated ellipses indicating stronger correlations. Grey boxes highlight statistically significant correlations ($p < 0.05$). Correlations were calculated among six leaf functional traits: SLA (Specific Leaf Area), LDMC (Leaf Dry Matter Content), LTH (leaf thickness), CHL (chlorophyll content), FLV (flavonol content), and ANTH (anthocyanin content); one canopy structural variable: LAI (Leaf Area Index); four climatic variables: LST (Land Surface Temperature), SMOI (Soil Moisture), PPT (Precipitation), and ACTEVP (Actual Evapotranspiration).


ns
***
ns
200
160
120
80
SLA
June
July
September
Month
Habitat
NF
UF

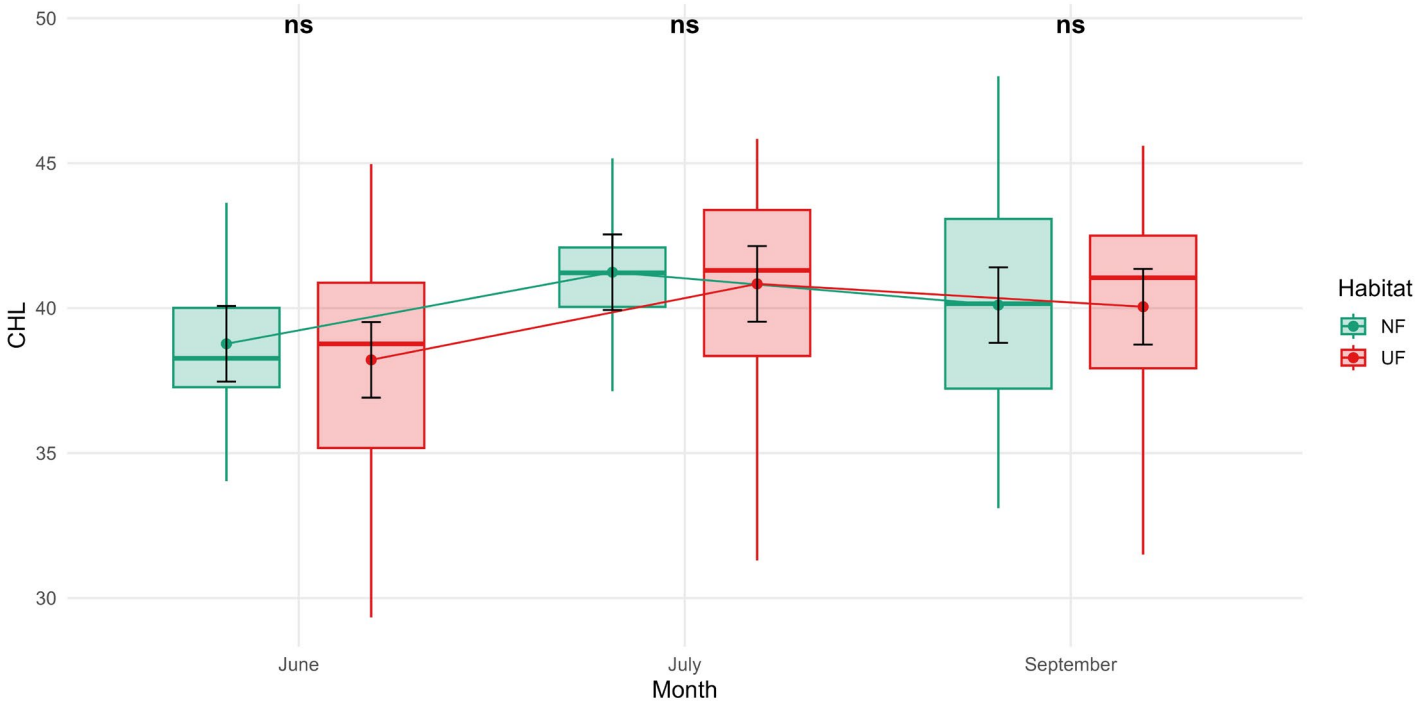
(a) SLA


0.55
0.50
0.45
0.40
0.35
0.30
LDMC
***
*
ns
June
July
September
Month
Habitat
NF
UF

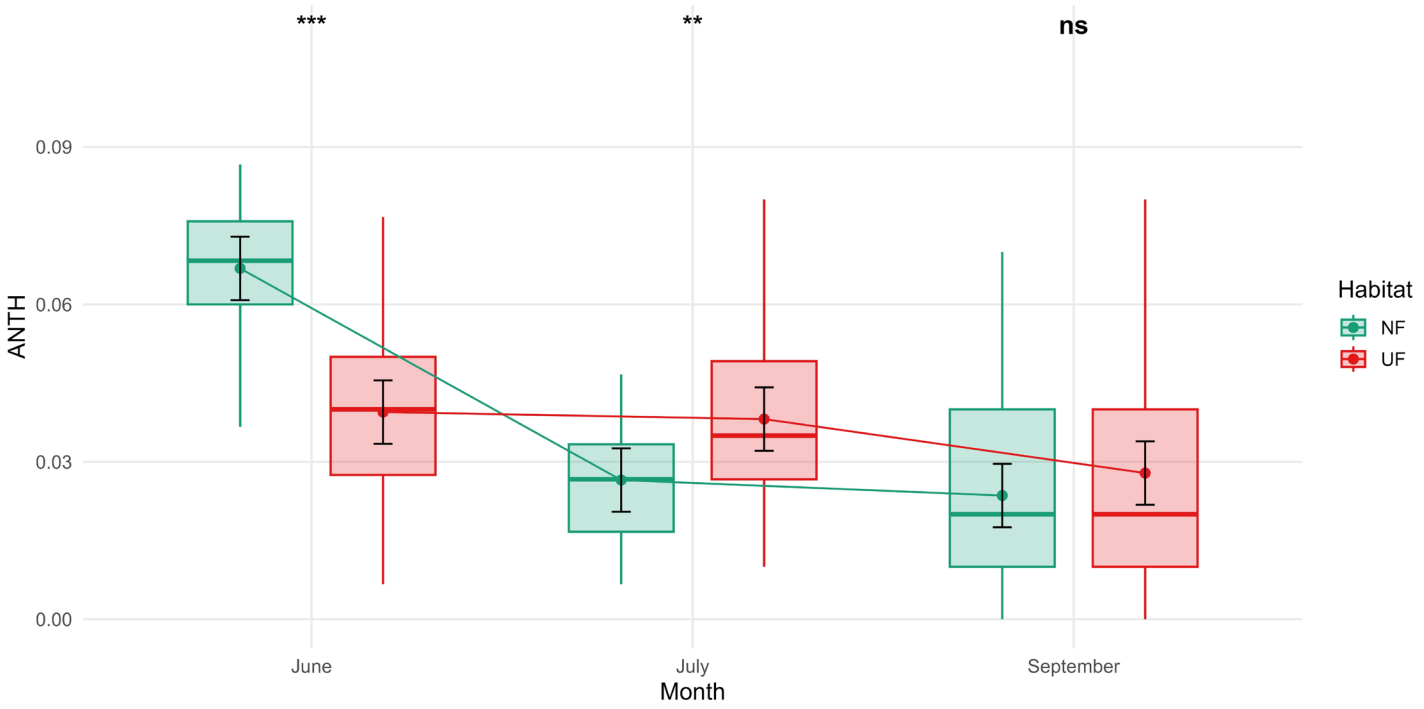
(b) LDMC



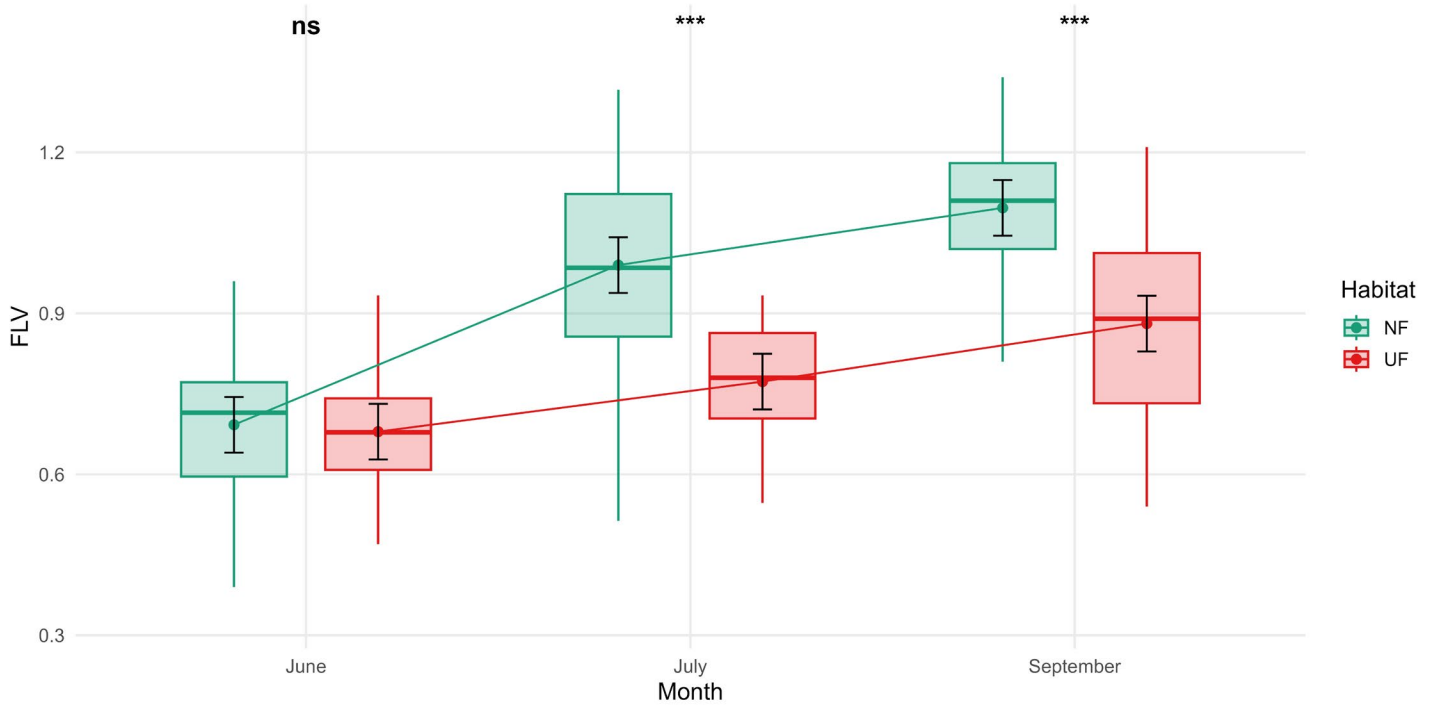
(c) LTH


ns
ns
ns
50
45
40
35
30
CHL
June
July
September
Month
Habitat
NF
UF

(d) CHL

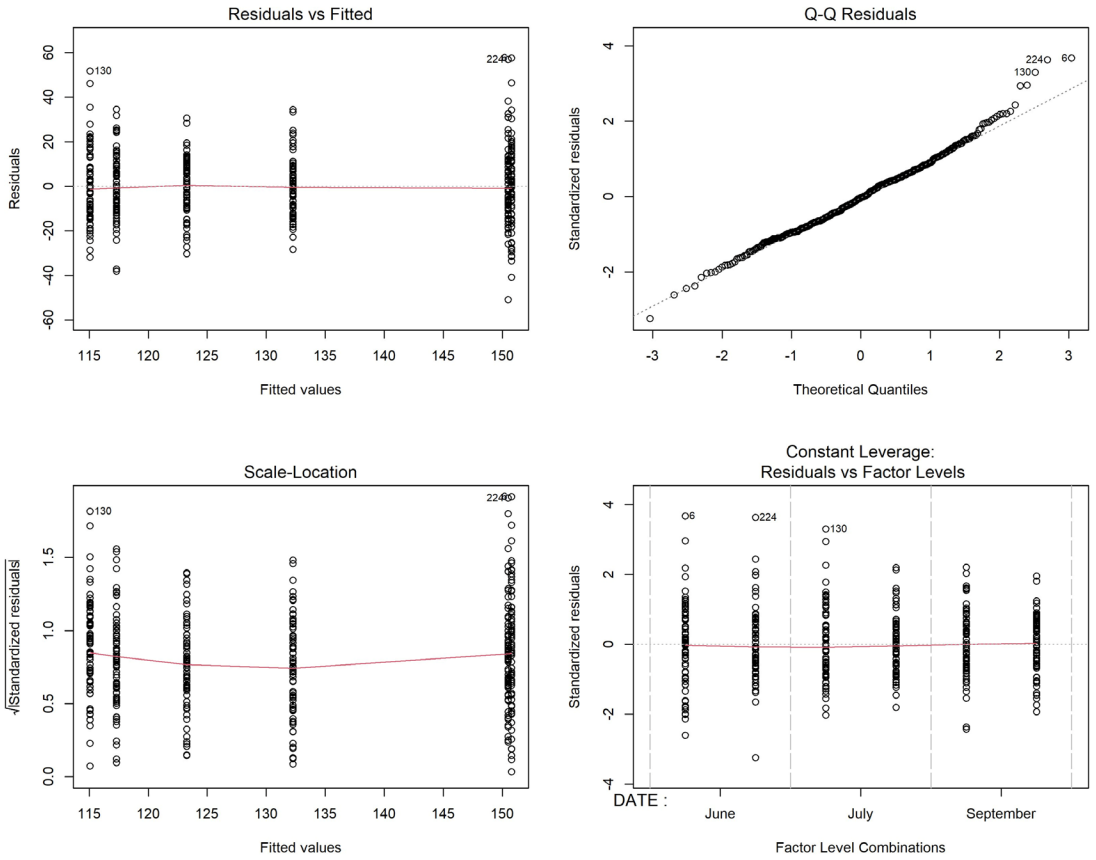

***
**
ns
0.09
0.06
0.03
0.00
ANTH
June
July
September
Month
Habitat
NF
UF

(e) ANTH

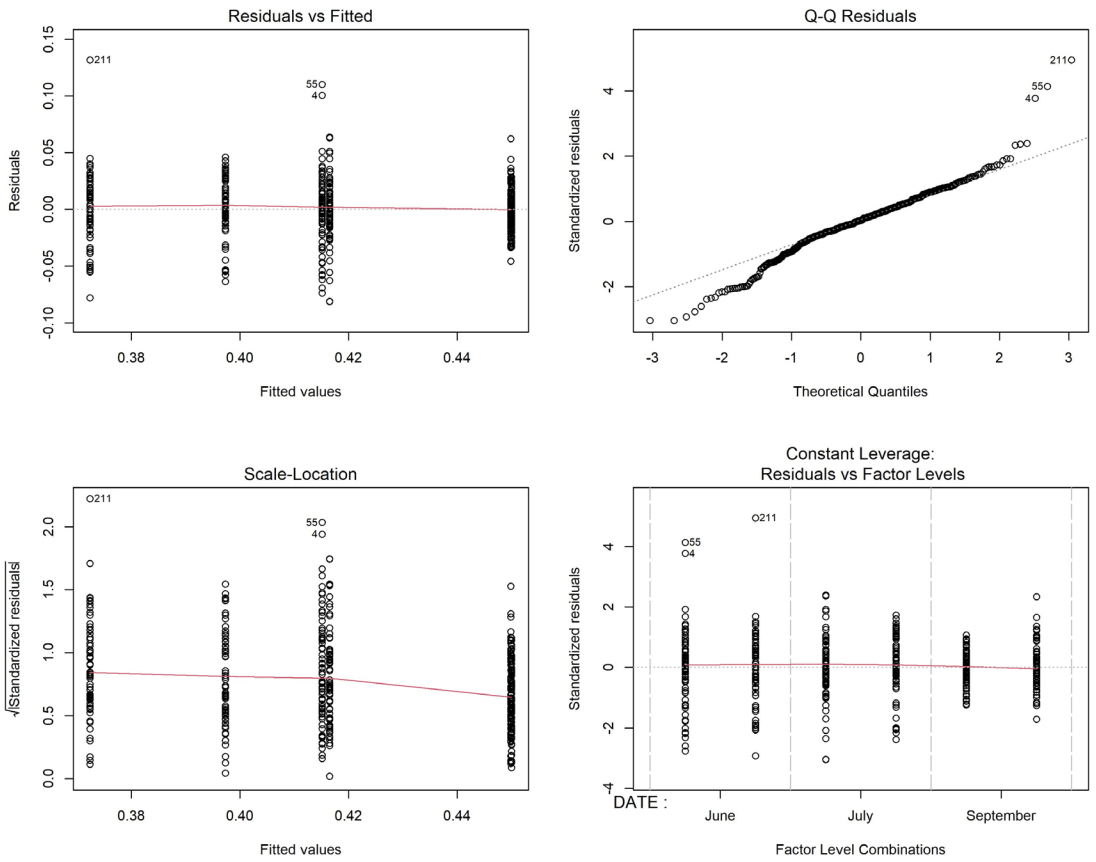


(f) FLV

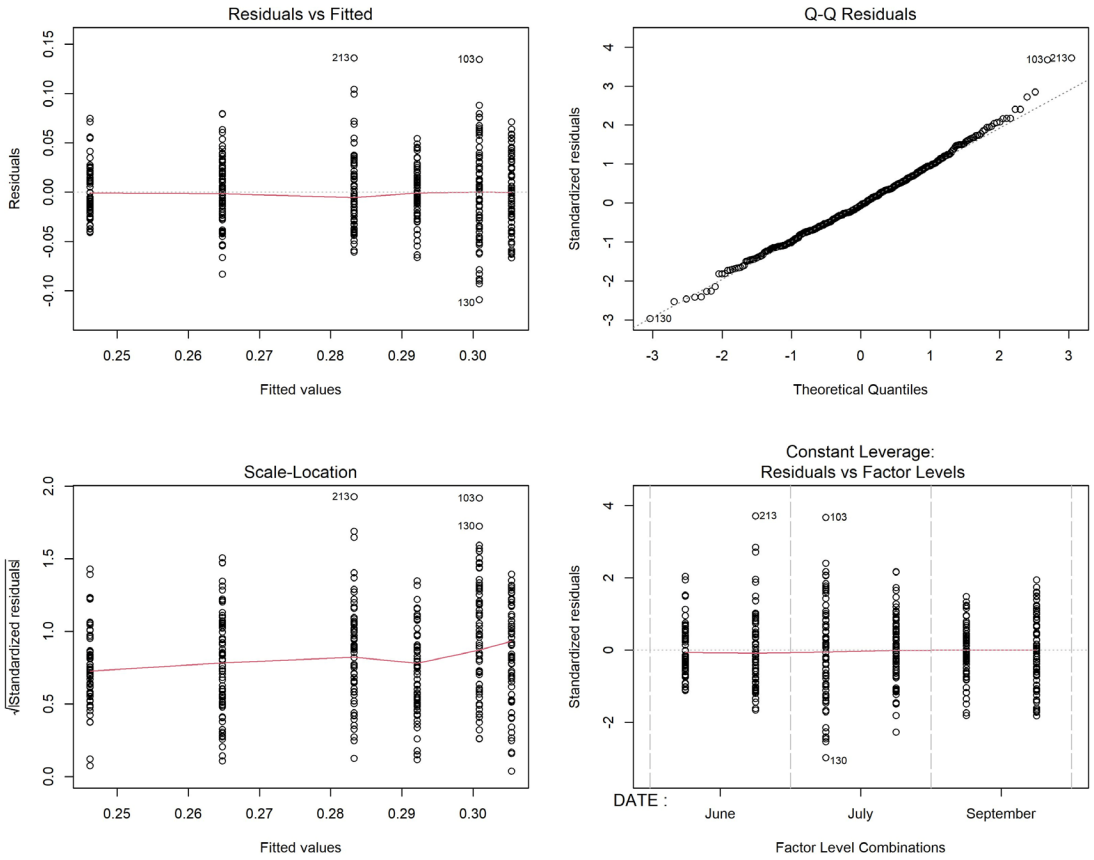
Figure S3. Within-species comparison of leaf functional traits of Quercus frainetto between the urban (UF) and natural (NF) forest stands within each sampling month, estimated through linear mixed-effects models (LMM) with tree identity as a random effect. Asterisks denote the significance of the UF–NF contrast within each month (*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; ns, not significant): (a) SLA, (b) LDMC, (c) LTH, (d) CHL, (e) ANTH, (f) FLV.


Residuals vs Fitted
Residuals
Fitted values
Q-Q Residuals
Standardized residuals
Theoretical Quantiles
Scale-Location
√|Standardized residuals|
Fitted values
Constant Leverage:
Residuals vs Factor Levels
Standardized residuals
DATE :
June
July
September
Factor Level Combinations

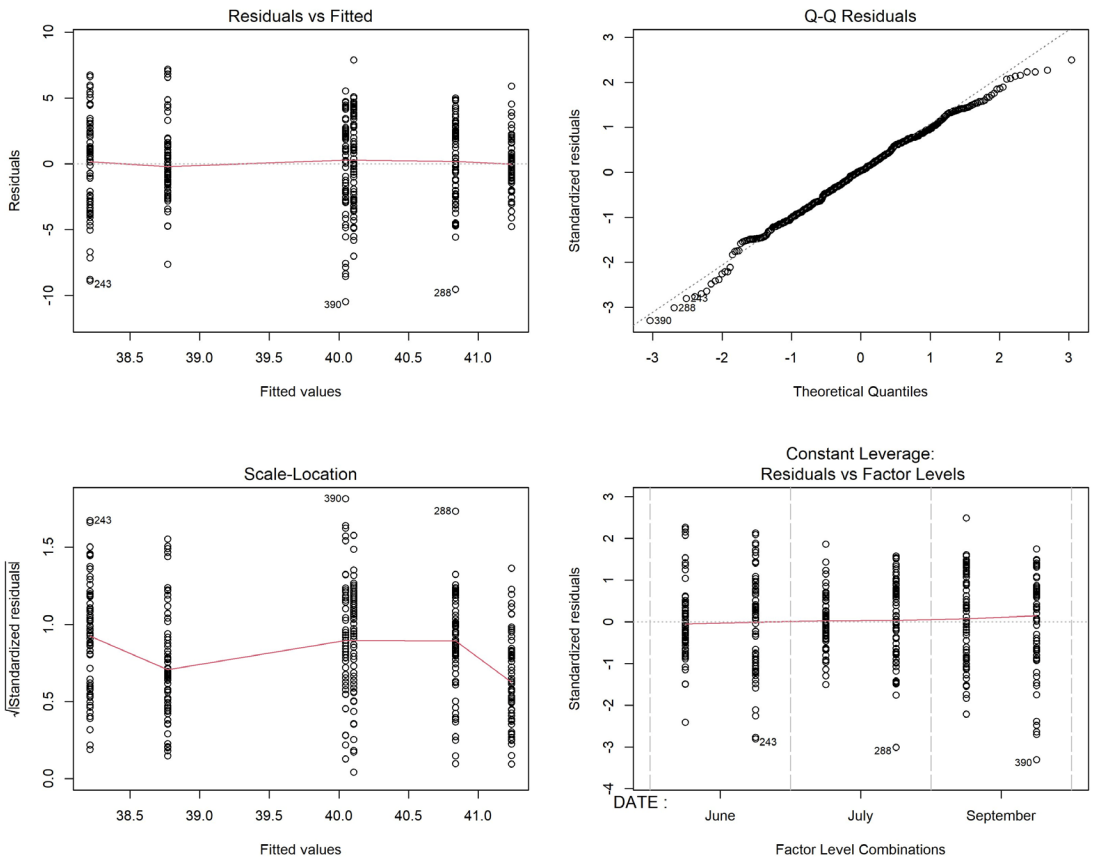
(a) SLA


Residuals vs Fitted
Residuals
Fitted values
211
55
4
Q-Q Residuals
Standardized residuals
Theoretical Quantiles
Scale-Location
√|Standardized residuals|
Constant Leverage:
Residuals vs Factor Levels
DATE :
June
July
September
Factor Level Combinations

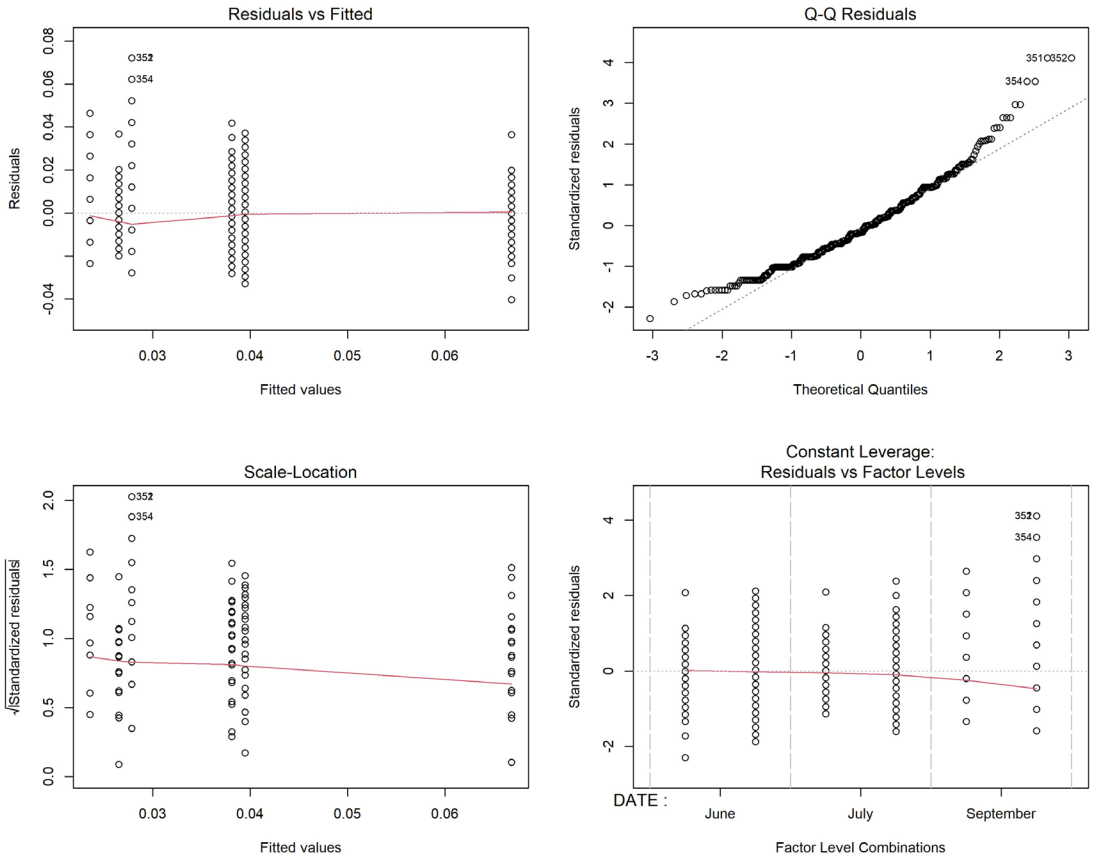
(b) LDMC


Residuals vs Fitted
Residuals
Fitted values
213
103
130
Q-Q Residuals
Standardized residuals
Theoretical Quantiles
Scale-Location
√|Standardized residuals|
Constant Leverage:
Residuals vs Factor Levels
DATE :
June
July
September
Factor Level Combinations

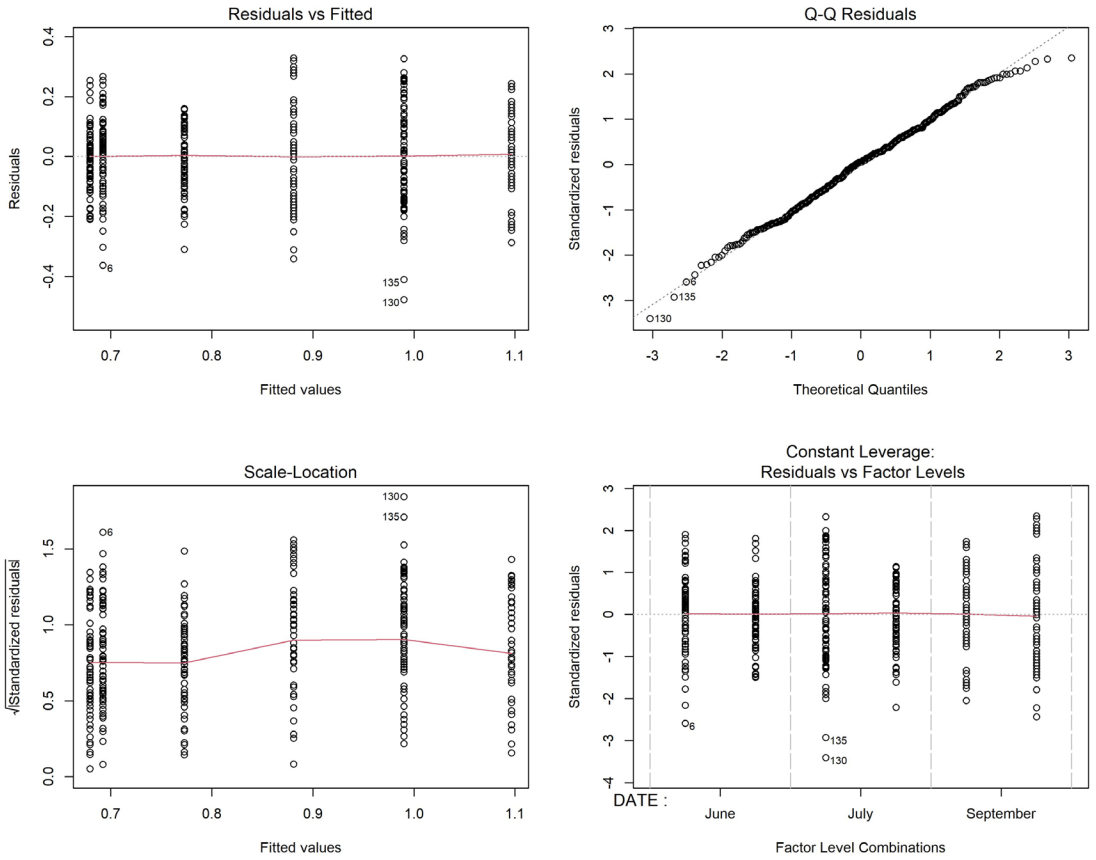
(c) LTH


Residuals vs Fitted
Residuals
Fitted values
Q-Q Residuals
Standardized residuals
Theoretical Quantiles
Scale-Location
√|Standardized residuals|
Fitted values
Constant Leverage:
Residuals vs Factor Levels
Standardized residuals
DATE :
June
July
September
Factor Level Combinations

(d) CHL


Residuals vs Fitted
Residuals
Fitted values
Q-Q Residuals
Standardized residuals
Theoretical Quantiles
Scale-Location
√|Standardized residuals|
Fitted values
Constant Leverage:
Residuals vs Factor Levels
Standardized residuals
DATE :
June
July
September
Factor Level Combinations

(e) ANTH



(f) FLV

Figure S4. Model diagnostic plots for the linear mixed-effects models of each leaf functional trait of Quercus frainetto: residuals versus fitted values, normal quantile–quantile plot of the residuals, scale–location plot, and residuals across factor levels. These plots were used to assess the assumptions of normality and homoscedasticity, which showed no severe departures: (a) SLA, (b) LDMC, (c) LTH, (d) CHL, (e) ANTH, (f) FLV.