Supplement data for

Bachmann-Pfabe, S., Kavka, M., Roschanski, A., Dehmer, K. J., Sampoux, J.-P., Willner, E. (2026). Phenotypic traits in natural perennial ryegrass populations and relations to climate conditions at sites of origins across Europe. *Genetic Resources* 6 (11), 99–114. doi: 10.46265/genresj.MDSO5816.

Contents

Supplemental Table 1: Collection Material. Passport data of the collected perennial ryegrass (*Lolium perenne* L.) populations including information about the sample area.

Country of origin	GLS number*	IPK accession number	Accession DOI	SAMP STAT§	COLL SRC§	Latitude (WGS84 dec)	Longitude (WGS84 dec)	Altitude (m asl)	COLL Area (m²)
BEL1	946	GR 13048	10.25642/IPK/GBIS/7214758	130	25	50.2450	4.3808	216.0	NA
BEL2	945	GR 13047	10.25642/IPK/GBIS/7214721	130	25	51.3261	4.2419	19.0	> 1000
DEU1	964	GR 13042	10.25642/IPK/GBIS/7214419	130	25	47.9287	8.0592	1040.0	100 000
DEU2	969	GR 13041	10.25642/IPK/GBIS/7214406	130	25	47.8604	9.8762	748.0	90 000
DEU3	968	GR 13043	10.25642/IPK/GBIS/7214422	130	25	49.9230	6.3016	338.0	6300
DEU4	966	GR 13030	10.25642/IPK/GBIS/7213497	130	25	52.4214	9.0181	33.0	5000
DEU5	975	GR 13031	10.25642/IPK/GBIS/7213500	130	25	53.1368	7.3721	0.0	30 000
DEU6	970	GR 13034	10.25642/IPK/GBIS/7214108	130	25	54.3442	8.8979	0.0	20 000
DEU7	963	GR 13025	10.25642/IPK/GBIS/7213462	130	25	52.6866	11.4368	41.0	22 500
DEU8	967	GR 13023	10.25642/IPK/GBIS/7213425	130	25	53.9806	11.3934	0.0	> 1000
DEU9	971	GR 13026	10.25642/IPK/GBIS/7213480	130	25	52.6858	12.7237	30.0	30 000
DEU10	976	GR 13027	10.25642/IPK/GBIS/7213487	130	25	52.7503	14.2345	8.0	25 000
EST1	948	GR 13052	10.25642/IPK/GBIS/7215473	130	25	58.3539	22.0328	3.5	1000
FRA1	957	GR 13068	10.25642/IPK/GBIS/7259547	100	99	43.5803	-1.2219	13.0	> 1000
FRA2	949	GR 13060	10.25642/IPK/GBIS/7259285	100	13	43.0419	1.4300	525.0	> 1000
FRA3	961	GR 13072	10.25642/IPK/GBIS/7259574	100	13	43.5046	4.6916	1.0	> 1000
FRA4	951	GR 13062	10.25642/IPK/GBIS/7259403	100	13	45.8298	0.5958	223.0	> 1000
FRA5	956	GR 13067	10.25642/IPK/GBIS/7259537	100	13	45.6282	2.7572	1200.0	100 - 1000
FRA6	954	GR 13065	10.25642/IPK/GBIS/7259520	100	13	43.9171	6.5381	911.0	100 - 1000
FRA7	952	GR 13063	10.25642/IPK/GBIS/7259407	100	13	44.9431	5.6159	800.0	> 1000
FRA8	960	GR 13071	10.25642/IPK/GBIS/7259568	100	13	46.6892	-1.4187	50.0	> 1000
FRA9	962	GR 13073	10.25642/IPK/GBIS/7259584	100	13	46.4046	1.4145	250.0	> 1000
FRA10	950	GR 13061	10.25642/IPK/GBIS/7259384	100	13	46.9383	3.1514	215.0	> 1000
FRA11	959	GR 13070	10.25642/IPK/GBIS/7259563	100	13	48.2957	6.1126	297.0	> 1000
GBR1	989	GR 13078	10.25642/IPK/GBIS/7308110	100	25	52.7298	-0.6152	142.0	NA
GBR2	990	GR 13079	10.25642/IPK/GBIS/7308116	100	25	52.7918	-1.2046	84.0	NA
GBR3	991	GR 13080	10.25642/IPK/GBIS/7308132	100	13	51.1448	-2.6982	134.0	NA
GBR4	992	GR 13081	10.25642/IPK/GBIS/7308166	100	13	51.3269	-2.7906	134.0	NA
GBR5	993	GR 13082	10.25642/IPK/GBIS/7308192	100	13	52.1196	-4.4466	161.0	NA
GBR6	994	GR 13083	10.25642/IPK/GBIS/7308198	100	13	52.5749	-3.9146	229.0	NA
GBR7	995	GR 13084	10.25642/IPK/GBIS/7308324	100	13	54.6493	-2.2286	402.0	NA
GBR8	996	GR 13085	10.25642/IPK/GBIS/7308327	100	13	54.6740	-2.2502	402.0	NA
LTU1	978	GR 13045	10.25642/IPK/GBIS/7214670	130	25	54.3486	23.2030	160.0	100

Country of origin	GLS number*	IPK accession number	Accession DOI	SAMP STAT§	COLL SRC§	Latitude (WGS84 dec)	Longitude (WGS84 dec)	Altitude (m asl)	COLL Area (m²)
LTU2	977	GR 13044	10.25642/IPK/GBIS/7214582	130	25	54.6820	23.4724	24.0	100
NLD1	979	GR 13033	10.25642/IPK/GBIS/7213981	120	25	53.1263	5.6201	0.0	35 000
POL1	980	GR 13036	10.25642/IPK/GBIS/7214189	130	25	54.0097	14.8145	2.0	290 000
PRT1	983	GR 13075	10.25642/IPK/GBIS/7260809	100	13	41.9056	-6.7278	675.0	> 1000
PRT2	984	GR 13076	10.25642/IPK/GBIS/7260831	100	13	41.8540	-6.9758	875.0	NA
SRB1	988	GR 13050	10.25642/IPK/GBIS/7214936	110	61	43.4016	19.8513	1076.0	100
SRB2	986	GR 13049	10.25642/IPK/GBIS/7214828	110	61	43.2674	20.1686	1159.0	100
SRB3	987	GR 13051	10.25642/IPK/GBIS/7214991	110	61	43.9685	21.3523	149.0	100

* Grasslandscape project accession number, as used in Blanco-Pastor *et al*. (2019) in which genotyping data of these accession are included.

§ sample status and sample source classified according to FAO/Bioversity Multi-Crop Passport Descriptors (2015), SAMPSTAT: biological sample status (100=wild, 110=natural, 120=semi-natural/wild, 130=semi-natural/sown); COLLSRC: collecting source (13=wild habitat grassland, 25=farm/cultivated habitat, pasture; 61=roadsides; 99 =other)

Supplemental Table 2: Bioclimatic variables used to describe the climatic conditions at the sites of origin of the perennial ryegrass populations (BIOCLIM like variables)*.

Abbreviation	Explanation
bio1	Annual mean temperature (°C)
bio2	Mean diurnal range (mean of 14/15 days year-slices, °C)
bio4	Temperature seasonality (standard deviation of average daily mean temperature x 100, °C x100)
bio5	Average daily maximum temperature of the warmest 14/15 days year slice (°C)
bio6	Average daily minimum temperature of the coldest 14/15 days year slice (°C)
bio7	Temperature annual range (bio5-bio6, °C)
bio8	Mean temperature of wettest quarter (°C)
bio9	Mean temperature of driest quarter (°C)
bio10	Mean temperature of warmest quarter (°C)
bio11	Mean temperature of the coldest quarter (°C)
bio12	Annual cumulated precipitations (mm)
bio16	Cumulated precipitation of wettest quarter (mm)
bio17	Cumulated precipitation of driest quarter (mm)
bio18	Cumulated precipitation of warmest quarter (mm)
bio19	Cumulated precipitation of coldest quarter (mm)

* All the BIOCLIM like variables we used were already described in Blanco-Pastor *et al*. (2021). Briefly, 1989-2010 norms of daily minimum, maximum and mean temperatures (tas, tasmax and tasmin, respectively) and daily cumulated precipitations were extracted from EURO4M-MESAN grids at 0.05° longitude and latitude resolution. The 365 days year was broken down into 25 year-slices of 14 days and a last one of 15 days and climate norms were averaged per 14/15 days slice. The resulting data were used to compute bioclimatic variables (bio1 to bio19) in the same way as BIOCLIM variables provided in the *WorldClim* (https://www.worldclim.org/data/bioclim.html).

Supplemental Table 3: Weather conditions over the experiment duration at the field trial site. Monthly average temperatures and cumulated precipitations were recorded during the field experiment period (Sept. 2015 – April 2018) by a weather station at the field trial site at Malchow/Poel in northern Germany (53°59‘40‘‘N, 11°28‘26‘‘E, 10 m asl).

Month/Year	2015	2016	2017	2018	2015	2016	2017	2018
	Mean temperature (C°)				Cumulated precipitation (mm)			
January	-	-0.6	0.4	2.8	-	31.3	37.6	66.6
February	-	3.2	1.9	-1.1	-	54.3	23.9	16.6
March	-	4.4	6.3	1.0	-	22.9	43.5	67.3
April	-	7.9	7.7	10.9	-	9.1	27.7	29.7
May	-	14.7	13.9	-	-	51.5	51.1	-
June	-	17.7	16.8	-	-	61.8	118	-
July	-	18.5	17.1	-	-	66.5	170	-
August	19.0	17.9	17.7	-	70.8	30.5	48.2	-
September	13.9	17.8	14.2	-	34.9	0.3	39.6	-
October	8.9	9.1	11.8	-	33.9	60.1	133.4	-
November	7.7	3.8	6.1	-	85.5	52.1	42.6	-
December	7.1	4.0	3.6	-	29.0	58.0	33.6	-
average/sum	-	9.9	9.8	-	-	498	770	-

Supplemental Table 4: Population means for the traits evaluated. Adjusted means of the different populations in the field experiment from March 2016 to 2018 for the scored traits including statistics from a one-way ANOVA (F- and p-values).

	WID (1 low - 9 strong)			GSp (1 low - 9 strong)			HAE (days after 1st of April)		GSu (1 low - 9 strong)		DIS (1 low - 9 high)		GWi (1 low - 9 strong)	
pop	**2016**	**2017**	**2018**	**2016**	**2017**	**2018**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**
F-value	7.073	8.129	5.104	17.553	8.892	7.546	87.189	53.782	7.678	5.104	5.673	3.304	7.820	9.241
p-value	***	***	***	***	***	***	***	***	***	***	***	***	***	***
BEL1	6.0	6.3	5.1	4.8	4.4	4.5	**53.2**	53.6	6.3	4.0	6.0	4.4	4.5	5.1
BEL2	5.9	4.7	4.2	**5.2**	**7.1**	**5.5**	**63.3**	**67.0**	**8.2**	**5.6**	5.2	2.9	**6.7**	**6.9**
DEU1	5.4	6.5	5.7	**5.5**	4.0	3.7	42.9	45.8	5.2	4.1	6.0	4.1	4.4	4.6
DEU2	5.6	5.6	4.9	4.8	5.8	**5.5**	25.8	25.5	**7.1**	**5.8**	**6.5**	**5.4**	5.4	**6.1**
DEU3	5.3	5.3	4.9	**5.4**	5.7	4.7	**57.4**	**61.1**	**7.5**	**5.5**	5.6	3.7	**5.8**	**6.1**
DEU4	5.1	5.4	5.4	**5.8**	**6.2**	4.8	40.3	41.5	6.7	5.1	**6.3**	4.0	5.6	**6.5**
DEU5	5.2	5.4	4.7	**5.3**	5.5	4.7	**58.3**	**60.3**	6.2	**5.2**	5.1	3.4	5.1	**6.3**
DEU6	6.0	6.8	5.4	4.4	3.5	4.1	**57.8**	**55.3**	4.8	4.7	5.4	3.6	3.4	5.0
DEU7	5.4	5.4	4.6	4.4	**6.3**	4.8	**52.9**	52.0	6.4	4.6	5.7	4.1	**5.9**	**6.2**
DEU8	NA	5.5	4.9	3.5*	5.6	4.5	**55.8**	**56.4**	6.5	4.8	5.4	3.4	5.5	5.7
DEU9	5.1	5.0	4.9	**5.8**	**6.6**	**4.8**	**52.1**	**56.7**	**7.3**	5.1	5.3	3.8	**6.4**	**6.4**
DEU10	NA	6.6	5.9	2.9*	4.7	3.5	**60.4**	**55.5**	4.4	3.7	5.8	3.7	4.0	4.4
FRA1	**7.5**	6.5	5.4	3.5	4.6	4.7	34.8	31.1	4.7	4.1	4.8	3.6	4.0	4.9
FRA2	**7.5**	7.0	5.9	3.8	3.8	3.7	36.1	34.8	3.8	3.3	4.7	4.0	3.0	3.5
FRA3	**8.3**	**7.4**	**6.6**	2.6	3.0	3.1	44.8	44.5	3.2	2.9	5.4	3.1	2.9	2.3
FRA4	**7.2**	6.3	5.5	4.1	5.1	3.6	34.8	32.3	5.0	3.5	5.2	3.3	4.1	4.3
FRA5	5.6	6.1	5.4	4.6	3.9	3.7	47.2	**52.2**	6.8	4.6	6.1	4.5	5.1	4.6
FRA6	6.3	6.3	4.9	3.9	5.1	4.3	31.7	29.2	5.1	4.1	**6.6**	4.6	4.0	4.5
FRA7	6.6	6.8	5.8	4.0	4.6	3.7	34.0	31.0	5.0	3.4	5.8	4.2	3.5	3.7
FRA8	6.3	5.0	5.1	**5.3**	**6.6**	**4.9**	47.4	50.9	**7.5**	**5.4**	5.6	3.7	**6.2**	**6.4**
FRA9	**6.9**	6.6	5.5	4.5	4.6	4.1	37.8	40.3	5.2	4.0	5.4	2.9	4.0	4.5
FRA10	6.2	6.2	5.6	4.9	4.4	4.0	39.9	41.8	5.5	4.1	5.3	3.7	4.2	4.7
FRA11	4.8	5.6	4.9	**6.2**	5.2	4.4	46.5	50.4	6.9	4.1	5.3	3.9	5.2	5.1
GBR1	5.5	6.3	6.0	4.1^	4.2	4.0	39.1	43.6	5.8	3.8	5.6	3.1	4.3	4.2
GBR2	5.7	**7.0**	6.0	4.1^	3.5	3.6	39.9	42.2	4.0	3.3	5.9	4.1	3.1	3.7
GBR3	5.8	5.7	5.4	3.7^	5.0	4.3	**51.5**	**54.0**	6.5	4.5	5.3	3.3	4.9	5.4
GBR4	5.0	6.2	5.2	3.7^	4.5	4.2	44.0	48.5	5.6	4.4	5.4	3.4	4.8	5.0
GBR5	5.8	6.7	5.9	3.6^	3.9	3.6	**54.3**	**55.7**	5.8	3.8	5.9	4.2	3.7	3.7
GBR6	5.2	6.0	5.7	3.7^	4.6	4.2	**55.4**	**54.8**	5.8	3.9	5.8	4.0	4.8	4.6
GBR7	5.3	**6.7**	5.6	3.3^	4.1	4.1	37.8	36.1	5.2	4.1	6.0	3.8	3.6	4.5
GBR8	6.0	5.6	5.6	3.4^	5.6	4.6	**61.2**	**61.0**	6.8	4.7	6.2	4.3	5.6	5.6
LTU2	4.8	6.7	5.5	5.7	3.4	3.8	43.3	48.6	4.9	3.4	5.1	3.3	3.3	4.0
NLD1	5.7	5.9	5.5	5.2	5.2	4.6	37.4	37.2	5.8	4.7	5.1	3.6	4.9	5.2
POL1	5.3	6.3	5.2	5.6	4.3	4.0	**55.2**	**56.5**	6.5	4.1	5.8	4.3	4.4	5.2
PRT1	5.8	6.1	5.2	4.1	4.2	3.8	45.8	49.8	5.1	4.1	5.0	3.8	4.2	4.8
PRT2	**7.0**	**7.0**	5.6	3.2	3.3	3.9	40.5	40.8	4.5	4.2	6.2	4.3	3.6	4.0
SRB1	6.0	6.1	5.4	5.1	4.9	4.1	42.6	45.8	5.2	3.8	6.1	4.2	4.2	4.8
SRB2	5.4	**6.8**	**6.7**	4.1	3.0	3.3	**53.2**	**58.6**	6.2	3.7	**6.8**	**5.1**	4.0	3.4
SRB3	5.6	**7.1**	**6.9**	4.7	2.9	2.7	**50.8**	54.4	5.8	3.5	**7.0**	**5.6**	3.7	3.1
MEAN	5.8	6.1	5.4	4.5	4.8	4.2	47.0	48.5	5.9	4.3	5.7	3.9	4.7	5.0

* planted later, in spring 2016, ^planted four weeks later and weak plants; underlined values represent a population means significantly lower than the overall mean, values marked in bold represent population means significantly higher (p-value ≤ 0.05) than the overall mean of the respective trait (post hoc comparison to the overall mean), *** p-value ≤ 0.001, ** 0.001 < p-value ≤ 0.01, *0.01 < p-value ≤ 0.05.

Supplemental Table 5: Adjusted means of the different populations in the field experiment from March 2016 to 2018 for the measured traits including statistics from a one-way ANOVA (F- and p-values).

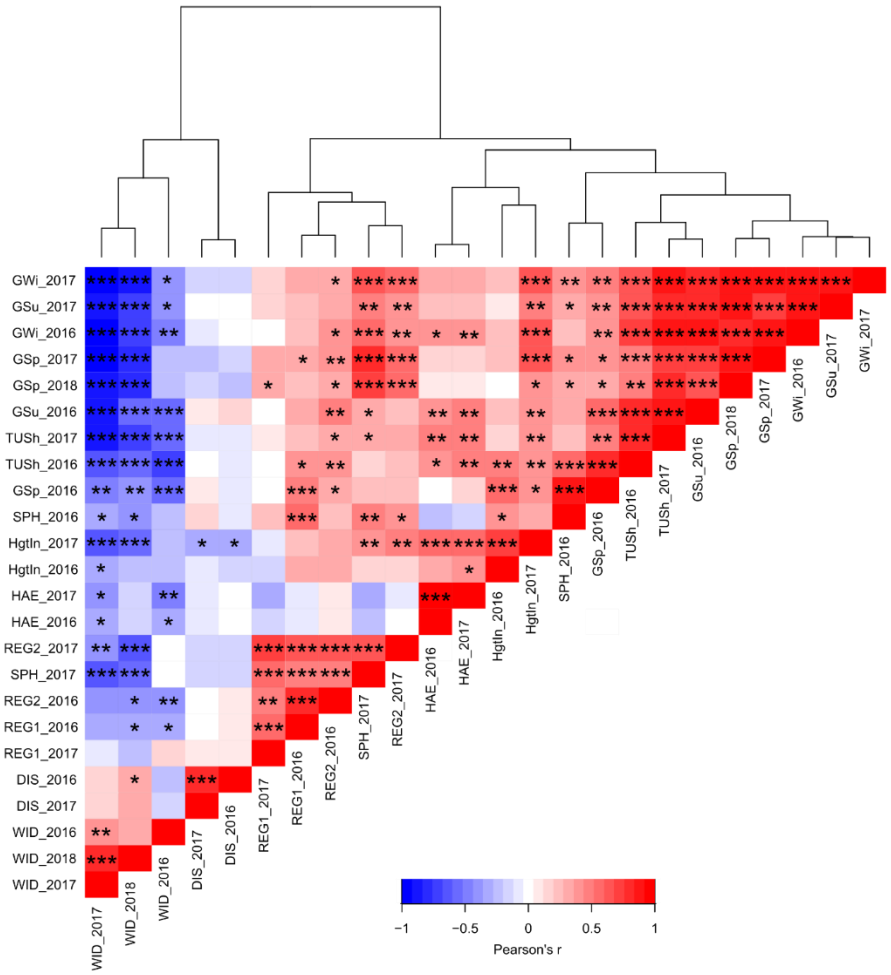
	SPH (mm)		REG1 (mm)		HgtIn (mm)		REG2 (mm)		TUSh (cm)	
pop	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**
F-value	13.983	8.722	5.667	3.729	8.836	6.125	5.287	4.932	13.439	12.414
p-value	***	***	***	***	***	***	***	***	***	***
BEL1	124	195	139	209	166	84.1	191	193	21.3	26.9
BEL2	121	232	138	202	168	115	190	187	**25.3**	**36.3**
DEU1	134	192	**155**	192	176	97.8	191	188	21.5	23.9
DEU2	140	**249**	**149**	**222**	103	57.3	197	190	21.0	28.7
DEU3	140	220	**157**	202	**170**	117	191	**196**	**23.6**	**31.7**
DEU4	**164**	**244**	145	199	129	103	181	184	**21.9**	**29.4**
DEU5	138	204	137	197	150	115	179	**194**	**23.8**	**30.5**
DEU6	129	160	133	206	115	76.4	169	183	20.4	25.4
DEU7	142	233	134	193	148	**133**	182	**205**	21.5	26.0
DEU8	114*	**234**	**150**	200	135	**121**	**212**	**203**	18.4	25.7
DEU9	**163**	**237**	142	197	**178**	**119**	195	**195**	**25.1**	**28.4**
DEU10	82.5*	210	141	214	157	113	195	194	15.9	20.5
FRA1	121	219	124	200	124	83.8	170	194	16.4	23.9
FRA2	132	215	132	216	139	74.9	177	183	17.0	18.3
FRA3	87.4	162	105	174	112	66.5	133	160	12.2	15.6
FRA4	131	**238**	136	204	152	85.4	190	185	18.3	22.6
FRA5	113	159	130	181	137	72.7	181	173	**23.7**	**28.5**
FRA6	133	**245**	145	**218**	119	64.1	192	191	16.9	22.0
FRA7	129	219	**152**	206	117	64.4	192	184	18.2	22.7
FRA8	**147**	**264**	**151**	205	**191**	**129**	**205**	193	**22.2**	**29.1**
FRA9	126	213	**148**	211	163	95.3	187	194	18.7	22.0
FRA10	129	204	136	191	**175**	103	188	184	20.7	24.1
FRA11	**149**	207	144	184	165	93.7	195	179	**25.0**	**27.8**
GBR1	110	193	138	186	111	62.8	185	169	18.9	23.1
GBR2	137	202	**153**	212	123	72.0	185	189	17.9	20.4
GBR3	105	202	138	184	128	91.0	179	174	21.2	**29.5**
GBR4	103	193	131	178	140	82.4	192	177	19.7	25.9
GBR5	96.4	173	132	195	134	80.1	183	169	20.1	26.1
GBR6	85.7	198	128	192	149	91.6	182	170	19.4	27.1
GBR7	95.7	190	125	196	96.2	58.7	169	181	18.0	24.2
GBR8	92.1	203	118	197	127	87.1	175	177	**22.1**	**31.0**
LTU2	145	186	**149**	195	**197**	88.2	204	179	**23.4**	23.3
NLD1	**148**	214	126	192	122	75.4	158	173	**22.2**	27.3
POL1	**151**	184	134	194	**192**	111	170	180	**23.6**	**27.7**
PRT1	109	180	117	165	168	111	155	159	17.5	22.5
PRT2	116	184	122	190	132	84.8	162	179	14.9	20.4
SRB1	**142**	222	133	178	**204**	105	168	168	19.3	21.8
SRB2	112	163	125	179	118	60.3	174	156	18.9	21.0
SRB3	129	159	135	186	165	72.0	179	166	20.5	21.3
MEAN	125	205	137	196	147	92.0	183	182	20.6	25.8

* planted later, in spring 2016, underlined values represent a population means significantly lower than the overall mean, values marked in bold represent population means significantly higher (p-value ≤ 0.05) than the overall mean of the respective trait (post hoc comparison to the grand mean), *** p-value ≤ 0.001, **0.001 < p-value ≤ 0.01, *0.01 < p-value ≤ 0.05.

Supplemental Table 6: Pearson correlation coefficients between the phenotypic traits (population means) and the climate norms at the site of origin of populations. Given are only phenotypic traits with relevant correlation coefficients ($r \geq 0.4$ or $r \leq -0.4$) in at least one year. Marked in bold are correlation coefficients $r \geq 0.4$ and underlined the correlations coefficients $r \leq -0.4$. Asterisks indicate the significance level: *** p-value ≤ 0.001, **$0.001 <$ p-value ≤ 0.01, *$0.01 <$ p-value ≤ 0.05.

	WID 2016		WID 2017		WID 2018	GSp 2016		GSp 2017	GSp 2018		GWi 2016		GWi 2017		DIS 2016		DIS 2017		HAE 2016		HAE 2017		SPH 2016		SPH 2017	TUSh 2016		TUSh 2017	
dec_lat	-0.61	***	-0.34	*	-0.30	0.15		0.31	0.34	*	0.34	*	**0.43**	**	-0.13		-0.30		**0.45**	**	**0.41**	**	0.01		0.06	**0.47**	**	**0.51**	***
dec_lon	-0.33	***	0.00		0.09	**0.44**	**	-0.03	-0.12		0.01		0.00		0.30		0.31	*	0.17		0.19		**0.42**	**	-0.01	0.27		-0.08	
altitude	0.06		0.22		0.16	-0.05		-0.27	-0.22		-0.17		-0.28		**0.48**	**	**0.53**	***	-0.32	*	-0.26		-0.06		-0.14	-0.16		-0.23	
bio1	**0.59**	***	0.11		0.06	-0.21		-0.01	-0.05		-0.15		-0.12		-0.46	**	-0.36	*	-0.15		-0.19		-0.02		0.12	-0.38	*	-0.25	
bio5	**0.51**	**	0.17		0.07	0.08		-0.07	-0.19		-0.21		-0.19		-0.19		-0.04		-0.28		-0.28		0.29		0.14	-0.33	*	-0.43	**
bio6	0.39	*	-0.05		-0.09	-0.30		0.11	0.12		0.03		0.06		-0.53	***	-0.57	***	0.01		-0.05		-0.25		0.07	-0.19		0.09	
bio8	0.00		0.00		0.03	0.11		0.06	0.01		-0.02		0.06		-0.04		0.07		0.02		-0.01		0.30		0.13	-0.04		-0.19	
bio9	**0.67**	***	0.15		0.00	-0.29		-0.07	-0.08		-0.17		-0.15		-0.53	***	-0.42	**	-0.20		-0.24		-0.18		-0.01	-0.35	*	-0.18	
bio10	**0.50**	**	0.15		0.08	0.01		-0.06	-0.15		-0.19		-0.16		-0.29		-0.15		-0.18		-0.19		0.22		0.11	-0.32	*	-0.37	*
bio11	**0.51**	***	0.05		0.00	-0.40	*	0.03	0.05		-0.09		-0.06		-0.51	***	-0.48	**	-0.11		-0.17		-0.27		0.08	-0.35	*	-0.07	
bio12	0.15		0.08		-0.04	-0.10		-0.10	0.01		-0.07		-0.10		0.06		0.21		-0.30		-0.30		-0.17		-0.05	-0.06		0.05	
bio16	0.26		0.12		-0.03	-0.26		-0.15	0.00		-0.13		-0.14		0.01		0.19		-0.30		-0.33	*	-0.26		-0.07	-0.24		-0.05	
bio17	-0.09		-0.02		-0.06	0.13		0.00	0.03		0.07		0.01		0.09		0.17		-0.16		-0.15		-0.03		-0.01	0.25		0.22	
bio18	-0.37	*	-0.16		-0.20	0.28		0.12	0.24		0.18		0.20		0.22		0.29		-0.07		-0.07		0.12		0.07	**0.41**	**	0.36	*
bio19	0.16		0.05		-0.04	-0.17		-0.10	-0.02		-0.03		-0.07		-0.08		0.04		-0.16		-0.17		-0.26		-0.11	-0.10		0.07	
bio2	**0.45**	**	0.30		0.23	0.00		-0.22	-0.30		-0.33	*	-0.38	*	0.15		0.33	*	-0.46	**	-0.43	**	0.20		0.09	-0.40	*	-0.55	***
bio4	-0.08		0.07		0.06	**0.42**	**	-0.07	-0.17		-0.06		-0.07		0.24		0.33	*	-0.03		0.01		**0.47**	**	0.03	0.08		-0.25	
bio7	0.17		0.18		0.12	0.27		-0.14	-0.24		-0.20		-0.21		0.20		0.35	*	-0.25		-0.21		**0.42**	**	0.07	-0.15		-0.43	**

dec_lat: latitude; dec_lon: longitude; bio1: annual mean temperature; bio5: average maximum temperature of the warmest 14/15 days period; bio6: average minimum temperature of the coldest 14/15 days period; bio8, bio, bio10, bio11: mean temperature of the wettest, driest, warmest and coldest quarters, respectively; bio12: annual cumulated precipitations; bio16, bio17, bio18, bio19: cumulated precipitations in the wettest, driest, warmest and coldest quarters, respectively; bio2: mean diurnal range; bio4: temperature seasonality (standard deviation of average daily mean temperature per year); bio7: temperature annual range. WID: Winter damage, GSp: Growth in spring, GWi: Growth before winter, DIS: Disease susceptibility, HAE: Heading date, SPH: Spring height, TUSh: Tussock size (highest)



Supplemental Figure 1: Pearson correlation coefficients r between the phenotypic traits (population means). Asterisks indicate the significance level: *** p-value ≤ 0.001, **0.001 < p-value ≤ 0.01, *0.01 < p-value ≤ 0.05.