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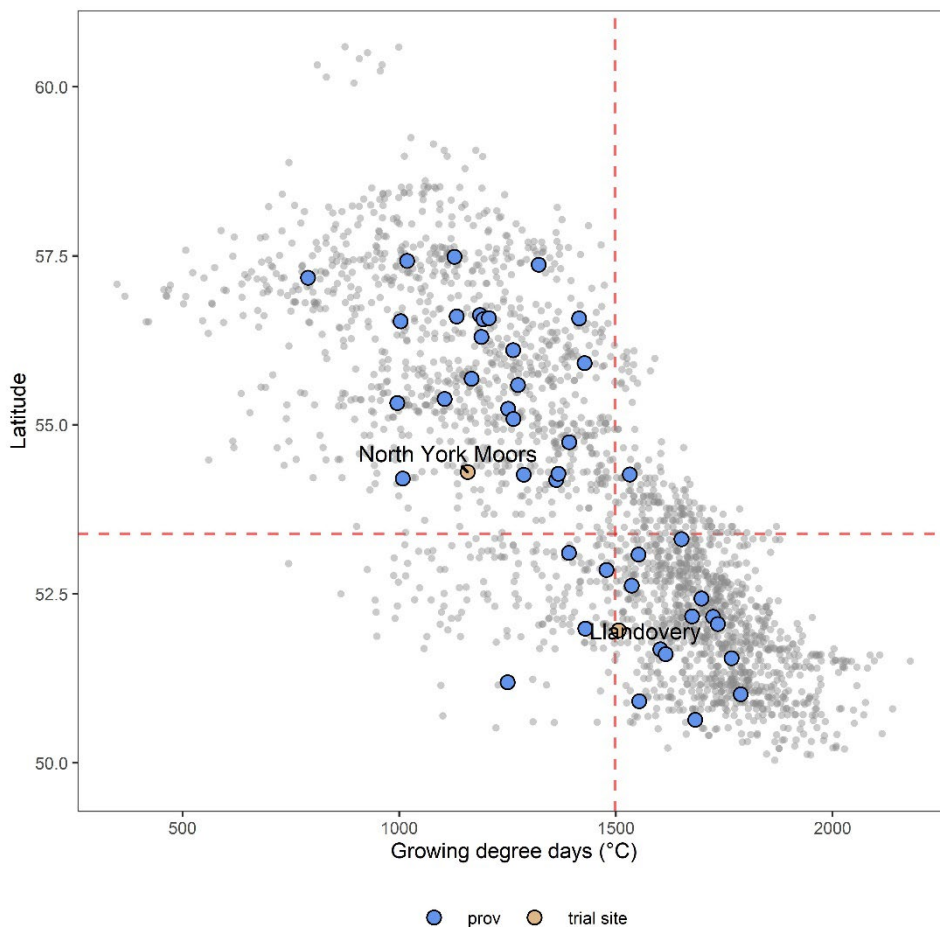
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1 **Supplementary material**

2 **Figure 1 Suppl.** Scatterplot with the latitude in the y axis and in the x axis the growing degree days,
 3 which is a measure of the cumulative annual degrees (measured as $\sum(\text{daily mean temperature} - 5.5)$
 4 whenever daily mean temperature > 5.5 °C) Met Office data, annual averages for 1970-2011 (Perry
 5 and Hollis, 2005). The grey dots correspond to the occurrence of common ash in Great Britain, for
 6 each 10x10km squares, data provided by the Botanical Society of the British Isles. The blue dots
 7 correspond to the provenances of study. The two orange dots correspond to the trial sites. The dotted
 8 lines correspond to the median values for latitude and for growing degree days.



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10 **Table 1 Suppl.** Coordinates and associated environmental information for provenance sites of origin.
 11 The “x” indicates the trial site (Llan = Llandoverly; NYM = North York Moors) in which each provenance
 12 was planted. Alt = Altitude, AP = Annual precipitation, GSL = growing season length (days where
 13 temperature mean is over 5 °C for over 5 consecutive days).

Provenance	Country	Lat	Long	Alt (m)	AP (mm)	GSL (days)	Site	
							Llan	NYM
Craigellachie	Scotland	57.484	-3.17	102	835.24	256.7	x	x
Rassal Wood, Kishorn	Scotland	57.426	-5.591	78	2623.5	268.5	x	x
Erchite Wood, Dores	Scotland	57.368	-4.345	56	852.79	285.4	x	x
Duisdale, Skye	Scotland	57.176	-5.751	18	2041.4	237.2	x	x

Den of Alyth	Scotland	56.623	-3.258	152	787.69	260.2	x	
Glen Lyon	Scotland	56.602	-4.248	183	1778.6	249.6	x	x
Fearnan Forest, Kenmore	Scotland	56.579	-4.037	142	1358.4	256.9	x	x
Glasdrum Wood, Loch Creran	Scotland	56.574	-5.232	33	2505.3	306	x	x
Ardtornish, Morvern	Scotland	56.56	-5.741	20	2145	290.7	x	x
Kilninian, Mull	Scotland	56.53	-6.208	71	1741.1	273.7	x	x
Pitcairns Glen, Dunning	Scotland	56.3	-3.573	119	1318.2	264.9	x	x
Add Valley, Kilmichael Glassary	Scotland	56.106	-5.42	30	1771.1	295.5	x	x
Shielhill Glen	Scotland	55.911	-4.825	107	1767.7	309.6	x	x
Clyde Valley	Scotland	55.68	-3.913	159	1056.2	263.1	x	x
Tweed Valley North Glen	Scotland	55.588	-2.662	68	712.21	270.9	x	x
Crawick Water	Scotland	55.381	-3.929	162	1270.9	256.1	x	x
Nith Valley	Scotland	55.32	-3.829	141	1455.1	232.6	x	x
Penpont	Scotland	55.235	-3.853	90	1294.3	279.2	x	x
Warks Burn	England	55.088	-2.222	90	825.79	272.7	x	x
Castle Eden Dene, Peterlee	England	54.743	-1.352	102	708.49	297.3	x	x
Forge Valley	England	54.274	-0.49	52	772.92	283.9	x	x
Witherslack	England	54.264	-2.87	79	1473.5	306.3	x	x
Ashberry Woods	England	54.262	-1.133	142	862.85	266.4	x	x
Upper Wharfedale	England	54.203	-2.104	202	1619.4	233	x	x
Park Wood & Hutton Roof	England	54.182	-2.689	170	1208	287.3	x	x
Treswell Woods	England	53.308	-0.861	54	616.42	295.7	x	
Via Gellia Woods	England	53.104	-1.619	239	980.75	285.4	x	x
Betws-y-Coed	Wales	53.079	-3.799	57	1899.5	312.5	x	x
Forest Bank, Marchington	England	52.852	-1.82	142	721.46	286.2	x	x
Tick Wood, Ironbridge	England	52.621	-2.523	99	714.33	299.7	x	x
Aberystwyth Area	Wales	52.43	-4.059	90	1051.2	329.1	x	x
Out Wood	England	52.166	0.415	96	623.85	303.9	x	x
Hayley Wood	England	52.158	-0.11	79	562.16	305.2	x	x
Groton Wood	England	52.05	0.883	66	565.55	303.5	x	x
Talgarth	Wales	51.986	-3.213	198	943.39	296.1	x	x
Wyndcliff, Wye Valley	England	51.678	-2.679	208	1052.4	310.6	x	x
Midger Wood	England	51.606	-2.285	160	861.5	301.2	x	x
Cardiff Area	Wales	51.546	-3.234	158	1329.3	315.9	x	x
Horner Wood, Porlock	England	51.189	-3.583	102	1541.2	293	x	x
Pheasant Copse, Petworth	England	51.011	-0.628	60	859.63	318.7	x	x
Bignor Hill	England	50.908	-0.616	194	936.24	300.4	x	x
Greta Wood, Purbeck Ridge	England	50.637	-2.136	126	867.59	321.3	x	x

15 **Table 2 Suppl.** Stages of leaf phenology and the corresponding scores.

Trait	Score	Description of the stage
Flushing, spring phenology	1	Bud closed, black, fully dormant winter state.
	2	Bud swollen but still closed, green-black in colour.
	3	Bud scales partially separated, some leaves visible.
	4	Bud scales completely separated, leaves visible but still furled and extending <1cm beyond scales.
	5	Leaves elongated >1cm from scales and spreading but leaflets still furled.
	6	All leaflets separated and shoot expanding.
Senescence, autumn phenology	1	No leaf loss
	2	1-25% leaf loss
	3	26-50% leaf loss
	4	51-75% leaf loss
	5	76-99% leaf loss
	6	100% leaf loss

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30 **Table 3 Suppl.** Simple regressions between each trait and climatic variables of the provenances. The
 31 significance (p), R-squared (R^2) and slope of the regressions. Variables extrapolated climatic data
 32 provided by Met Office, 5x5 km polygons, annual averages for 1970-2011 (Perry and Hollis, 2005):
 33 GSL= growing season length (days where temperature mean is over 5 °C for over 5 consecutive
 34 days); GFD = ground frost days (Count of days when the minimum temperature is below 0 °C); AP =
 35 annual precipitation (in mm); MFT is mean February temperature; and MJT is the mean July
 36 temperature.

Trait	Trial site	Climatic Variable				
		GSL	GFD	AP	MFT	MJT
Height	LLAN	R^2 : 0.34, $p < 0.001$ slope: 0.0084	R^2 : 0.25, $p < 0.001$ slope: -0.9262	R^2 : 0.28, $p < 0.001$ slope: -0.0309	R^2 : 0.27, $p < 0.001$ slope: 21.062	R^2 : 0.46, $p < 0.001$ slope: 20.867
	NYM	R^2 : 0.33, $p < 0.001$ slope: 0.0030	R^2 : 0.29, $p < 0.05$ slope: -0.3708	ns	R^2 : 0.28, $p < 0.05$ slope: 6.680	R^2 : 0.33, $p < 0.001$ slope: 5.940
DBH	LLAN	R^2 : 0.25, $p < 0.001$ slope: 0.0131	R^2 : 0.20, $p < 0.01$ slope: -0.0156	R^2 : 0.20, $p < 0.01$ slope: -0.0004	R^2 : 0.20, $p < 0.01$ slope: 0.3166	R^2 : 0.34, $p < 0.001$ slope: 0.3430
	NYM	R^2 : 0.34, $p < 0.001$ slope: 0.0232	R^2 : 0.33, $p < 0.05$ slope: -0.0324	ns	R^2 : 0.32, $p < 0.05$ slope: 0.5600	R^2 : 0.35, $p < 0.01$ slope: 0.4839
Forks	LLAN	ns	ns	ns	ns	ns
	NYM	R^2 : 0.19, $p < 0.001$ slope: 0.0077	R^2 : 0.17, $p < 0.01$ slope: -0.0031	ns	R^2 : 0.16, $p < 0.05$ slope: 0.0581	R^2 : 0.16, $p < 0.01$ slope: 0.0349
Flush	LLAN	R^2 : 0.34, $p < 0.001$ slope: -0.0843	R^2 : 0.24, $p < 0.001$ slope: 0.1168	R^2 : 0.10, $p < 0.001$ slope: 2.296e-03	R^2 : 0.23, $p < 0.001$ slope: -2.3387	R^2 : 0.40, $p < 0.001$ slope: -1.7382
	NYM	R^2 : 0.31, $p < 0.001$ slope: -0.0627	R^2 : 0.21, $p < 0.001$ slope: 0.0867	R^2 : 0.12, $p < 0.001$ slope: 1.893e-03	R^2 : 0.22, $p < 0.001$ slope: -1.7283	R^2 : 0.38, $p < 0.001$ slope: -1.3563
Sen	LLAN	R^2 : 0.29, $p < 0.001$ slope: 0.0984	R^2 : 0.23, $p < 0.001$ slope: -0.1280	ns	R^2 : 0.23, $p < 0.001$ slope: 2.5567	R^2 : 0.31, $p < 0.001$ slope: 1.9637
	NYM	R^2 : 0.44, $p < 0.001$ slope: 0.0425	ns	ns	ns	R^2 : 0.43, $p < 0.05$ slope: 0.7314

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44 **Table 4 Suppl.** Correlation coefficient between the provenances' latitude and the other climatic
 45 variables. Variables extrapolated climatic data provided by Met Office, 5x5 km polygons, annual
 46 averages for 1970-2011 (Perry and Hollis, 2005): GDD= growing degree days ($\sum(\text{daily mean}$
 47 $\text{temperature} - 5.5)$ whenever daily mean temperature > 5.5 °C); GSL= growing season length (days
 48 where temperature mean is over 5 °C for over 5 consecutive days); GFD = ground frost days (Count
 49 of days when the minimum temperature is below 0 °C); AP = annual precipitation (in mm); MFT is
 50 mean February temperature; and MJT is the mean July temperature.

Variable	Correlation	Coefficient R and significance
Growing degree days	GDD~Lat	R: -0.77, p < 0.001
Growing season length	GSL~Lat	R: -0.65, p < 0.001
Ground frost days	GFD~Lat	R: 0.57, p < 0.001
Annual precipitation	AP~Lat	R: 0.50, p < 0.001
Mean July Temperature	MJT~Lat	R: -0,79, p < 0.001
Mean February Temperature	MFT~Lat	R: 0.46, p < 0.001

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