

Bontemps, A., Davi, H., Lefèvre, F., Rozenberg, P. and Oddou-Muratorio, S. 2017. How do functional traits syndromes covary with growth and reproductive performance in a water-stressed population of *Fagus sylvatica*? - Oikos doi. 10.1111/oik.04156.

Appendix 1

Table A1. Average climate on the studied stand from 1959 to 2013 using Météo France data and downscaled for temperature, humidity and precipitation using a climate station installed on the stand since 2007 (Davi and Cailleret 2017)

	Spring	Summer	Fall	Winter	Year
Global radiation (Mj.m⁻²)	17.92	21.29	8.00	7.99	13.85
Relative humidity (%)	74.99	70.57	82.41	78.94	76.68
Precipitation (mm)	258.51	186.80	339.78	235.49	1020.59
Maximal temperature (°C)	13.21	21.62	10.07	5.10	12.55
Minimal temperature (°C)	6.83	13.31	4.05	0.00	6.09
Average temperature (°C)	10.02	17.46	7.06	2.55	9.32

Davi, H. and Cailleret, M. 2017. Assessing drought-driven mortality with a process-based model. - Agric. For. Meteorol. 232: 279–290.

Table A2. Projection of functional traits on the four axis of the PCA. For trait's codes, see

Table 1.

	PC1	PC2	PC3	PC4
PSS	-0.67	0.17	0.00	-0.12
LMA	0.61	0.44	-0.21	-0.28
LA	0.34	-0.71	-0.11	0.10
HV	-0.13	0.78	0.05	-0.05
LWC	-0.60	-0.06	0.59	0.17
Nmass	0.24	-0.27	0.63	-0.49
d13C	0.56	0.27	0.52	-0.01
WDens	0.37	0.17	0.22	0.77

Table A3. Pearson coefficients of correlation among functional traits, performance traits and covariates (significant values at the 95% confidence level are shown in bold).

r	PSS	LA	LMA	d13C	Nmass	LWC	WDens	HV	RW10M	FOtree	FObranch	FWmean	comp20
LA	-0.20												
LMA	-0.17	-0.07											
d13C	-0.26	-0.04	0.29										
Nmass	-0.08	0.13	0.03	0.17									
LWC	0.24	-0.16	-0.43	0.04	0.11								
WDens	-0.11	0.04	0.13	0.20	0	-0.08							
HV	0.07	-0.38	0.17	0.12	-0.08	0.06	0.04						
RW10M	0.18	-0.08	-0.24	-0.11	-0.05	0.29	-0.16	0.10					
FOtree	0.41	-0.29	-0.24	-0.08	0.20	0.32	-0.21	0.02	0.30				
FObranch	0.41	-0.33	-0.27	-0.23	-0.12	0.46	-0.10	0.28	0.21	0.40			
FWmean	0.39	-0.24	-0.20	-0.17	-0.08	0.49	-0.04	0.29	0.25	0.42	0.92		
comp20	-0.21	0.17	0.34	0.09	-0.08	-0.32	0.04	-0.01	-0.54	-0.46	-0.21	-0.22	
Height	0.16	-0.21	-0.08	0.23	0.06	0.10	-0.18	0.30	0.29	0.11	0.02	-0.07	-0.26

Table A4. Spatial autocorrelation of the four axis of the PCA. D_{tresh} is the distance up to which between-individuals similarity of PCx is higher than expected by chance, and Slope is the slope of the regression between PCx similarity and distance.

Axis	n	D_{tresh} (m)	Slope
PC1	147	25	-0.11
PC2	147	30	-0.06
PC3	147	5	-0.04
PC4	147		NS

Table A5. Detailed results of multiple regression analyses of RW10M against functional traits with the full model (variable selection performed with step procedure in R).

Significant effects (p-value <0.05) are underlined in yellow, and marginal effects are underline in grey (p-value <0.10), with their estimate (Est), standard error (SE), t-value and associated p-value. Note that the values reported here differ from those in Table 4 because 1) here, the best model and the corresponding p-values were fitted on the log-transformed and scaled functional traits and 2) in Table 4, the coefficients of interest were estimated by fitting the best model on the scaled function traits. Variance inflation factors (vif) were estimated using the R package CAR*

	Est	SE	t-value	p-value	vif
(Intercept)	-1.03	0.70	-1.483	0.142	-
D13C	-0.09	0.05	-1.724	0.089	1.99
N	-0.03	0.05	-0.718	0.475	1.61
LWC	0.03	0.05	0.553	0.582	1.95
PSS	0.06	0.05	1.321	0.191	1.77
LA	0.05	0.06	0.849	0.398	2.46
HV	0.14	0.04	3.138	0.002	1.56
WDens	-0.03	0.07	-0.480	0.632	3.38
Comp20	-0.16	0.06	-2.827	0.006	2.64
D13C²	-0.08	0.04	-2.217	0.030	2.05
N²	-0.10	0.03	-2.818	0.006	2.07
LWC²	-0.03	0.02	-1.510	0.135	1.81
PSS²	-0.06	0.05	-1.405	0.164	2.18
LA²	-0.07	0.04	-1.759	0.083	2.70
dbh	0.77	0.23	3.378	0.001	2.64
D13C:PSS	-0.10	0.05	-1.995	0.050	2.61
D13C:LA	-0.10	0.04	-2.313	0.024	2.06
D13C:WDens	0.14	0.08	1.679	0.097	4.59
N:PSS	0.10	0.05	2.111	0.038	1.53
N:LA	0.10	0.06	1.587	0.117	2.47
N:WDens	0.17	0.08	2.047	0.044	2.16
LWC:WDens	-0.29	0.11	-2.692	0.009	2.70
PSS:LA	-0.11	0.05	-2.065	0.042	2.91
PSS:HV	0.12	0.06	1.952	0.055	1.88
PSS:WDens	0.23	0.07	3.128	0.003	1.95
LA:WDens	-0.24	0.11	-2.189	0.032	3.03
HV:WDens	-0.38	0.12	-3.140	0.002	4.22
WDens:Comp20	-0.10	0.07	-1.360	0.178	2.34

Adjusted R-squared: 0.53 For: 74 DF

* John Fox and Sanford Weisberg (2011). An {R} Companion to Applied Regression. Second Edition. Thousand Oaks CA: Sage. URL: <http://socserv.socsci.mcmaster.ca/jfox/Books/Companion>

Table A6. Detailed results of multiple regression analyses of FO_{tree} against functional traits with the full model (variable selection performed with step procedure in R).

Significant effects (p-value <0.05) are underlined in yellow, and marginal effects are underline in grey (p-value <0.10), with their estimate (Est), standard error (SE), t-value and associated p-value. Note that the values reported here differ from those in Table 4 because 1) here, the best model and the corresponding p-values were fitted on the log-transformed and scaled functional traits and 2) in Table 4, the coefficients of interest were estimated by fitting the best model on the scaled function traits. Variance inflation factors (vif) were estimated using the R package CAR*

	Est	SE	t-value	p-value	vif
(Intercept)	1.10	0.06	17.395	0.000	-
D13C	0.01	0.04	0.232	0.817	1.73
LMA	0.03	0.05	0.636	0.527	2.84
N	0.09	0.04	2.361	0.021	1.37
LWC	0.08	0.05	1.468	0.146	2.62
PSS	0.18	0.04	4.147	0.000	1.74
LA	-0.04	0.04	-0.962	0.339	1.94
HV	0.00	0.05	0.107	0.915	1.99
WDens	-0.05	0.05	-1.009	0.316	2.22
Comp20	-0.16	0.04	-3.632	0.001	1.85
D13C²	-0.03	0.03	-0.823	0.413	2.22
LMA²	0.06	0.03	1.782	0.079	2.63
LWC²	-0.04	0.02	-2.030	0.046	2.71
PSS²	-0.08	0.04	-2.080	0.041	1.95
LA²	-0.07	0.04	-1.792	0.077	3.00
D13C:LMA	0.09	0.04	1.937	0.057	2.43
D13C:LWC	0.08	0.05	1.449	0.152	3.46
D13C:LA	0.10	0.04	2.678	0.009	2.28
D13C:HV	-0.12	0.06	-2.082	0.041	2.62
LMA:LA	-0.11	0.04	-2.726	0.008	1.92
LMA:Comp20	-0.10	0.06	-1.701	0.093	2.32
N:LWC	-0.08	0.05	-1.428	0.158	1.48
LWC:PSS	0.09	0.05	1.679	0.097	2.29
LWC:LA	-0.12	0.05	-2.259	0.027	2.43
LWC:HV	-0.10	0.06	-1.854	0.068	2.06
PSS:Comp20	0.06	0.04	1.566	0.122	1.78
LA:HV	-0.09	0.04	-2.036	0.045	2.14
LA:Comp20	0.11	0.04	2.577	0.012	2.14
WDens:Comp20	0.09	0.07	1.282	0.204	2.33
Adjusted R-squared:	0.50 For: 73 DF				

Table A7. Detailed results of multiple regression analyses of FO_{branch} against functional traits with the full model (variable selection performed with step procedure in R).

Significant effects (p-value <0.05) are underlined in yellow, and marginal effects are underline in grey (p-value <0.10), with their estimate (Est), standard error (SE), t-value and associated p-value. Note that the values reported here differ from those in Table 4 because 1) here, the best model and the corresponding p-values were fitted on the log-transformed and scaled functional traits and 2) in Table 4, the coefficients of interest were estimated by fitting the best model on the scaled function traits. Variance inflation factors (vif) were estimated using the R package CAR*

	Est	SE	t-value	p-value	vif
(Intercept)	1.27	0.10	12.684	0.000	-
D13C	-0.17	0.07	-2.574	0.012	1.86
LMA	-0.09	0.07	-1.258	0.213	2.20
N	-0.05	0.07	-0.748	0.457	1.87
LWC	0.31	0.08	4.010	0.000	2.59
PSS	0.15	0.06	2.419	0.018	1.71
LA	0.04	0.07	0.576	0.566	2.07
HV	0.35	0.08	4.355	0.000	2.90
WDens	-0.05	0.10	-0.526	0.601	4.24
Comp20	0.10	0.06	1.586	0.117	1.74
LWC²	-0.08	0.03	-2.660	0.010	2.87
PSS²	-0.15	0.06	-2.549	0.013	2.06
LA²	-0.17	0.05	-3.170	0.002	2.55
HV²	-0.08	0.05	-1.641	0.105	5.10
WDens²	0.03	0.02	2.024	0.047	4.37
D13C:LMA	0.09	0.06	1.572	0.120	1.92
D13C:LWC	0.19	0.08	2.401	0.019	3.54
D13C:PSS	-0.22	0.07	-3.106	0.003	2.89
D13C:LA	0.06	0.06	1.002	0.320	2.46
LMA:LA	-0.10	0.06	-1.689	0.096	1.89
LMA:HV	-0.15	0.07	-2.138	0.036	1.92
N:LWC	-0.25	0.09	-2.841	0.006	1.96
N:LA	0.08	0.07	1.146	0.256	1.73
N:HV	-0.19	0.07	-2.508	0.014	1.52
N:WDens	0.18	0.11	1.639	0.106	1.98
N:Comp20	-0.10	0.09	-1.114	0.269	1.95
LWC:PSS	0.24	0.08	3.147	0.002	2.06
LWC:LA	-0.14	0.07	-1.985	0.051	2.11
PSS:WDens	0.15	0.10	1.559	0.124	1.89
LA:HV	-0.06	0.08	-0.797	0.428	2.83
WDens:Comp20	0.13	0.10	1.239	0.220	2.63
Adjusted R-squared:	0.55 For: 71 DF				

Table A8. Detailed results of multiple regression analyses of FW_{mean} against functional traits with the full model (variable selection performed with step procedure in R).

Significant effects (p-value <0.05) are underlined in yellow, and marginal effects are underline in grey (p-value <0.10), with their estimate (Est), standard error (SE), t-value and associated p-value. Note that the values reported here differ from those in Table 4 because 1) here, the best model and the corresponding p-values were fitted on the log-transformed and scaled functional traits and 2) in Table 4, the coefficients of interest were estimated by fitting the best model on the scaled function traits. Variance inflation factors (vif) were estimated using the R package CAR*

	Est	SE	t-value	p-value	vif
(Intercept)	1.24	0.11	11.212	0.000	-
D13C	-0.14	0.07	-2.081	0.041	1.78
LMA	0.06	0.08	0.803	0.424	2.40
N	-0.06	0.07	-0.957	0.342	1.70
LWC	0.45	0.08	5.462	0.000	2.46
PSS	0.13	0.07	2.001	0.049	1.67
LA	0.04	0.07	0.594	0.555	1.95
HV	0.36	0.09	4.071	0.000	2.94
WDens	-0.12	0.10	-1.149	0.254	3.96
Comp20	0.07	0.07	1.132	0.261	1.63
LWC²	-0.08	0.03	-3.041	0.003	1.78
PSS²	-0.12	0.07	-1.760	0.083	2.23
LA²	-0.09	0.05	-1.873	0.065	1.81
HV²	-0.09	0.05	-1.888	0.063	4.74
WDens²	0.05	0.02	2.115	0.038	8.41
D13C:PSS	-0.11	0.06	-1.767	0.081	2.09
D13C:HV	-0.09	0.09	-1.049	0.298	2.26
LMA:Comp20	-0.18	0.08	-2.339	0.022	1.59
N:LWC	-0.13	0.08	-1.617	0.110	1.25
N:LA	0.05	0.07	0.660	0.512	1.56
N:WDens	0.16	0.12	1.369	0.175	2.01
LWC:PSS	0.16	0.08	1.983	0.051	2.05
LWC:WDens	-0.24	0.15	-1.637	0.106	2.31
LWC:Comp20	-0.20	0.08	-2.441	0.017	1.74
PSS:WDens	0.22	0.11	2.008	0.048	2.05
PSS:Comp20	0.12	0.06	2.024	0.047	1.77
LA:HV	-0.16	0.08	-1.964	0.053	2.89
HV:WDens	-0.24	0.17	-1.387	0.170	3.97
Adjusted R-squared:	0.52	For: 74 DF			

: supplementary figures for the manuscript:

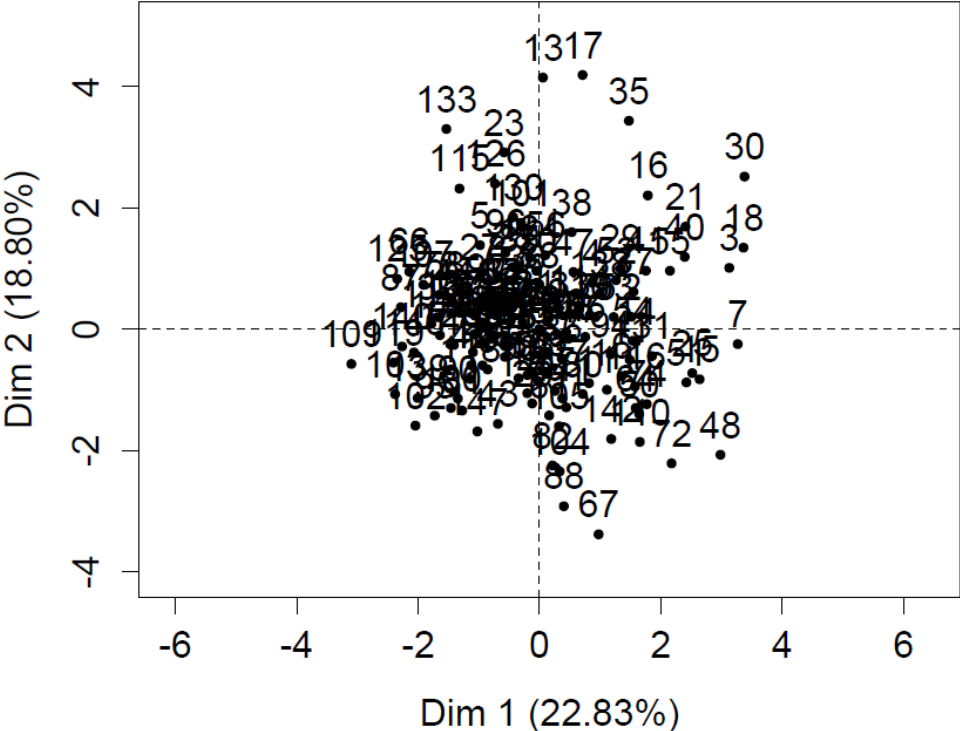
How do functional traits syndromes covary with growth and reproductive performance in a water-stressed population of *Fagus sylvatica* ?

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Appendix 2

Figure A1. Projection of individual tree on the principal components plotted in Fig. 2 of the main manuscript. The first and second axes (A) and the third and four axes (B) are plotted.

A



B

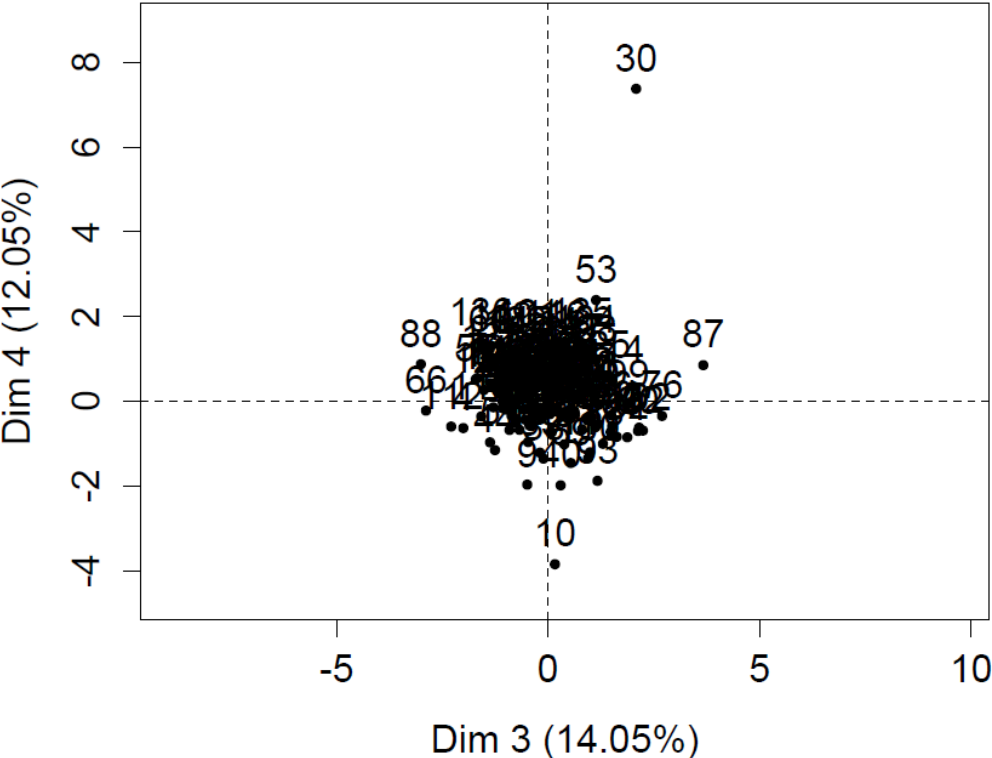


Figure A2. Correlation coefficients (r) between individual competition intensity (as measured by the Martin-Ek index) at a given distance (in m) and the 4 principal component of the PCA in the studied population. Competition intensity was estimated considering the potential competitors within a circle with radius ranging from 1 m to 20 m with a 1 m step. Stars indicate correlation coefficients significantly higher or lower than expected at 95% confidence level.

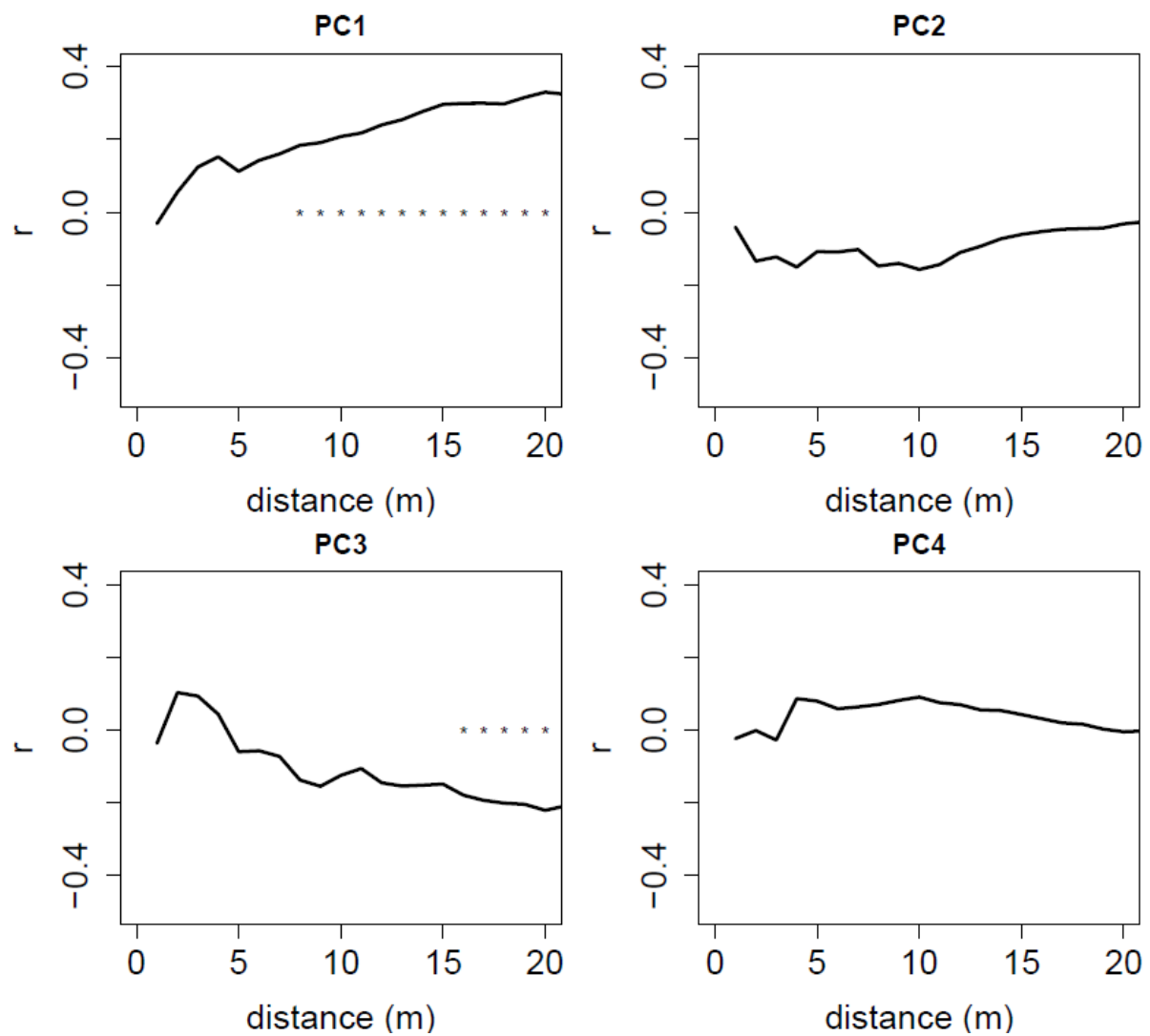
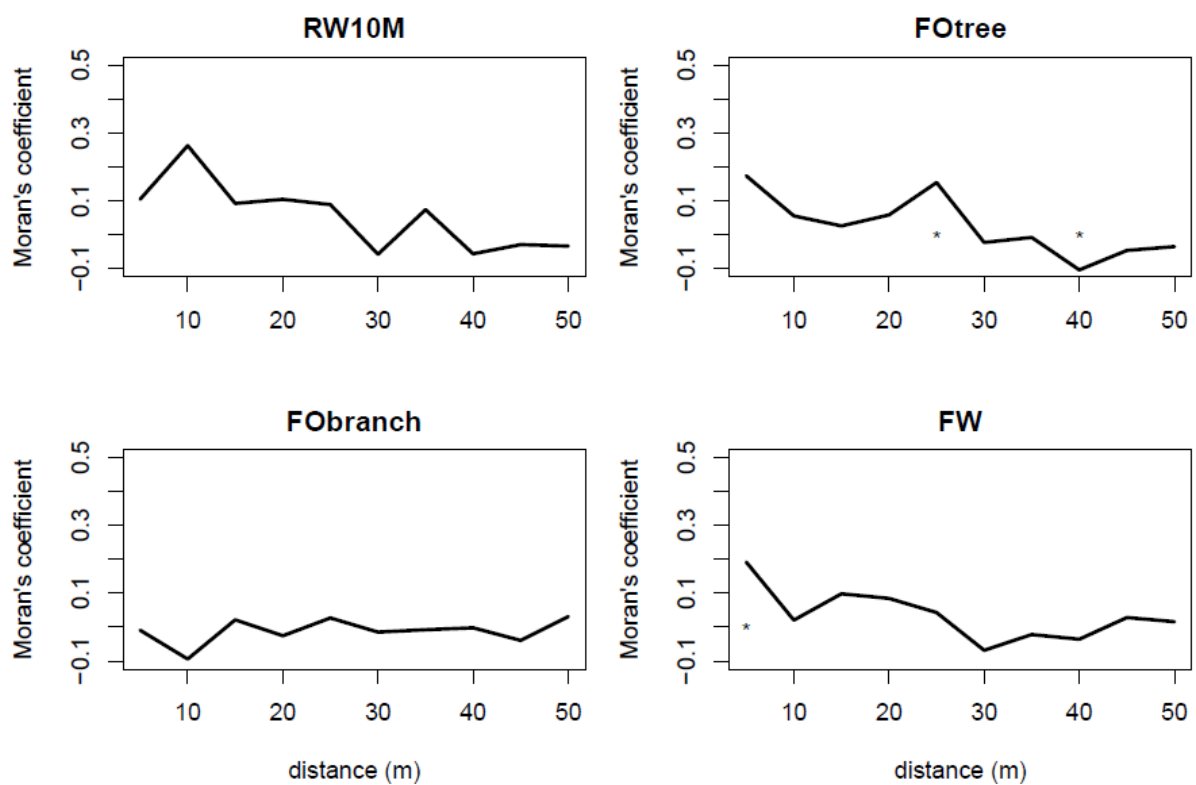
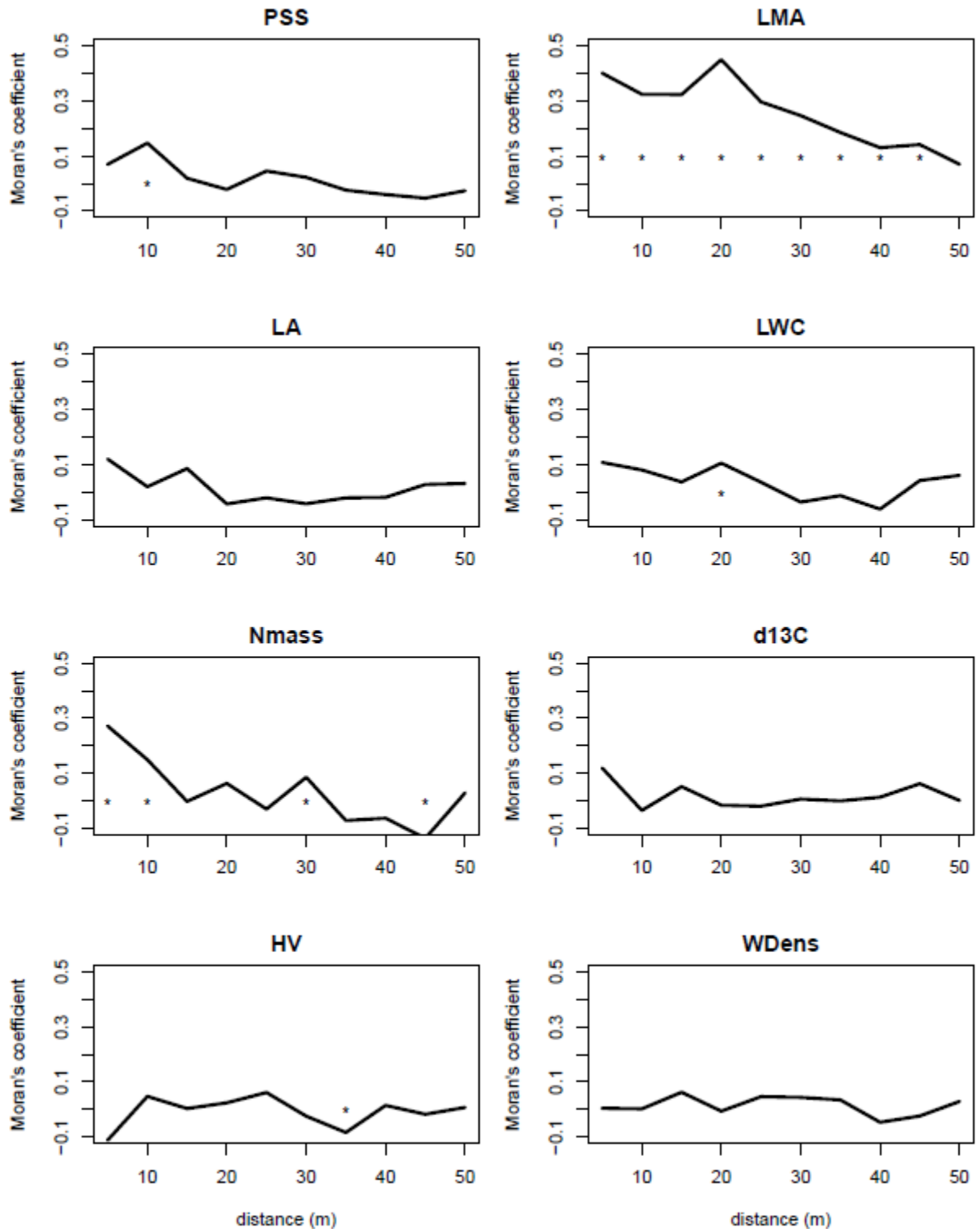


Figure A3. Spatial autocorrelation of (A) the four studied performance traits, (B) the eight studied functional traits and, (C) the 4 principal component of the PCA (see Fig. 2 in main manuscript). On each plot, average Moran's coefficient within 5m-distance class are plotted against the distance between individuals. Stars indicate Moran's coefficient significantly higher or lower than expected under complete spatial randomness.

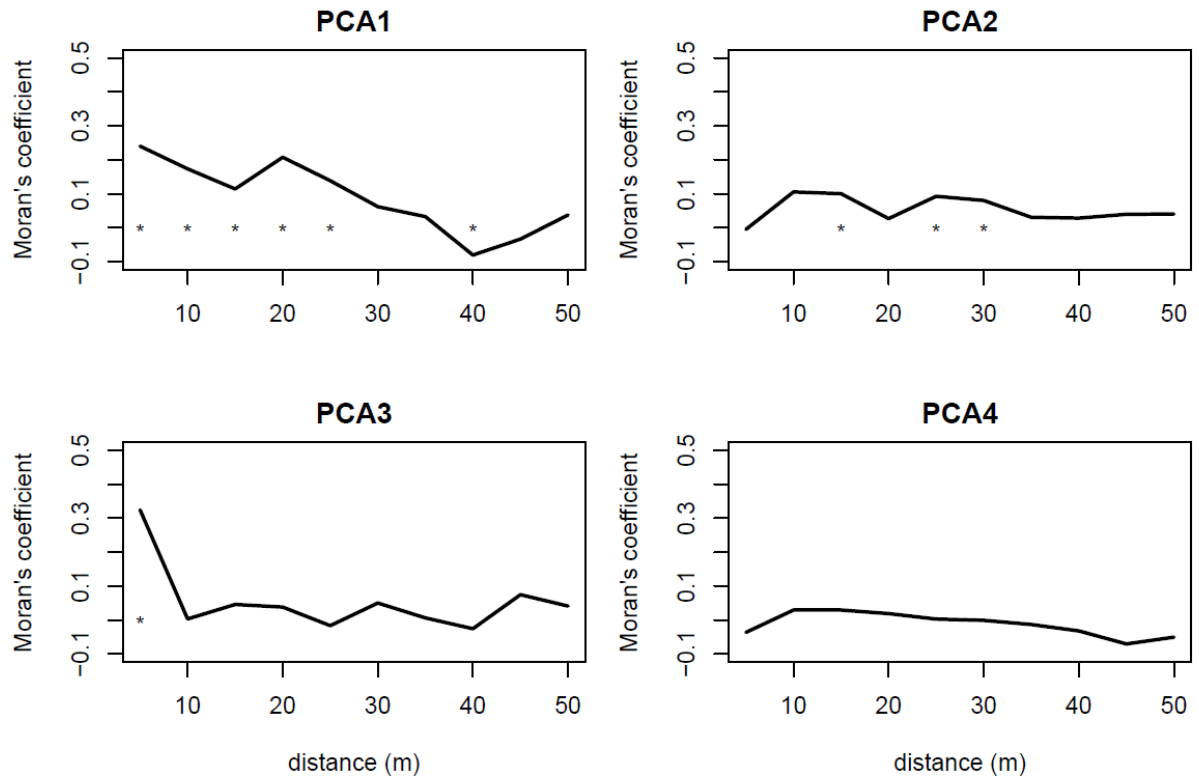
(A)



(B)



(C)



Appendix 3

Detail phenotypic selection analyses on functional traits

Objective

This appendix provides results of phenotypic selection analyses on functional traits, performed using univariate and multivariate regression analyses of performance traits against the set of all functional traits. Methodology is detailed, and all the selection gradients (including the non-significant values) are provided in Table A3:1 and A3:2.

Material and methods

Univariate regressions: for a functional trait i , we estimated the univariate selection gradient σ_i for functional trait X_i through the following model:

$$P = \alpha + \sigma_i X_i + \theta_1 \text{Comp}_{20} + \theta_2 \text{dbh} + \epsilon \quad (\text{A1})$$

Where P is the performance trait, α is the origin of the regression, θ_1 and θ_2 the effect of Comp_{20} and dbh , and ϵ the residual.

Multivariate regressions: for two functional traits i and j , we considered two models. Model 1 only included directional selection gradients on functional trait X_i as follows:

$$P = \alpha + \sum_i \beta_i X_i + \theta_1 \text{Comp}_{20} + \theta_2 \text{dbh} + \epsilon \quad (\text{A2})$$

Model 2 included in addition correlational and quadratic selection gradients as follows:

$$P = \alpha + \sum_i \beta_i X_i + \sum_i \gamma_i X_i^2 + \sum_i \sum_j \beta_{ij} X_i X_j + \theta_1 \text{Comp}_{20} + \theta_2 \text{dbh} + \epsilon \quad (\text{A3})$$

Where β_{ij} are the correlational selection gradients involving interaction effect between trait X_i and trait X_j , γ_i the quadratic selection gradient on functional trait X_i . Interactions between competition and traits were also included in the models, in order to account for a potential change in relationships between traits and performance depending on the level of competition. Model 1 aimed to estimate the directional selection gradients (without the impact of second order coefficients, as advised in Lande and Arnold 1983), while Model 2 aimed to characterise

the potential complexity of the selection surface.

For the sake of simplicity, results reported in the main manuscript are those derived for the multivariate model 2.

Results

Selection gradients on functional traits for growth performance

First, univariate selection gradients were estimated for each trait (Table A3:1). We found that only two traits were significantly associated to RW10M, with high RW10M obtained with low LMA values ($\sigma_{LMA}=-0.13$, $p_{val}<0.01$) and high HV values ($\sigma_{HV}=0.10$, $p_{val}<0.05$). Secondly, using a linear multivariate model without interactions (adjusted $R^2=0.42$, $DF=97$), we found only one significant directional selection gradient for HV ($\beta_{HV}=0.11$, $p_{val}=0.01$, Table A3:1). Finally, the full multivariate model, including quadratic and correlational selection gradients (Table A3:2), revealed that all traits, but LMA, were associated to fitness either directly or in interaction with the other traits. First, negative quadratic selection gradients ($\gamma_{LA}=-0.14$, $p_{val}=0.05$, $\gamma_{N_{mass}}=-0.19$, $p_{val}=0.009$; $\gamma_{\delta 13C}=-0.16$, $p_{val}=0.03$) suggested optimal LA, N_{mass} and $\delta 13C$ values maximising RW10M. Secondly, significant directional selection gradients were detected for HV ($\beta_{HV}=0.14$, $p_{val}=0.003$). Finally, we found significant interaction effects between pairs of functional traits on growth performance. PSS was found interacting with several traits and thus, high (respectively low) PSS together with low (high) LA, high (low) HV, high (low) N_{mass} and high (low) W_{dens} were associated to high RW10M ($\beta_{PSS-LA}=-0.11$, $p_{val}=0.03$, $\beta_{PSS-HV}=0.12$, $p_{val}=0.05$, $\beta_{PSS-N_{mass}}=0.10$, $p_{val}=0.03$, $\beta_{PSS-W_{dens}}=0.23$, $p_{val}<0.001$). Lastly, high (respectively low) W_{dens} together with low (high) HV, low (high) LWC, low (high) LA and high (low) N_{mass} was associated to high RW10M ($\beta_{HV-W_{dens}}=-0.38$, $p_{val}<0.001$; $\beta_{LWC-W_{dens}}=-0.29$, $p_{val}=0.003$; $\beta_{LA-W_{dens}}=-0.24$, $p_{val}=0.01$, $\beta_{N_{mass}-W_{dens}}=0.17$, $p_{val}=0.03$). Fitness surfaces were strongly hump-shaped when quadratic selection was significant (Fig.4A), or were more saddle-shaped when only correlational selection was present (Fig.4B).

Selection gradients on functional traits for reproductive performance

Univariate and multivariate selection gradients were estimated for the proxies of reproductive performance (Table A3:1): the relative fruit number at tree level (FO_{tree}), the total fruit number (FO_{branch}) and the mean fruit weight (FW_{mean}) at branch level.

First regarding univariate selection gradients, we found that numerous traits were related to reproductive traits (Table A3:1). Moreover, the sign of the relationships were consistent among FOtree, FObranch and SWmean and this mostly showed that traits values favouring carbon uptake increased reproductive output. Linear multivariate models confirmed this association (Table 2B). High FOtree were associated to high PSS, low LA and high Nmass ($\beta_{PSS}=0.14$, $p_{val}<0.001$; $\beta_{LA}=-0.08$, $p_{val}<0.05$; $\beta_{Nmass}=0.10$, $p_{val}<0.01$); high FObranch were associated to high PSS, high HV, high LWC and low D13C ($\beta_{PSS}=0.14$, $p_{val}<0.001$; $\beta_{HV}=0.20$, $p_{val}<0.001$; $\beta_{LWC}=0.29$, $p_{val}<0.001$; $\beta_{\delta 13C}=-0.15$, $p_{val}<0.05$); High SWmean were associated to high PSS, high HV and high LWC ($\beta_{PSS}=0.16$, $p_{val}=0.01$; $\beta_{HV}=0.21$, $p_{val}<0.001$; $\beta_{LWC}=0.32$, $p_{val}<0.001$).

On the other hand, the full multivariate model revealed that the selection surface for all three reproductive traits was strongly departing from simple linear relationships, with several significant quadratic and correlational parameters estimated (Table A3:2). First regarding FOtree, negative quadratic selection gradients ($\gamma_{PSS}=-0.16$, $p_{val}=0.03$; $\gamma_{LA}=-0.14$, $p_{val}=0.04$) suggested optimum PSS and LA values maximising FOtree. Significant interaction effects between seven pairs of traits were detected: e.g. high (respectively low) HV together with low (high) 400 d13C, low (high) LWC or low (high) LA was associated to high FOtree ($\beta_{HV-\delta 13C}=-0.12$, $p_{val}=0.009$; $\beta_{HV-LWC}=-0.10$, $p_{val}=0.03$; $\beta_{HV-LA}=-0.09$, $p_{val}=0.02$). High (respectively low) LA together with low (high) LMA, low (high) LWC, or high (low) d13C was associated to high FOtree ($\beta_{LA-LMA}=-0.11$, $p_{val}=0.004$, $\beta_{LA-LWC}=0.12$, $p_{val}=0.04$; $\beta_{LA-\delta 13C}=0.10$, $p_{val}=0.02$). Lastly, high (respectively low) LMA together with high (low) d13C was associated to high FOtree ($\beta_{LMA-\delta 13C}=0.08$, $p_{val}=0.04$).

Regarding FObranch, the negative quadratic parameters estimated for ($\gamma_{PSS}=-0.30$, $p_{val}=0.01$; $\gamma_{LA}=-0.34$, $p_{val}=0.002$; $\gamma_{LWC}=-0.16$, $p_{val}=0.02$) suggested optimum PSS, LA and LWC values maximising FObranch. Significant interaction effects between five pairs of traits were detected e.g. high (respectively low) Nmass together with low (high) 409 LWC, low (high) HV was associated to high FObranch ($\beta_{LWC-Nmass}=-0.25$, $p_{val}=0.005$, $\beta_{Nmass-HV}=-0.19$, $p_{val}=0.04$). Moreover, high (respectively low) PSS together low (high) with d13C and high (low) LWC was associated to high FObranch ($\beta_{PSS-d13C}=-0.22$, $p_{val}=0.007$, $\beta_{PSS-LWC}=0.24$, $p_{val}=0.004$). Lastly, high (respectively low) LMA together with low (high) HV was associated to high FObranch ($\beta_{LMA-HV}=-0.15$, $p_{val}=0.03$). Here, directional, quadratic and correlational coefficients

were of the same order of magnitude, the corresponding fitness surface was slightly humped and a sharp fitness drop was observed for low PSS and high LWC values (e.g. Fig 4C).

Finally, regarding FW_{mean} , the negative quadratic parameter ($\gamma_{\text{PSS}}=-0.24$, $p_{\text{val}}=0.05$; $\gamma_{\text{HV}}=-0.18$, $p_{\text{val}}=0.03$; $\gamma_{\text{LWC}}=-0.16$, $p_{\text{val}}=0.001$) suggested optimum PSS, HV, LWC values maximizing FW_{mean} , while the positive quadratic parameter ($\gamma_{\text{Wdens}}=0.10$, $p_{\text{val}}=0.04$) suggested extreme low and high Wdens values maximizing FW_{mean} . A relatively low number of interactions were detected for FW_{mean} e.g. high (respectively) low PSS together with high (low) LWC and high (low) Wdens ($\beta_{\text{PSS-LWC}}=0.16$, $p_{\text{val}}=0.04$; $\beta_{\text{PSS-Wdens}}=0.22$, $p_{\text{val}}=0.03$). As for RW10M, when the interaction effects were as strong as or stronger than the main (linear or quadratic) effects of the same traits, the fitness surfaces for FW_{mean} showed several peaks (e.g. Fig 4D).

Table A3:1. Phenotypic selection analyses through regressions of growth (RWmean) and reproductive performance (FO_{tree}, FO_{branch} and FW_{mean}) against functional traits (see Tabl1 1 for trait codes). Selection differentials (σ_i) were estimated with the univariate model (Eq. A1) while directional (β_i) selection gradients estimated with the multivariate model 1 (Eq. A2). Significant values are reported in red, and non-significant in black, with the estimate given on the left side and the standard error on the right side.

Funct. Trait	RWmean		FO _{tree}		FO _{branch}		FW _{mean}	
	σ_i	β_i	σ_i	β_i	σ_i	β_i	σ_i	β_i
PSS			0.10 ± 0.04 ***	0.14 ± 0.04 ***	0.30 ± 0.07 ***	0.17 ± 0.06 **	0.30 ± 0.07 ***	0.16 ± 0.06 *
LMA	-0.13 ± 0.05 **		-0.11 ± 0.04 **		-0.19 ± 0.07 **		-0.15 ± 0.07 *	
LA			-0.13 ± 0.04 **	-0.08 ± 0.04 *	-0.23 ± 0.07 ***		-0.18 ± 0.07 *	
HV	0.10 ± 0.05 *	0.11 ± 0.05 *			0.20 ± 0.07 **	0.20 ± 0.06 ***	0.22 ± 0.07 **	0.21 ± 0.06 ***
LWC			0.15 ± 0.04 ***		0.33 ± 0.06 ***	0.29 ± 0.06 ***	0.37 ± 0.07 ***	0.32 ± 0.06 ***
N _{mass}			0.09 ± 0.04 *	0.10 ± 0.04 **				
d13C					-1.17 ± 0.07 *	-0.15 ± 0.06 *		
Wdens			-0.10 ± 0.04*					
R2	0.39, 97 DF		0.37, 96 DF		0.39, 97 DF		0.38, 97 DF	

Table A3:2. Phenotypic selection analyses through regressions of growth (RWmean) and reproductive performance (FO_{tree}, FO_{branch} and FW_{mean}) against functional traits (see Tab11 1 for trait codes). Directional (β_i), correlational (β_{ij}) as well as quadratic (γ_i) selection gradients fitted with the multivariate model 2 (Eq. A3) are reported. Significant values are reported in red, and non-significant in black, with the estimate given on the left side and the standard error on the right side.

Funct. Trait	RWmean		FO _{tree}		FO _{branch}		FW _{mean}	
	β_i (β_{ij})	γ_i	β_i (β_{ij})	γ_i	β_i (β_{ij})	γ_i	β_i (β_{ij})	γ_i
PSS			0.18 ± 0.04	-0.16 ± 0.08	0.15 ± 0.06	-0.30 ± 0.12	0.13 ± 0.07	-0.24 ± 0.13
LMA								
LA		-0.14 ± 0.08		-0.14 ± 0.08		-0.34 ± 0.11		
HV	0.14 ± 0.04				0.35 ± 0.08		0.36 ± 0.09	-0.18 ± 0.10
LWC					0.31 ± 0.08	-0.16 ± 0.06	0.45 ± 0.08	-0.16 ± 0.05
N _{mass}		-0.19 ± 0.07	0.09 ± 0.04					
d13C		-0.16 ± 0.07			-0.17 ± 0.07		-0.14 ± 0.07	
WDens								0.10 ± 0.05
PSS:LMA								
PSS:LA	-0.11 ± 0.05							
PSS:HV	0.12 ± 0.06							
PSS:LWC					0.24 ± 0.08		0.16 ± 0.08	
PSS: N _{mass}	0.1 ± 0.05							
PSS: d13C	-0.1 ± 0.05				-0.22 ± 0.07			
PSS: WDens	0.23 ± 0.07						0.22 ± 0.11	
LMA:LA			-0.11 ± 0.04					

LMA:HV			-0.15 ± 0.07	
LMA:LWC				
LMA: N _{mass}				
LMA: d13C				
LMA: WDens				
LA:HV		-0.09 ± 0.04		
LA:LWC		-0.12 ± 0.05	-0.14 ± 0.07	
LA: N _{mass}				
LA: d13C	-0.1 ± 0.04	0.10 ± 0.04		
LA: WDens	-0.24 ± 0.11			
HV:LWC				
HV: N _{mass}			-0.19 ± 0.07	
HV: d13C		-0.12 ± 0.06		
HV: WDens	-0.38 ± 0.12			
LWC: N _{mass}			-0.25 ± 0.09	
LWC: d13C			0.19 ± 0.08	
LWC: WDens	-0.29 ± 0.11			
N _{mass} : d13C				
N _{mass} : WDens	0.17 ± 0.08			
Adjusted R ²	0.53	0.50	0.55	0.52
DF	74	73	71	74