

Supplemental file

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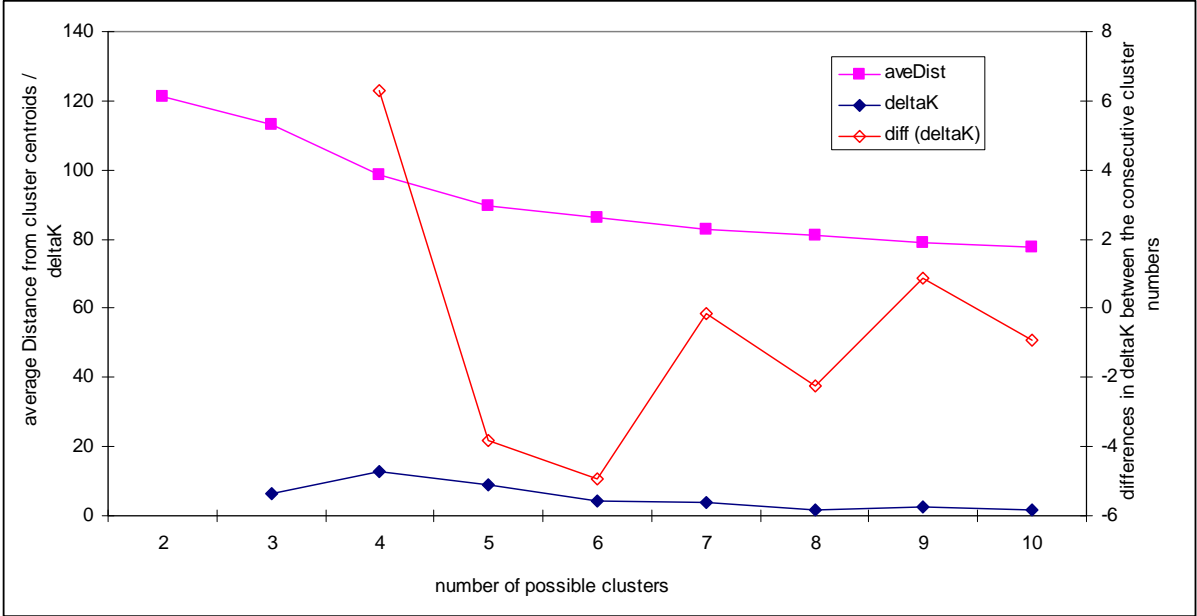
Developmental patterns of a large set of barley (*Hordeum vulgare* L.) cultivars in response to ambient temperature

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Supplemental Figure 1. Establishment of the possible number of clusters within the PCA scatterplot on the basis of the thermal times required to attain the various phenophases under four ambient temperature treatments in 168 barley cultivars. ($\Delta k_n = (\text{aveDist}_{\text{clu}N} - \text{aveDist}_{\text{clu}N+1}) / \text{aveDist}_{\text{clu}N}$; $\text{diff}\Delta k = \Delta k_{N+1} - \Delta k_N$)



Summary of the discriminant analysis	Four clusters	Six clusters
Percentage correct classifications	97.6	98.8
Number of cultivars not correctly placed	4	2
Average Mahalanobis distances within clusters	37.2	36.9
Average Mahalanobis distances between clusters	85.5	129.1

Supplemental Table 1 Lists of barley cultivars, with information on their origin and allele type in the major plant developmental genes as explained in Materials and Methods

Genotype	Ear type	Country	Region	<i>VrnH1 / VrnH2</i>	<i>VRN-H3</i>	<i>PPDH1</i>	<i>HvFT3</i>	Temp_Clu
Morex	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
Robust	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
Legacy	6	USA	NAM	spring	AG	ppdH1	Triumph like	3
Tradition	6	USA	NAM	spring	AG	ppdH1	Triumph like	3
Drummond	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
Foster	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
B1202	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
CDC-Kendall	2	CAN	NAM	spring	TC	ppdH1	Triumph like	3
Merit	2	USA	NAM	spring	AG	ppdH1	Triumph like	3
Klages	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
B1215	2	USA	NAM	spring	AG	ppdH1	Triumph like	3
Garnett	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
CDC-Stratus	2	CAN	NAM	spring	TC	ppdH1	Triumph like	3
AC_Metcalf	2	CAN	NAM	spring	AG	ppdH1	Triumph like	3
Baronesse	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Barke	2	DEU	EU	spring	TC	ppdH1	Triumph like	3
Arapiles	2	AUSTRALIA	AUS	spring	TC	PpdH1	Triumph like	2
Collins	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Scarlett	2	DEU	EU	spring	TC	ppdH1	Triumph like	3
B1614	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
MNBrite	6	USA	NAM	spring	AG	ppdH1	Triumph like	3
CDC-Sisler	6	CAN	NAM	spring	AG	ppdH1	Triumph like	3
Harrington	2	CAN	NAM	spring	TC	ppdH1	Triumph like	3
CDC-Copeland	2	CAN	NAM	spring	AG	ppdH1	Triumph like	3
Newdale	2	CAN	NAM	spring	AG	PpdH1	Triumph like	3
TR306	2	CAN	NAM	spring	TC	ppdH1	Triumph like	3
C-14	2	USA	NAM	spring	TC	PpdH1	Triumph like	2
Franklin	2	AUSTRALIA	AUS	spring	AG	ppdH1	Triumph like	3
Flagship	2	AUSTRALIA	AUS	spring	TC	PpdH1	Triumph like	2
Strider	6	USA	NAM	winter	AG	PpdH1	Igri like	4
Kold	6	USA	NAM	winter	AG	PpdH1	Igri like	5
88Ab536	6	USA	NAM	facultative	AG	ppdH1	Triumph like	6
Orca	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
BCD47	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Sussex	6	USA	NAM	winter	TC	PpdH1	Triumph like	6
Price	6	USA	NAM	winter	TC	PpdH1	Triumph like	6
Thoroughbred	6	USA	NAM	winter	TC	PpdH1	Igri like	4
Wysor	6	USA	NAM	winter	TC	PpdH1	Igri like	4
Nomini	6	USA	NAM	winter	AG	PpdH1	Igri like	4
Conlon	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
ND21863	2	USA	NAM	spring	AG	ppdH1	Igri like	3
Bowman	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Shenmai3	2	CHINA	EA	facultative	TC	ppdH1	Igri like	2
Canela	2	CIMMYT	CAM	spring	TC	ppdH1	Triumph like	6
M122	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
M123	6	USA	NAM	spring	AG	ppdH1	Triumph like	3

FE90-31	6	USA	NAM	spring	AG	ppdH1	Triumph like	3
FE66-08	6	USA	NAM	spring	AG	ppdH1	Triumph like	3
Stellar	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
Larker	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
NDB112	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
ND20448	6	USA	NAM	spring	TC	ppdH1	Triumph like	6
ND20508	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
Clho4196	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Craft	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Hockett	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Geraldine	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Eslick	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Haxby	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Hays	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Sublette	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Charles	2	USA	NAM	winter	TC	ppdH1	Igri like	5
Radiant	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Crest	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Farmington	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Belford	6	USA	NAM	winter	TC	PpdH1	Triumph like	6
Washford	6	USA	NAM	spring	TC	ppdH1	Triumph like	3
WA1614-95	6	USA	NAM	facultative	AG	PpdH1	Igri like	6
Conrad	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
2B98-5312	2	USA	NAM	spring	AG	ppdH1	Triumph like	3
6B94-8253	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
BCD12	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Haruna_Nijo	2	JAPAN	EA	facultative	TC	PpdH1	Triumph like	2
Colter	6	USA	NAM	spring	TC	PpdH1	Triumph like	2
Galena	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
Gobernadora	2	USA	NAM	spring	TC	ppdH1	Triumph like	2
Eight-twelve	6	USA	NAM	winter	AG	PpdH1	Triumph like	6
Hundred	6	USA	NAM	winter	TC	PpdH1	Igri like	5
Scio	6	USA	NAM	facultative	AG	PpdH1	Triumph like	6
Lewis	2	USA	NAM	spring	TC	ppdH1	Triumph like	3
ND5377	6	USA	NAM	spring	AG	PpdH1	Triumph like	6
Steptoe	6	USA	NAM	spring	TC	PpdH1	Igri like	2
Calisib	6	CIMMYT	CAM	winter	TC	ppdH1	Triumph like	6
Dicktoo	6	USA	NAM	facultative	TC	PpdH1	Igri like	2
Kompolti 4	6	HU	EU	winter	TC	PpdH1	Igri like	4
Rex	2	HOR	EU	winter	AG	ppdH1	Triumph like	1
Hardy	2	A	EU	winter	AG	PpdH1	Igri like	4
Kompolti kor.	6	HU	EU	winter	TC	PpdH1	Igri like	5
Manas	6	UKR	EU	facultative	TC	PpdH1	Igri like	2
Plaisant	6	FRA	EU	winter	TC	PpdH1	Igri like	4
Secura	2	A	EU	spring	TC	ppdH1	Triumph like	3
Montana	2	USA	NAM	winter	TC	ppdH1	Igri like	1
Jubilant	2	SLO	EU	spring	TC	ppdH1	Triumph like	3
P3313	6	A	EU	winter	TC	PpdH1	Igri like	6
Vintage	2	GB	EU	spring	TC	ppdH1	Triumph like	3
Orbit	2	SLO	EU	spring	TC	ppdH1	Triumph like	6
Petra	6	A	EU	winter	TC	PpdH1	Igri like	5
Barbinak	6	UKR	EU	winter	AG	PpdH1	Igri like	5

Rodnik	2	HOR	EU	winter	TC	ppdH1	Triumph like	5
Chevron	6	USA	NAM	spring	AG	ppdH1	Triumph like	6
Igri	2	D	EU	winter	TC	PpdH1	Igri like	5
Grivita	2	RO	EU	winter	TC	PpdH1	Igri like	5
Viktoria	2	RO	EU	winter	TC	ppdH1	Igri like	1
Kompolti 17	6	HU	EU	winter	TC	PpdH1	Igri like	4
Attila	6	D	EU	winter	TC	PpdH1	Igri like	4
GK Metál	2	HU	EU	winter	TC	PpdH1	Igri like	6
GK Eszter	6	HU	EU	winter	TC	PpdH1	Igri like	5
GK SztárOmega	2	HU	EU	winter	TC	ppdH1	Igri like	1
Gotic	6	FRA	EU	winter	AG	PpdH1	Igri like	6
Patricia	6	A	EU	winter	TC	PpdH1	Igri like	1
Cristal	2	FRA	EU	winter	TC	ppdH1	Triumph like	1
Extract	2	GB	EU	spring	TC	ppdH1	Triumph like	3
Pannonia	2	A	EU	spring	TC	ppdH1	Triumph like	6
Maresi	2	D	EU	spring	TC	ppdH1	Triumph like	6
Chalice	2	GB	EU	spring	TC	ppdH1	Triumph like	3
Svit	2	SLO	EU	spring	TC	ppdH1	Triumph like	6
Ferment	2	GB	EU	spring	TC	ppdH1	Triumph like	6
Panorama	2	A	EU	spring	TC	ppdH1	Triumph like	6
Nure	2	I	EU	winter	TC	ppdH1	Triumph like	5
Tremois	2	FRA	EU	spring	TC	ppdH1	Triumph like	3
Mugurel	6	TURK	WA	winter	AG	PpdH1	Igri like	1
Skorohod	6	RUS	EU	winter	TC	PpdH1	Igri like	5
Adagio	2	GB	EU	spring	TC	ppdH1	Triumph like	6
Acuario	2	USA	NAM	spring	TC	ppdH1	Triumph like	6
Cabuya	6	CIMMYT	CAM	spring	TC	ppdH1	Triumph like	6
Ciurelo	6	CIMMYT	CAM	spring	TC	ppdH1	Triumph like	6
Baishishek	2	Kazak	WA	winter	TC	PpdH1	Triumph like	2
Pamir-09	2	ICARDA	WA	winter	TC	PpdH1	Triumph like	5
Tokak	2	TURK	WA	spring	TC	ppdH1	Triumph like	6
Gaelic	2	FRA	EU	spring	TC	ppdH1	Igri like	3
Hassan	2	NLD	EU	spring	TC	ppdH1	Triumph like	6
Kym	2	GBR	EU	spring	TC	ppdH1	Triumph like	6
Cierzo	6	ESP	EU	spring	TC	PpdH1	Igri like	2
Alexis	2	DEU	EU	spring	TC	ppdH1	Triumph like	3
Orria	6	ESP	EU	spring	TC	ppdH1	Igri like	6
Hatif de Grignon	6	FRA	EU	facultative	TC	PpdH1	Igri like	2
Monlón	6	FRA	EU	facultative	AG	PpdH1	Igri like	2
Alpha	2	FRA	EU	winter	TC	ppdH1	Igri like	1
Pané	6	ESP	EU	winter	TC	PpdH1	Triumph like	2
Aldeaseca	6	ESP	EU	winter	AG	PpdH1	Triumph like	4
Albacete	6	ESP	EU	winter	TC	PpdH1	Triumph like	2
Barberousse	6	FRA	EU	winter	TC	PpdH1	Igri like	5
Liliana	6	RO	EU	facultative	TC	PpdH1	Igri like	2
Univers	6	RO	EU	facultative	TC	PpdH1	Igri like	2
Somborac	6	SERB	EU	winter	TC	PpdH1	Igri like	6
Javor	6	SERB	EU	winter	TC	PpdH1	Igri like	6
Izvor	2	MAC	EU	winter	TC	ppdH1	Triumph like	5
Hit	2	MAC	EU	winter	TC	PpdH1	Triumph like	4
Orman	2	MAC	EU	winter	TC	PpdH1	Triumph like	5
Nitran	2	SLO	EU	spring	TC	ppdH1	Triumph like	3

GK Habzó	2	HU	EU	spring	TC	ppdH1	Triumph like	6
Andrea	2	RO	EU	facultative	TC	PpdH1	Igri like	2
Pek	2	SERB	EU	spring	TC	PpdH1	Triumph like	2
GK-STRAMM	2	HU	EU	winter	TC	ppdH1	Triumph like	6
GK-JUDY	2	HU	EU	winter	TC	ppdH1	Igri like	1
KH-MALKO	2	HU	EU	winter	AG	ppdH1	Igri like	1
KH-TAS	6	HU	EU	winter	AG	PpdH1	Igri like	4
KH-KORSO	2	HU	EU	winter	TC	ppdH1	Triumph like	3
KH-VIKTOR	6	HU	EU	winter	TC	PpdH1	Igri like	5
PALINKA	6	HU	EU	winter	TC	PpdH1	Igri like	1
ANGORA	2	DEU	EU	winter	TC	ppdH1	Igri like	5
TIFFANY	2	DEU	EU	winter	TC	ppdH1	Igri like	5
NELLY	6	DEU	EU	winter	TC	PpdH1	Igri like	5
CANDESSE	6	DEU	EU	facultative	AG	PpdH1	Igri like	2
FRIDERICUS	6	DEU	EU	winter	TC	PpdH1	Igri like	5
LOMERIT	6	DEU	EU	winter	TC	PpdH1	Igri like	6
SIBERIA	6	FRA	EU	winter	TC	PpdH1	Igri like	4
PARIS	6	GBR	EU	winter	TC	PpdH1	Igri like	6

Supplemental Table 2. Two-way ANOVA without replication of the morphological traits

measured in the entire set of barley cultivars

Traits	Variance components (MQ)				
	Temperature (T)		Genotype (G)		Error
DEV21 (days)	1,457,332	***	8,640	**	6,448
DEV29 (days)	2,781,812	***	78,515	***	29,142
DEV31 (days)	1,784,194	***	175,530	***	687
DEV30 (days)	1,227,131	***	140,329	***	13,533
DEV37 (days)	1,213,705	***	131,787	***	8,898
DEV39 (days)	1,552,591	***	145,491	***	10,661
DEV49 (days)	2,931,663	***	318,255	***	1,102
DEVSE end (days)	1,173,367	***	152,773	***	11,208
DEVPHmax (days)	430,102	***	138,516	***	11,399
Duration of stem elongation (GDD ¹)	396,436	***	7,797	*	6,016
Duration of tillering period (GDD)	1,364,131	***	88,913	***	28,906
Leaf number at DEV31	4.4	***	6.4	***	0.3
Leaf number at DEV31 (%)	585	***	165	***	27.0
Phyllochron (GDD)	39,585	***	601	***	67.0
Final leaf number	19.6	***	7.0	***	0.5
Plant height at DEV31 (cm)	29.6	***	14.4	***	3.8
Plant height at DEV49 (cm)	8917	***	146	***	30.0
Final plant height (cm)	19152	***	156.8	***	25.9
Rate of plant height growth (GDD)	924.9	***	13.3	***	5.7

df for temperature = 4; df for genotype = 167; df for error = 668

1 GDD, growing degree days

Supplemental Table 3. Cluster means of the thermal times required to attain nine developmental phases under the four ambient temperature treatments for the six clusters of barley cultivars with different growth habits

Developmental phase	Temp	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	P value
		N = 11	N = 21	N = 47	N = 13	N = 21	N = 55	
DEV21	13.0	80 b ¹	96 ab	101 ab	101 ab	105 a	103 a	0.015
	16.5	130	113	113	116	120	116	0.767
	18.0	100	108	123	108	91	115	0.421
	23.0	241 b	475 a	277 b	228 b	243 b	288 b	1.5E-07
LSD (0.05) ²		39.4	71.7	20.8	89.0	31.2	28.2	
DEV29	13.0	559 a	366 c	376 c	420 b	495 a	381 c	4.2E-21
	16.5	688 a	356 c	595 a	653 a	648 a	485 b	2.8E-16
	18.0	886 a	406 d	740 b	783 ab	808 ab	493 c	3.2E-22
	23.0	1085 a	601 c	840 b	459 d	832 b	558 cd	9.6E-15
LSD (0.05)		122.7	83.4	73.4	157.7	71.9	54.1	
DEV30	13.0	792 a	387 e	505 d	564 c	678 b	501 d	7.2E-46
	16.5	1025 a	298 f	454 d	674 c	803 b	409 e	1.5E-63
	18.0	1115 a	324 f	504 c	784 b	891 b	444 e	1.9E-57
	23.0	1212 a	398 e	798 c	544 d	948 b	590 d	3.5E-51
LSD (0.05)		117.0	18.8	31.3	107.1	69.6	27.3	
DEV31	13.0	603 a	307 d	345 c	468 b	565 a	354 c	4.2E-47
	16.5	684 a	278 d	335 c	595 b	632 ab	338 c	3.8E-55
	18.0	788 a	307 d	359 c	691 b	701 b	361 c	4.6E-57
	23.0	1042 a	353 e	541 c	542 c	779 b	472 d	4.7E-63
LSD (0.05)		84.1	22.5	17.3	79.6	43.2	16.2	
DEV37	13.0	897 a	449 e	565 d	684 c	834 b	553 d	3.8E-59
	16.5	1008 a	396 f	578 d	818 c	891 b	526 e	4.8E-67
	18.0	1073 a	409 f	611 d	866 c	979 b	555 e	6.3E-71
	23.0	1367 a	476 e	857 c	677 d	1035 b	692 d	1.0E-65
LSD (0.05)		99.8	22.1	20.9	102.6	51.8	22.4	
DEV39	13.0	987 a	530 e	650 d	750 c	909 b	631 d	1.7E-64
	16.5	1141 a	473 f	671 d	914 c	1005 b	608 e	1.3E-70
	18.0	1209 a	494 f	718 d	990 c	1100 b	650 e	6.1E-72
	23.0	1499 a	546 f	997 c	755 d	1138 b	797 d	4.8E-67
LSD (0.05)		96.2	22.3	21.5	104.9	56.0	22.8	
DEV49	13.0	1017 a	575 f	715 d	785 c	937 b	692 e	4.1E-62
	16.5	1288 a	544 f	780 d	1006 c	1092 b	703 e	3.4E-73
	18.0	1398 a	555 f	794 d	1077 c	1197 b	721 e	3.0E-74
	23.0	1557 a	585 f	1084 c	785 e	1173 b	856 d	3.0E-61
LSD (0.05)		94.6	22.2	19.1	103.8	64.3	22.7	
DEVSEend	13.0	1095 a	656 e	748 d	831 c	1025 b	735 d	4.2E-68
	16.5	1340 a	598 e	887 c	1071 b	1144 b	807 d	2.4E-69
	18.0	1460 a	625 f	904 d	1160 c	1272 b	797 e	3.8E-72
	23.0	1523 a	632 e	1101 c	836 d	1225 b	886 d	1.3E-59
LSD (0.05)		98.8	25.2	20.8	98.5	61.9	24.3	
DEVPHmax	13.0	1180 a	766 e	884 c	956 b	1129 a	860 d	1.4E-46
	16.5	1388 a	723 f	956 d	1110 c	1190 b	875 e	3.2E-56
	18.0	1493 a	692 e	965 c	1227 b	1319 b	877 d	3.2E-60
	23.0	1560 a	712 e	1126 c	882 d	1272 b	924 d	1.2E-60
LSD (0.05)		89.7	34.1	24.6	109.9	63.2	29.0	

¹ Values with same letters within a row are not significantly different at $P = 0.05$ (comparison of the various clusters under a given temperature)

² The least significant difference (LSD) at $P = 0.05$ between the values of a given cluster under the different temperature regimes

Supplemental Table 4. Group means of the yield component traits under the four ambient temperature treatments for the six clusters of barley cultivars with different growth habits

Trait	Temp	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	P value
		N = 11	N = 21	N = 47	N = 13	N = 21	N = 55	
No of reproductive tillers	13.0	5.0 ab	3.4 cd	5.6 a	2.8 d	4.4 bc	3.7 cd	1.4E-08
	16.5	2.3 c	3.5 b	4.4 a	2.8 bc	3.7 ab	3.1 b	8.6E-07
	18.0	1.8 d	3.2 ab	3.8 a	2.1 cd	2.5 c	2.7 bc	3.7E-08
	23.0	1.5 b	1.6 b	2.9 a	1.1 b	1.7 b	1.6 b	4.2E-08
LSD(0.05)		1.0	0.6	0.4	0.5	0.8	0.3	
Seed no. in main spike	13.0	42.7 bc	40.2 bc	35.9 c	61.1 a	51.8 ab	47.8 b	3.3E-05
	16.5	32.0 bc	31.2 c	30.2 c	51.8 a	40.1 b	40.6 b	5.2E-06
	18.0	25.6 d	30.3 cd	29.1 d	45.0 a	35.3 bc	36.8 b	4.5E-05
	23.0	12.3 c	19.2 b	14.9 c	28.7 a	23.4 ab	23.3 ab	4.1E-07
LSD (0.05)		6.3	3.7	2.7	5.3	4.1	2.7	
Seed weight in main spike (g)	13.0	1.8 c	2.5 b	2.0 c	3.1 a	2.3 bc	2.6 b	1.2E-05
	16.5	1.5 bc	1.6 bc	1.5 c	2.4 a	2.1 a	1.8 ab	1.2E-06
	18.0	1.1 c	1.4 bc	1.4 c	1.8 a	1.6 ab	1.6 ab	0.0004
	23.0	0.5 c	0.8 b	0.6 bc	1.1 a	0.9 ab	0.9 ab	6.4E-07
LSD (0.05)		0.3	0.3	0.1	0.3	0.2	0.1	
1000-Kernel weight in main spike (g)	13.0	43.6 d	65.0 a	56.7 b	52.5 c	46.4 d	56.4 b	5.8E-14
	16.5	45.2 b	53.1 a	51.4 a	47.2 ab	53.5 a	46.6 b	0.0056
	18.0	43.8 ab	49.5 a	48.0 a	41.5 b	45.4 ab	44.9 ab	0.0437
	23.0	25.5 c	44.1 a	37.3 b	38.3 ab	36.9 b	39.9 ab	0.0002
LSD (0.05)		12.3	3.4	2.6	3.7	3.8	1.8	
Seed no. in side tillers	13.0	126.0 ab	84.4 c	147.8 a	130.5 ab	153.4 a	120.3 b	4.0E-10
	16.5	39.6 d	76.2 c	103.8 a	92.8 ab	87.4 bc	96.2 ab	8.5E-09
	18.0	15.9 d	57.0 bc	77.2 a	58.3 bc	50.2 c	66.2 b	6.7E-11
	23.0	9.1 d	15.7 cd	32.2 a	18.2 bc	21.5 bc	23.7 b	7.3E-06
LSD (0.05)		19.0	12.3	9.8	22.5	17.9	9.7	
Seed weight in side tillers (g)	13.0	4.7 c	4.8 c	7.1 a	6.0 b	5.7 b	6.0 b	3.0E-10
	16.5	1.4 c	3.2 b	4.1 a	3.3 b	3.6 b	3.6 b	2.7E-09
	18.0	0.6 d	2.3 bc	2.9 a	2.0 bc	1.8 c	2.5 b	4.5E-11
	23.0	0.3 c	0.8 b	1.1 a	0.6 bc	0.8 b	0.8 b	2.3E-05
LSD (0.05)		0.8	0.5	0.4	0.9	0.7	0.4	
1000-Kernel weight in side tillers (g)	13.0	37.8 c	59.1 a	49.1 b	47.1 b	38.8 c	50.5 b	1.2E-18
	16.5	25.5 c	45.7 a	41.1 ab	37.0 b	39.6 ab	39.0 b	2.2E-05
	18.0	15.8 c	41.4 a	38.1 a	30.3 b	32.7 b	38.9 a	2.2E-11
	23.0	13.0	26.2 b	34.2 a	24.5 b	31.8 a	28.2 b	0.0001
LSD (0.05)		11.6	7.5	2.3	7.9	5.7	3.1	
Yield (g)	13.0	6.5 d	7.3 c	9.2 a	9.1 a	8.0 bc	8.6 ab	1.7E-09
	16.5	2.9 c	4.8 b	5.3 a	5.7 a	5.7 a	5.4 a	2.3E-07
	18.0	1.7 c	3.7 ab	4.3 a	3.8 ab	3.3 ab	4.1 a	7.7E-10
	23.0	0.8 c	1.3 b	1.7 a	1.7 ab	1.6 ab	1.7 a	0.0001
LSD (0.05)		1.2	0.6	0.5	1.0	0.8	0.5	

¹ Values with the same letter within a row are not significantly different at $P = 0.05$

(comparison of the various clusters under a given temperature)

² The least significant difference (LSD) at $P = 0.05$ between the values of a given cluster under the different temperature regimes

Supplemental Table 5. Correlation between the DEV49 values from the field-grown and controlled environment experiments for the 168 barley cultivars

DEV49 in field test	Group	DEV49 in controlled tests at ambient temperature			
		13 °C	16.5 °C	18 °C	23 °C
Field_0vern ¹	168 cultivars	0.71***	0.76***	0.75***	0.54***
	Spring (Clu_3, 6)	0.34***	0.33***	0.29**	Ns
	Facult (Clu_2)	0.73***	0.46*	0.67***	Ns
	Winter (Clu_1, 4, 5)	0.44**	0.60***	0.52***	0.47***
Field_15vern	168 cultivars	0.75***	0.73***	0.73***	0.59***
	Spring (Clu_3, 6)	0.42***	0.26**	0.22*	Ns
	Facult (Clu_2)	0.79***	0.49*	0.75***	Ns
	Winter (Clu_1, 4, 5)	0.46**	0.49***	0.51***	0.56***
Field_30vern	168 cultivars	0.69***	0.62***	0.63***	0.64***
	Spring (Clu_3, 6)	0.41***	0.24*	0.26**	Ns
	Facult (Clu_2)	0.94***	0.59**	0.75***	0.51*
	Winter (Clu_1, 4, 5)	0.53***	0.45**	0.51***	0.61***
Field_45vern	168 cultivars	0.56***	0.45***	0.44***	0.63***
	Spring (Clu_3, 6)	0.49***	0.28**	0.30**	0.36***
	Facult (Clu_2)	0.83***	0.60**	0.67***	0.56**
	Winter (Clu_1, 4, 5)	0.47***	Ns	0.33*	0.61***
Field_60vern	168 cultivars	0.55***	0.45***	0.45***	0.63***
	Spring (Clu_3, 6)	0.40***	0.26**	0.28**	0.39***
	Facult (Clu_2)	0.88***	0.60**	0.74***	0.58**
	Winter (Clu_1, 4, 5)	0.55***	0.40*	0.45**	0.62***

¹ Duration of vernalization treatment in days before transplantation of plants into the field