

Figure S2. Evolutionary distinctiveness of birch (million years) vs tree species richness in the plots per plot composition type (dot colour). The number associated with the dots represent the number of trees sampled.

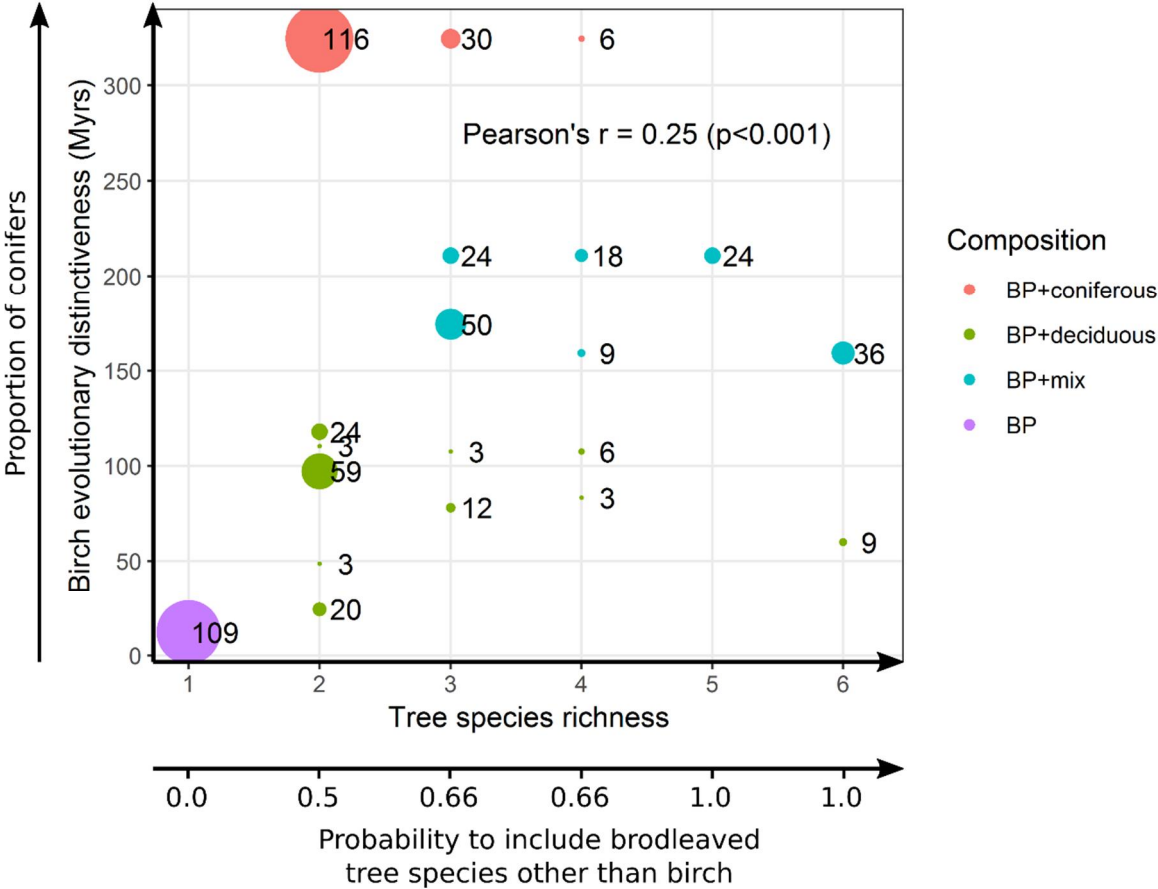


Figure S3. (a) Mean annual temperature (°C) (a) vs mean annual cumulated rainfall (mm) and (b) vs latitude (decimal degrees) at experimental sites. Climatic data is derived from the CHELSA database (<http://chelsa-climate.org/>) and corresponds to 1979-2013 average.

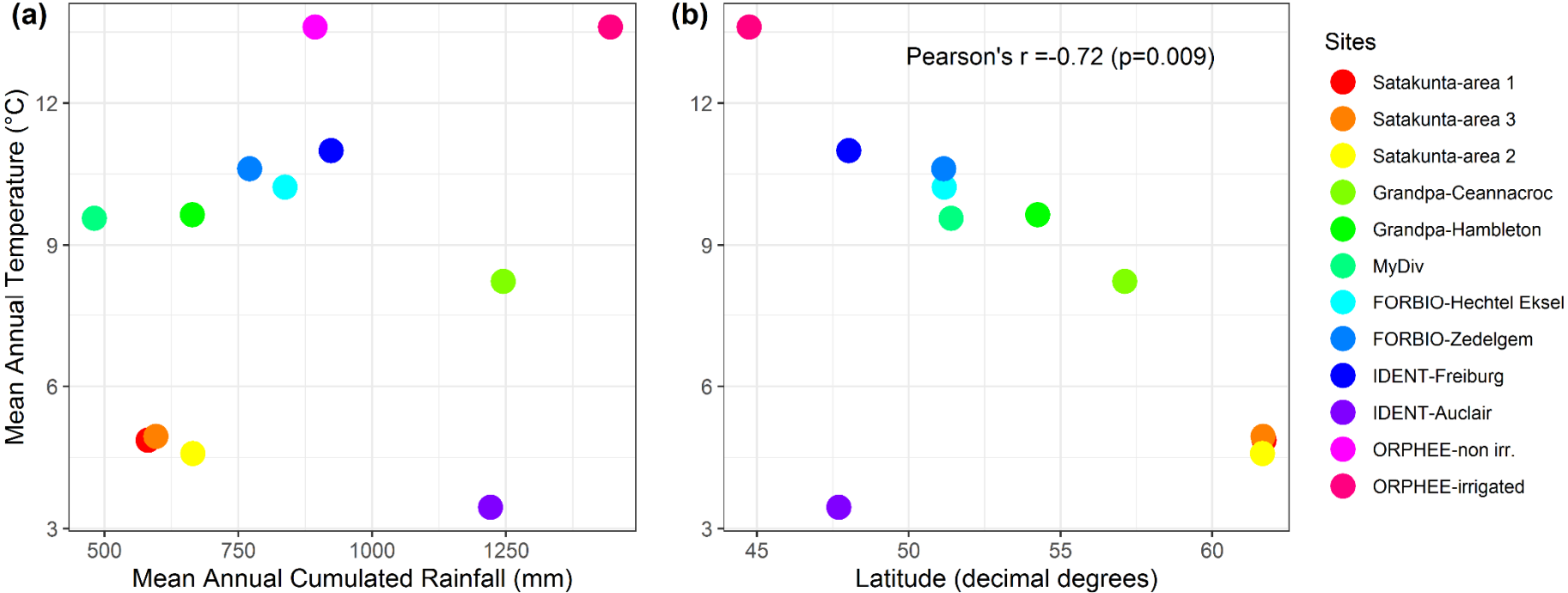


Figure S4. Correlation matrix and density plots of the concentrations of the different phenolic compounds in birch leaves (in mg per g of dry matter). Coefficient corresponds to Pearson correlation coefficients.

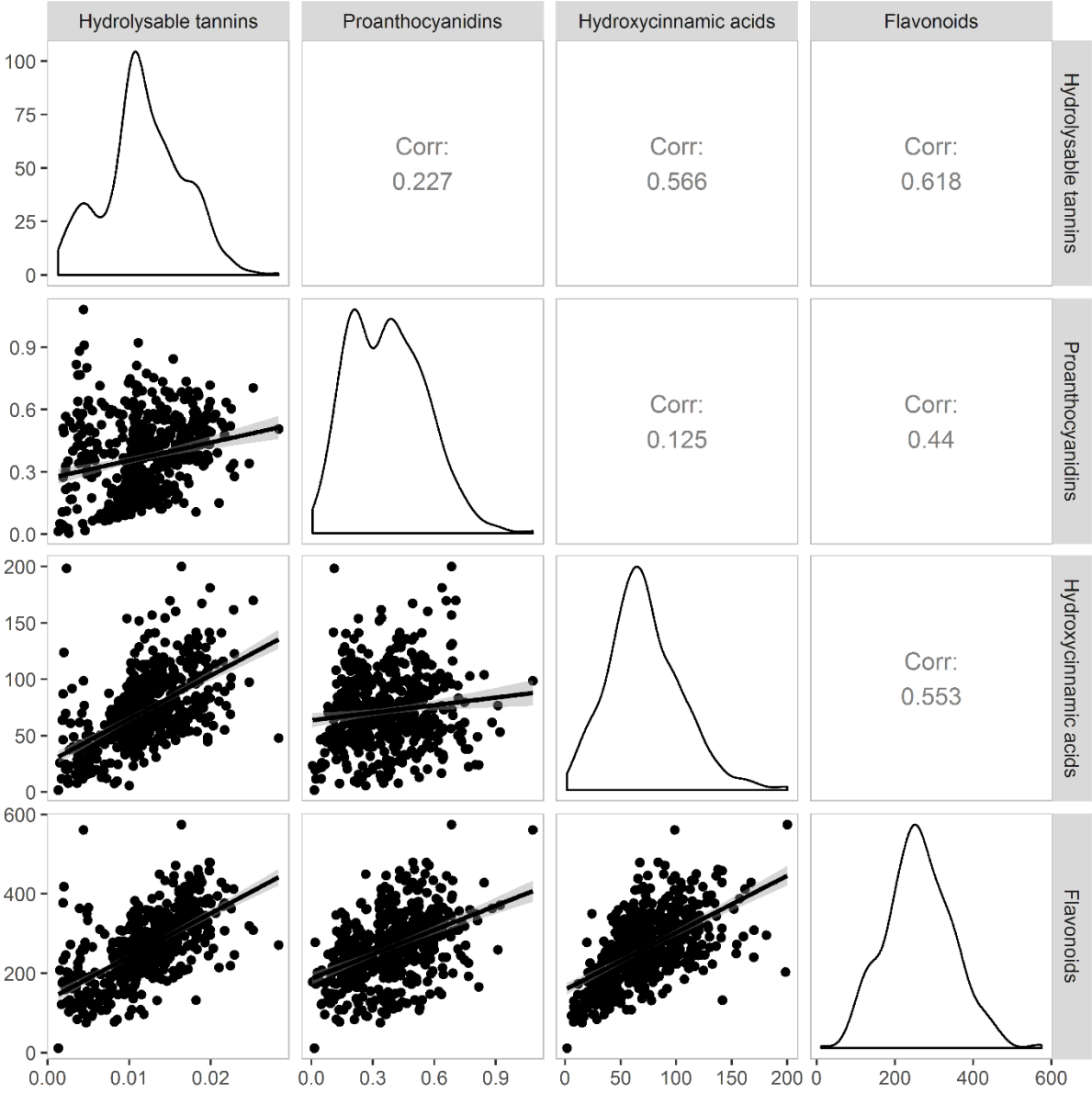


Table S1. Characteristics of the experimental sites.

Experiment	Site	Country	Latitude	Longitude	Year of installation	Plot area (m ²)	Tree density (trees per m ²)	Pool of tree species	Richness levels	Birch evolutionary distinctiveness levels
Satakunta	area 1	Finland	61.7	21.97	1999	400	0.42	<i>Betula pendula, Alnus glutinosa, Larix sibirica, Pinus sylvestris</i>	1, 2, 3	12.15, 24.30, 174.35, 324.40
Satakunta	area 3	Finland	61.67	21.7	1999	400	0.42	<i>Betula pendula, Alnus glutinosa, Larix sibirica, Pinus sylvestris</i>	1, 2, 3	12.15, 24.30, 174.35, 324.40
Satakunta	area 2	Finland	61.65	22.15	1999	400	0.42	<i>Betula pendula, Alnus glutinosa, Larix sibirica, Pinus sylvestris</i>	1, 2, 3	12.15, 174.35, 324.40
Grandpa	Ceannacroc	United Kingdom	57.12	-4.75	1960	2000	0.43	<i>Betula pendula, Pinus sylvestris</i>	1, 2	12.15, 324.40
Grandpa	Hambleton	United Kingdom	54.25	-1.5	1961	2000	0.43	<i>Betula pendula, Pinus sylvestris</i>	1, 2	12.15, 324.40
MyDiv		Germany	51.39	11.89	2015	121	1.16	<i>Betula pendula, Acer pseudoplatanus, Aesculus hippocastanum, Carpinus betulus, Fagus sylvatica, Prunus avium, Quercus petraea, Tilia platyphyllos</i>	1, 2, 3, 4	12.15, 48.60, 78.08, 83.25, 97.20, 107.55, 110.40, 117.90
FORBIO	Hechtel-Eksel	Belgium	51.17	5.32	2012	1296	0.44	<i>Betula pendula, Larix kaempferi, Pinus sylvestris, Pseudotsuga menziesii, Quercus petraea</i>	1, 2, 4	12.15, 97.20, 210.80, 324.40
FORBIO	Zedelgem	Belgium	51.15	3.12	2010	1764	0.44	<i>Betula pendula, Fagus sylvatica, Pinus sylvestris, Quercus robur, Tilia cordata</i>	1, 2, 4	12.15, 97.20, 107.55, 159.18, 210.80, 324.40
IDENT	Freiburg	Germany	48.02	7.83	2013	13	3.78	<i>Betula pendula, Acer Platanoides, Acer saccharum, Betula papyrifera, Larix decidua, Larix laricina, Picea abies, Picea glauca, Pinus strobus, Pinus sylvestris, Quercus rubra</i>	1, 2, 6	12.15, 59.85, 97.20, 117.90, 159.18, 324.40
IDENT	Auclair	Canada	47.7	-68.66	2010	14.44	3.4	<i>Betula pendula, Acer platanoides, Larix decidua, Larix laricina, Picea abies, Pinus banksiana, Pinus sylvestris, Quercus robur</i>	1, 2, 6	12.15, 97.20, 117.90, 159.18, 324.40
ORPHEE	non-irrigated	France	44.74	-0.8	2008	400	0.25	<i>Betula pendula, Pinus pinaster, Quercus ilex, Quercus pyrenaica, Quercus robur</i>	1, 2, 3, 5	12.15, 97.20, 210.80, 324.40
ORPHEE	irrigated	France	44.74	-0.8	2008	400	0.25	<i>Betula pendula, Pinus pinaster, Quercus ilex, Quercus pyrenaica, Quercus robur</i>	1, 2, 3, 5	12.15, 97.20, 210.80, 324.40

Table S2. Minimum, maximum, mean and standard deviation of insect herbivory (% leaf area removed) on birch leaves at the experimental sites.

Experimental site		Nb. of pure plots	Nb. of mixed plots	Nb. of birch trees sampled	Insect Herbivory (% leaf area removed)	
					min - max	mean \pm sd
Satakunta	area 1	2	10	60	0.59 - 9.24	3.14 \pm 1.87
Satakunta	area 3	2	10	60	0.48 - 5.10	2.30 \pm 1.02
Satakunta	area 2	2	5	35	0.71 - 6.68	3.11 \pm 1.52
Grandpa	Ceannacroc	3	6	27	1.47 - 6.90	3.27 \pm 1.43
Grandpa	Hambleton	3	6	27	1.23 - 5.94	2.97 \pm 1.25
MyDiv		2	12	42	0.78 - 7.79	2.81 \pm 1.55
FORBIO	Hechtel-Eksel	2	11	40	0.75 - 6.66	2.23 \pm 1.15
FORBIO	Zedelgem	2	10	36	1.98 - 11.5	5.79 \pm 2.66
IDENT	Freiburg	3	18	63	0.66 - 7.41	2.71 \pm 1.36
IDENT	Auclair	3	15	54	0.36 - 8.23	3.05 \pm 1.89
ORPHEE	non-irrigated	3	12	60	2.34 - 13.0	7.75 \pm 2.63
ORPHEE	irrigated	3	12	60	1.69 - 12.0	6.44 \pm 2.31
Overall		30	127	564	0.36 - 13.03	3.91 \pm 2.60

Table S3. Average proportions of the different phenolic compounds in birch leaves (% of total phenolics) and minimum, maximum, mean and standard deviation of the concentrations of the phenolic compounds (mg g⁻¹ dry matter) at each experimental site. n: number of observations.

Average proportion		Leaf Phenolic Concentration (mg g ⁻¹ dry matter)									
		Hydrolysable tannins 0.004 %		Proanthocyanidins (condensed tannins) 0.111 %		Hydroxycinnamic acids (lignins) 21.509 %		Flavonoids 78.377 %		Total Phenolics	
Experimental site	n	min – max	mean ± sd	min – max	mean ± sd	min – max	mean ± sd	min – max	mean ± sd	min – max	mean ± sd
Satakunta area 1	58	0.001 - 0.023	0.011 ± 0.003	0.014 - 0.422	0.227 ± 0.073	1.72 - 154.03	69.77 ± 28.85	11.78 - 313.60	222.94 ± 51.16	13.51 - 455.00	292.95 ± 71.93
Satakunta area 3	54	0.002 - 0.018	0.012 ± 0.003	0.090 - 0.376	0.192 ± 0.051	36.22 - 127.00	74.46 ± 21.09	108.03 - 378.11	257.55 ± 63.67	163.92 - 505.37	332.21 ± 75.87
Satakunta area 2	35	0.004 - 0.020	0.012 ± 0.003	0.075 - 0.394	0.213 ± 0.066	28.69 - 140.51	89.24 ± 27.41	84.25 - 361.82	255.79 ± 51.47	113.06 - 472.23	345.25 ± 71.61
Grandpa Ceannacroc	27	0.006 - 0.021	0.009 ± 0.003	0.065 - 0.259	0.138 ± 0.056	30.90 - 107.40	58.42 ± 18.22	96.04 - 258.34	182.68 ± 42.09	131.11 - 342.82	241.24 ± 51.21
Grandpa Hambleton	0	–	–	–	–	–	–	–	–	–	–
MyDiv	42	0.003 - 0.016	0.010 ± 0.003	0.251 - 1.082	0.536 ± 0.171	24.20 - 157.01	65.80 ± 24.32	187.11 - 561.33	300.92 ± 70.74	236.61 - 661.13	367.27 ± 84.96
FORBIO Hechtel-Eksel	37	0.011 - 0.028	0.018 ± 0.004	0.319 - 0.922	0.565 ± 0.142	47.82 - 199.93	98.95 ± 37.57	187.75 - 574.46	325.42 ± 74.05	260.64 - 775.08	424.95 ± 98.01
FORBIO Zedelgem	36	0.002 - 0.018	0.012 ± 0.004	0.106 - 0.715	0.434 ± 0.145	37.74 - 198.38	98.06 ± 34.78	131.42 - 292.38	222.08 ± 41.34	171.08 - 427.18	320.59 ± 58.29
IDENT Freiburg	44	0.002 - 0.017	0.009 ± 0.003	0.101 - 0.911	0.461 ± 0.186	22.47 - 151.86	65.33 ± 25.84	164.98 - 382.86	266.92 ± 53.73	218.33 - 514.08	332.72 ± 68.36
IDENT Auclair	54	0.002 - 0.012	0.005 ± 0.002	0.005 - 0.635	0.331 ± 0.161	5.68 - 69.93	25.39 ± 13.14	75.84 - 277.72	140.32 ± 37.63	91.40 - 297.46	166.05 ± 43.91
ORPHEE non-irrigated	60	0.010 - 0.023	0.017 ± 0.003	0.215 - 0.647	0.415 ± 0.095	42.09 - 167.32	76.75 ± 25.78	180.30 - 479.39	339.32 ± 64.06	249.36 - 596.71	416.50 ± 77.72
ORPHEE irrigated	60	0.002 - 0.023	0.016 ± 0.004	0.300 - 0.818	0.521 ± 0.109	23.97 - 141.38	81.86 ± 30.97	154.41 - 461.92	331.18 ± 74.13	190.14 - 600.06	413.57 ± 98.96

Table S4. Summary of LMMs testing for the effects of climate, diversity and their interaction on the concentration of the different types of phenolic compounds. All full models have the following structure: Phenolics concentration ~ Species richness + Birch ED + Temperature + Rainfall + Sp. richness x Temperature + Sp. Richness x Rainfall + Birch ED x Temperature + Birch ED x Rainfall + Temperature x Rainfall + Sp. Richness x Temperature x Rainfall + Birch ED x Temperature x Rainfall + (1|Site/Block/Plot). Results correspond to the simplified models. Predictors are scaled and centred. Predictor having a significant effect on the response variable are in bold.

Response	Predictors	Standardized estimate \pm sd	df	t-value	P-value
Hydroxycinnamic acids (lignins)					
	Intercept	71.57 \pm 5.21	6.82	13.74	<0.001
	Species richness	3.55 \pm 1.50	139.94	2.36	0.020
	Birch ED	-2.29 \pm 1.76	133.22	-1.30	0.195
	Temperature	8.88 \pm 5.63	6.82	1.58	0.160
	Rainfall	-9.43 \pm 5.22	6.74	-1.81	0.115
	Birch ED x Temperature	-0.70 \pm 1.65	115.62	-0.43	0.671
	Birch ED x Rainfall	-1.96 \pm 1.61	122.58	-1.22	0.226
	Temp. x Rainfall	8.31 \pm 4.99	6.70	1.67	0.142
	Birch ED x Temp. x Rainfall	-3.88 \pm 1.40	111.68	-2.77	0.007
Flavonoids					
	Intercept	255.24 \pm 11.91	6.95	21.43	<0.001
	Species richness	8.05 \pm 3.37	148.27	2.39	0.018
	Birch ED	-11.47 \pm 3.95	140.11	-2.90	0.004
	Temperature	43.89 \pm 12.84	6.89	3.42	0.011
	Rainfall	-21.71 \pm 11.95	6.91	-1.82	0.113
	Birch ED x Temperature	-8.40 \pm 3.73	123.93	-2.25	0.026
	Birch ED x Rainfall	-3.01 \pm 3.63	130.71	-0.83	0.408
	Temp. x Rainfall	21.65 \pm 11.41	6.82	1.90	0.101
	Birch ED x Temp. x Rainfall	-9.22 \pm 3.16	120.28	-2.92	0.004
Proanthocyanidins (condensed tannins)					
	Intercept	0.37 \pm 0.03	8.93	10.69	<0.001
	Temperature	0.10 \pm 0.04	8.86	2.92	0.017
Hydrolysable tannins					
	Intercept	0.01 \pm 0.00	9.00	12.20	<0.001
	Species richness	0.0004 \pm 0.0002	129.30	2.28	0.025
	Birch ED	-0.001 \pm 0.0002	109.20	-2.81	0.006
	Temperature	0.002 \pm 0.001	8.95	2.28	0.049
	Sp. Richness x Temperature	0.0003 \pm 0.0002	118.60	2.15	0.034
	Birch ED x Temperature	-0.0004 \pm 0.0002	98.08	-2.08	0.040