Table S1. Peach germplasm included in the study. Phenotypic data for bloom and heat requirement observed per accession averaged across eight years (2014–2021). Min—minimum; max—maximum; and BLUP—best linear unbiased prediction values for bloom date. Heat requirement was calculated as the growing degree hours using Richardson's model [27] at three different base temperatures (2.5, 4.5 and 6.5 °C) for each accession. Chilling requirements (CR), fruit type, origin and cultivar release date are also included.

Accession	Fruit type	Origin	Release date	CR	Heat Requirement					Bloom Date		
					BLUP (Tb)					Julian Days		
					Min	Max	2.5 °C	4.5 °C	6.5 °C	Min	Max	BLUP
SC-10	P	US (SC)	-	516	5997	8338	8882	6917	4972	54	71	62
SC-13	P	US (SC)	-	516	6863	9656	9436	7342	5257	55	74	65
SC-12	P	US (SC)	-	540	7039	9682	9560	7441	5327	55	76	67
SC-02	P	US (SC)	-	564	5947	8057	8602	6723	4865	53	71	62
Coronet	P	US (GA)	1953	588	5934	8859	9203	7167	5142	58	77	69
Burpeachfourteen	P	US (CA)	2003	600	5631	8338	9014	7015	5031	55	79	68
Burpeachnineteen	P	US (CA)	2004	600	5631	8148	8795	6863	4944	54	76	67
Carored	P	US (SC)	2005	612	6197	6964	8311	6495	4713	74	75	69
Sierra Gem	P	US (CA)	1999	612	6281	9761	9729	7592	5451	61	80	72
Burpeachfive	P	US (CA)	2002	636	6243	9263	9356	7321	5283	61	79	72
Caroking	P	US (SC)	1987	636	5824	9263	9045	7090	5136	61	79	71
Empress	P	US (CA)	1964	650	5400	7583	8350	6556	4778	58	77	69
Goldcrest	P	US (CA)	1984	650	4598	6967	7742	6080	4447	54	74	66
June Gold	P	US (CA)	1959	650	4879	7495	8031	6319	4624	55	77	68
June Prince	P	US (GA)	1985	650	4598	7364	7999	6286	4594	54	76	67
Karla Rose	N	US (CA)	1975	650	5824	7668	8375	6584	4807	71	78	70
Snow Queen	N	US (CA)	1975	650	6336	10348	9244	7230	5217	77	89	76
Suncrest	P	US (CA)	1959	650	6117	7989	8916	6988	5064	61	79	72
Glowingstar	P	US (MI)	1997	660	7132	9670	9891	7721	5539	79	83	78
Flamin' Fury (PF23)	P	US (MI)	1993	700	5287	6332	8138	6426	4725	58	77	69
Klondike White	P	US (CA)	1999	700	5822	6487	8307	6552	4806	62	78	70

Saturn	P	US (NJ)	1980	700	6004	7125	8559	6734	4916	61	81	72
Stark Saturn	P	US (NJ)	1985	700	7125	7125	8387	6608	4843	81	81	74
Valley Sweet	P	US (CA)	1998	700	4485	6944	7707	6125	4560	54	62	64
Brightstar	P	US (CA)	1976	708	6242	7502	8920	7019	5114	62	81	74
SC-09	P	US (SC)	-	708	5473	9194	8589	6760	4936	59	76	71
Allstar	P	US (MI)	1995	750	6228	9725	8941	7043	5138	73	80	74
Arctic Blaze	N	US (CA)	1998	750	4476	8012	8143	6435	4738	58	76	69
Arrington	N	US (AR)	2002	750	5193	9114	8566	6756	4948	61	79	72
Big Red	P	US (FL)	1969	750	5193	9524	8645	6823	4998	61	81	72
Blake	P	US (NJ)	1953	750	7366	7373	9158	7165	5175	77	82	78
Canadian Harmony	P	Canada	1968	750	6228	7322	8675	6840	5002	68	80	73
Carolina Belle	P	US (NC)	1990	750	6889	7744	8916	7003	5089	80	83	76
Fantasia	N	US (CA)	1969	750	5031	7322	8342	6588	4838	60	79	71
Flavortop	N	US (CA)	1969	750	5391	7322	8399	6630	4863	63	79	72
Gala Peach	P	US (GA)	1992	750	4476	6317	8008	6345	4690	58	78	70
Galaxy	P	US (CA)	1995	750	2911	6316	7184	5690	4228	51	74	66
Harvester	P	US (LA)	1973	750	5193	6784	8243	6515	4791	61	78	71
Majestic	P	US (LA)	1979	750	5869	8877	8657	6832	5003	67	80	73
Redskin	P	US (MD)	1944	750	6362	6870	8664	6833	5000	69	80	73
Scarlet Pearl	P	US (GA)	1989	750	5531	9114	8417	6644	4874	64	79	72
Summer Gold	P	US (GA)	1970	750	5719	6051	8074	6387	4709	65	76	71
Sunbrite	P	US (GA)	1976	750	4476	7348	7602	6011	4441	58	75	68
Sunhigh	P	US (NJ)	1938	750	5993	7322	8542	6741	4940	67	80	72
Westbrook	N	US (AR)	2002	750	4791	9524	8795	6936	5071	58	81	73
Wildrose	P	US (NJ)	1947	750	5391	9524	8529	6730	4932	63	79	72
Yukon King	P	US (CA)	1997	750	6283	7322	8421	6635	4858	69	79	74
Burnectseven	N	US (CA)	2003	756	5299	9016	8489	6700	4913	63	79	72
Earlystar	P	US (GA)	-	756	5299	9426	8665	6837	5007	63	80	73
Winblo sport	P	US (NC)	1972	756	6228	7321	8496	6702	4910	74	81	73
Arctic Pride	N	US (CA)	1993	800	2846	8193	7544	6043	4543	58	72	69

Autumnprince	P	US (GA)	1997	800	3901	9106	8318	6599	4876	64	82	73
Autumn Red	P	US (CA)	1996	800	5284	5284	8307	6564	4829	74	74	78
Bounty	P	US (WV)	1988	800	3667	6510	7809	6206	4610	62	79	71
Calred	P	US (CA)	1976	800	5284	7250	8348	6607	4865	71	81	74
Early Augustprince	P	US (GA)	2006	800	5112	7250	8471	6707	4938	69	81	74
Early Loring Blair	P	US (KY)	1977	800	4365	7009	8318	6585	4851	66	82	74
Elberta	P	US (GA)	1889	800	5112	7509	8452	6687	4918	69	82	75
Galactica	P	US (NC)	1995	800	5112	7009	8400	6653	4902	69	81	74
Glory	P	US (GA)	1992	800	5280	7509	8368	6624	4878	73	82	74
Harrow Beauty	P	Canada	1983	800	6386	7265	8937	7047	5145	77	83	78
Joanna Sweet	P	US (CA)	1999	800	5112	7250	8378	6632	4884	69	81	75
John Boy PP#11591	P	US (PA)	2000	800	4365	7250	8293	6569	4844	66	81	74
John Boy PP#6827	P	US (NJ)	1989	800	3564	6588	7938	6309	4683	61	79	71
Loring	P	US (MO)	1946	800	3667	9106	8215	6521	4825	62	80	73
O’Henry	P	US (CA)	1970	800	4876	9106	8416	6675	4927	68	80	74
Parade	P	US (CA)	1960	800	3762	9106	7992	6350	4710	63	79	72
Rich May	P	US (CA)	1991	800	3402	5950	7544	6011	4489	60	76	70
SC-01	P	US (SC)	-	800	2706	6930	7155	5742	4338	57	74	66
SC-08	P	US (SC)	-	800	5095	8459	7778	6221	4659	58	74	69
Snow Giant	N	US (CA)	1993	800	2846	6510	7736	6154	4580	58	79	71
Sugar Giant	P	US (CA)	1993	800	5112	7009	8372	6634	4891	69	81	74
Summer Beaut	N	US (CA)	1979	800	5112	7009	8500	6718	4934	69	82	75
Sunprince	P	US (GA)	1982	800	3402	8943	7872	6261	4654	60	79	71
Sweet Dream	P	US (CA)	1998	800	5112	6769	8297	6579	4858	69	80	73
Sweet Scarlet	P	US (CA)	1996	800	3762	6769	7960	6324	4691	63	80	72
Tra-Zee	P	US (CA)	1988	800	5915	5915	8558	6735	4923	78	78	80
Victoria	P	US (CA)	1993	800	3564	7797	8060	6388	4721	61	79	72
White County	P	US (AR)	1993	800	5112	6769	8329	6599	4867	69	80	74
White Lady	P	US (CA)	1986	800	7082	7524	9179	7225	5257	81	83	79
White Rock	P	US (AR)	1993	800	5280	7524	8561	6777	4986	64	83	75

Augustprince	P	US (GA)	2006	850	1547	6539	7087	5721	4356	69	81	75
Belle of Georgia	P	US (GA)	1875	850	1715	7190	7700	6141	4585	73	82	76
Blazeprince	P	US (GA)	1997	850	5243	8941	8033	6395	4753	75	80	73
Carogem	P	US (SC)	1989	850	2178	6935	7668	6120	4575	72	82	75
Early Red Fire	P	US (VA)	1938	850	2543	7491	7881	6279	4676	76	84	77
Fireprince	P	US (GA)	1985	850	5796	8458	8057	6429	4791	73	80	73
Flameprince	P	US (GA)	1993	850	5661	8458	7945	6344	4736	73	79	72
Garnet Beauty	P	Canada	1958	850	2178	6772	7613	6070	4535	77	81	76
Glohaven	P	US (MI)	1963	850	1715	6526	7414	5931	4455	73	79	74
Jefferson	P	US (VA)	1960	850	3578	6797	7898	6295	4690	79	83	77
Julyprince	P	US (GA)	2004	850	1654	7190	7694	6146	4598	70	82	75
June Princess	N	US (GA)	1997	850	6117	8694	8106	6463	4807	74	79	73
Madison	P	US (VA)	1963	850	3872	7190	8141	6471	4797	78	84	79
Redglobe	P	US (MD)	1954	850	1654	7449	7713	6156	4601	70	83	75
Redgold	N	US (CA)	1962	850	1547	6772	7467	5975	4488	69	81	74
Redrose	P	US (NJ)	1940	850	1654	6797	7199	5799	4400	70	82	75
Scarlet Prince	P	US (GA)	1989	850	5426	6694	7879	6288	4692	73	80	72
Sentry	P	US (WV)	1980	850	5426	6526	7881	6299	4707	73	79	72
September Sun	P	US (CA)	1987	850	1547	7190	7635	6100	4568	69	82	75
Springold	P	US (GA)	1966	850	5242	6141	7761	6218	4664	71	77	71
Starfire	P	US (MI)	1995	850	1715	6694	7482	5981	4486	73	80	74
Summer Prince	P	US (GA)	1992	850	5242	8941	7755	6207	4653	71	77	71
Sunglo	N	US (CA)	1962	850	1547	6668	7356	5894	4438	69	80	73
Sweet September	P	US (CA)	1997	850	2350	2350	7159	5769	4383	78	78	80
Beaumont	P	US (MI)	2007	852	5661	9305	8097	6458	4810	59	79	72
Arctic Belle	N	US (CA)	1998	900	6076	8354	7989	6395	4785	71	79	75
Arctic Jay	N	US (CA)	1991	900	5196	5526	7430	5972	4510	71	77	70
Biscoe	P	US (NC)	1977	900	5380	6567	7723	6189	4647	73	80	73
Encore	P	US (NJ)	1980	900	5808	6567	7913	6328	4732	77	81	74
Risingstar	P	US (MI)	1997	900	6504	7390	8436	6713	4974	67	84	77

September Snow	P	US (CA)	1992	900	5380	5820	7554	6056	4555	73	79	71
Snow King	P	US (CA)	1993	900	5808	6671	7936	6335	4726	77	81	74
BY93p3538	P	US (GA)	-	924	6070	8154	7910	6338	4747	76	79	74
Jersey Queen	P	US (NJ)	1964	924	6492	6730	8266	6597	4909	81	83	77
Autumnglo	P	US (NJ)	1977	950	5260	5997	7569	6102	4619	71	80	74
Candor	P	US (NC)	1965	950	5485	5919	7435	6001	4554	76	82	73
Challenger	P	US (NC)	1999	950	5388	6024	7407	5983	4544	74	80	73
Coralstar	P	US (MI)	1997	950	5388	8151	7549	6085	4609	74	80	73
Cresthaven	P	US (MI)	1963	950	5506	6158	7647	6150	4638	77	81	74
CVN-4	P	US (TN)	-	950	5260	6024	7427	6000	4559	74	80	73
Harrow Diamond	P	Canada	1984	950	5029	6158	7457	6019	4567	72	81	73
Redhaven	P	US (MI)	1940	950	5352	5919	7349	5941	4520	75	80	73
Sureprince	P	US (GA)	1998	950	5260	6024	7427	6000	4559	74	80	73
SC-03	P	US (SC)	-	972	3877	6659	7135	5776	4410	67	83	77
SC-07	P	US (SC)	-	972	1362	5441	5811	4808	3814	57	76	70
SC-04	P	US (SC)	-	996	3052	6542	6803	5538	4269	66	82	76
Intrepid	P	US (NC)	2002	1000	5260	6489	7859	6317	4752	82	83	77
Redstar	P	US (MI)	1997	1000	6282	6754	8166	6565	4932	81	88	78
Carolina Gold	P	US (NC)	2007	1050	4619	6277	7536	6095	4629	81	82	76
Contender	P	US (NC)	1987	1050	5175	6296	7533	6112	4662	81	84	77
Raritan Rose	P	US (NJ)	1936	1050	5166	7374	8058	6506	4915	79	89	79
Reliance	P	US (NH)	1964	1050	6017	6591	8064	6486	4875	84	87	79
SC-05	P	US (SC)	-	1068	4147	7201	7403	6001	4574	72	82	78
SC-11	P	US (SC)	-	1068	3779	5338	6673	5489	4282	61	79	73
SC-06	P	US (SC)	-	1116	4856	4856	7289	5961	4576	77	77	72

Table S2. Description of phenotypic data for bloom and heat requirement observed in the peach germplasm per year of study. Minimum (Min), maximum (Max), mean and standard deviation (SD) of bloom dates expressed in Julian days, and heat requirements using different threshold temperatures (Tb) (2.5 °C, 4.5 °C and 6.5 °C) expressed in growing degree hours in each year (2014–2021) are shown.

Trait	Year	Min	Max	Mean	SD
Bloom date (JD)	2014	68	89	75	3.6
	2015	74	85	80	2.3
	2016	74	89	79	2.9
	2017	51	84	66	8
	2018	56	76	62	4.8
	2019	54	73	65	6.4
	2020	53	83	71	6.6
	2021	71	82	78	2.6
Heat requirement (Tb 2.5 ºC)	2014	6449	9460	7722	591
	2015	7096	9866	8463	621
	2016	5363	12574	7866	1033
	2017	1875	11892	6060	2505
	2018	6291	10627	8730	1036
	2019	4949	10694	7918	1644
	2020	1616	12013	9950	2096
	2021	6162	10168	8743	926
Heat requirement (Tb 4.5 ºC)	2014	4946	7374	5948	450
	2015	5414	7640	6555	488
	2016	4619	10348	6511	811
	2017	1547	9670	4944	2034
	2018	5223	8497	7059	775
	2019	3779	8148	6045	1220
	2020	1362	9761	8171	1710
	2021	4856	7744	6660	671
Heat requirement (Tb 6.5 ºC)	2014	3310	5288	4175	320
	2015	3605	5421	4647	379
	2016	3843	8122	5155	601
	2017	1219	7462	3829	1563
	2018	4155	6367	5388	515
	2019	2609	5602	4173	807
	2020	1108	7599	6392	1330
	2021	3550	5320	4577	431

BLUP: Best linear unbiased prediction

Table S3. Correlation between bloom date (BD), heat (HR), and chilling requirement (CR) among years (2014 to 2021). Asterisks indicate Pearson correlation coefficient at significance level of $p < 0.05$ (*) and $p < 0.01$ (**).

		BD							HR								CR
		2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Individual CH**
BD	**2014**	0.828**	0.846**	0.761**	0.514	0.848	0.674**	0.454**	**0.716****	0.410**	0.065	-0.057	-0.339	-0.372	0.578**	-0.285*	0.582**
	2015	1	0.739**	0.708**	0.367	0.685	0.791**	0.665**	0.598**	**0.650****	0.02	-0.095	-0.451	-0.535	0.712**	-0.152	0.555**
	2016		1	0.810**	0.453	0.685	0.793**	0.544**	0.553**	0.373**	**0.309****	-0.17	-0.267	-0.535	0.755**	-0.304*	0.521**
	2017			1	0.637*	0.339	0.795**	0.706**	0.461**	0.606**	0.299*	**-0.168**	0.046	-0.498	0.672**	0.101	0.615**
	2018				1	0.734**	0.679**	0.810**	0.636	-0.071	-0.051	-0.321	**0.246**	-0.372	-0.108	0.212	0.534*
	2019					1	0.739**	0.778**	0.419	0.089	-0.637	-0.197	-0.231	**-0.174**	-0.326	0.017	0.693**
	2020						1	0.816**	0.505**	0.486**	-0.073	-0.272	-0.191	-0.509*	**0.142**	0.127	0.720**
	2021							1	0.384**	0.502**	0.093	-0.303*	-0.026	-0.311	0.078	**0.298****	0.476**
HR	**2014**								1	0.681**	0.440**	0.414**	0.154	0.023	0.629**	0.317**	-0.037
	2015									1	0.502**	0.179	-0.233	0.202	0.591**	0.455**	-0.195*
	2016										1	0.426**	0.457	0.201	0.125	0.504**	-0.580**
	2017											1	0.352	0.772**	0.155	0.474**	-0.787**
	2018												1	0.698**	0.761**	0.778**	-0.637**
	2019													1	0.231	0.499*	-0.732**
	2020														1	0.427**	-0.342*
	2021															1	-0.625**

Table S4. Description of statistical significance of chilling (CR) and heat requirements (HR) on bloom date (BD) in the U.S. peach germplasm in each year of the study (2014–2021) and for BLUP values. *p*-values of analysis of variance (ANOVA) using multiple regression model and standardized model (*z*-scores), and *t*-test ($p < 0.05$) for each model are shown. Asterisks indicate significant correlation at a level of $p < 0.05$.

	Analysis of variance (ANOVA) multiple regression model $BD = \beta_0 + \beta_1 CR + \beta_2 HR$ Parameter Estimate (*p*-value)			Standardized Model (Mean Effect) $H_0: \beta_1 = \beta_2$ $H_1: \beta_1 \neq \beta_2$ Parameter Estimate (*p*-value)		
Year	**CR**	**HR**	**Custom Test (Significance $p < 0.05$)**	**CR**	**HR**	**Custom Test (Significance $p < 0.05$)**
2014	0.0212*	0.006*	$p<0.0001$*	0.6866	0.739	0.3019
2015	0.0155*	0.0037*	$p<0.0001$*	0.7901	0.7884	0.9679
2016	0.0285*	0.0033*	$p<0.0001$*	0.0099*	0.9205	$p<0.0001$*
2017	0.1215	0.0032*	$p<0.0001$*	1.7939	0.8294	0.9546
2018	0.0318*	0.0061*	$p<0.0001$*	0.7804	0.9842	0.0280*
2019	0.0424*	0.0037*	$p<0.0001$*	0.7847	0.7178	0.6016
2020	0.0472*	0.0017*	$p<0.0001$*	0.8409	0.4392	0.0003*
2021	0.022*	0.0038*	$p<0.0001$*	0.9962	0.9764	0.6873
BLUP	0.0285*	0.005*	$p<0.0001$*	0.986	0.6495	$p<0.0001$*

$\beta 0$: intercept; β_1: chilling requirement (CR) effect; β_2: heat requirement (HR) effect.

Table S5. Chilling requirements (CR), and heat requirements (GDH) in the U.S. peach germplasm according to the classified group. HR is expressed in growing degree hours (GDH) under 4.5 °C (Tb) and CR in chill hours (CH).

Accession	Chilling requirements	Heat requirements (BLUP values) Tb (4.5 °C)
SC-10	501 - 650 CH (Low)	6917
SC-13		7342
SC-12		7441
SC-02		6723
Coronet		7167
Burpeachfourteen		7015
Burpeachnineteen		6863
Carored		6495
Sierra Gem		7592
Burpeachfive		7321
Caroking		7090
Empress		6556
Goldcrest		6080
June Gold		6319
June Prince		6286
Karla Rose		6584
Snow Queen		7230
Suncrest		6988
Glowingstar	651 - 700 CH (Low-medium)	7721
Flamin' Fury (PF23)		6426
Klondike White		6552
Saturn		6734
Stark Saturn		6608
Valley Sweet		6125
Brightstar		7019
SC-09		6760
Allstar		7043
Arctic Blaze		6435
Arrington		6756
Big Red		6823
Blake		7165
Canadian Harmony		6840
Carolina Belle		7003

Fantasia		6588
Flavortop		6630
Gala Peach		6345
Galaxy		5690
Harvester		6515
Majestic		6832
Redskin		6833
Scarlet Pearl		6644
Summer Gold		6387
Sunbrite		6011
Sunhigh		6741
Westbrook		6936
Wildrose		6730
Yukon King		6635
Burnectseven		6700
Earlystar		6837
Winblo sport		6702
Arctic Pride	701 - 800 CH (Medium)	6043
Autumnprince		6599
Autumn Red		6564
Bounty		6206
Calred		6607
Early Augustprince		6707
Early Loring Blair		6585
Elberta		6687
Galactica		6653
Glory		6624
Harrow Beauty		7047
Joanna Sweet		6632
John Boy PP#11591		6569
John Boy PP#6827		6309
Loring		6521
O'Henry		6675
Parade		6350
Rich May		6011
SC-01		5742
SC-08		6221
Snow Giant		6154
Sugar Giant		6634

Summer Beaut		6718
Sunprince		6261
Sweet Dream		6579
Sweet Scarlet		6324
Tra-Zee		6735
Victoria		6388
White County		6599
White Lady		7225
White Rock		6777
Augustprince	801 - 850 CH (Medium-high)	5721
Belle of Georgia		6141
Blazeprince		6395
Carogem		6120
Early Red Fire		6279
Fireprince		6429
Flameprince		6344
Garnet Beauty		6070
Glohaven		5931
Jefferson		6295
Julyprince		6146
June Princess		6463
Madison		6471
Redglobe		6156
Redgold		5975
Redrose		5799
Scarlet Prince		6288
Sentry		6299
September Sun		6100
Springold		6218
Starfire		5981
Summer Prince		6207
Sunglo		5894
Sweet September		5769
Beaumont		6458
Arctic Belle		6395
Arctic Jay		5972
Biscoe		6189
Encore		6328
Risingstar		6713

September Snow		6056
Snow King		6335
BY93p3538		6338
Jersey Queen		6597
Autumnglo		6102
Candor		6001
Challenger	851 - 1000 CH	5983
Coralstar	(High)	6085
Cresthaven		6150
CVN-4		6000
Harrow Diamond		6019
Redhaven		5941
Sureprince		6000
SC-03		5776
SC-07		4808
SC-04		5538
Intrepid		6317
Redstar		6565
Carolina Gold		6095
Contender		6112
Raritan Rose	>1000 CH	6506
Reliance	(Very high)	6486
SC-05		6001
SC-11		5489
SC-06		5961

BLUP: The best linear unbiased prediction; CH: Chill hour

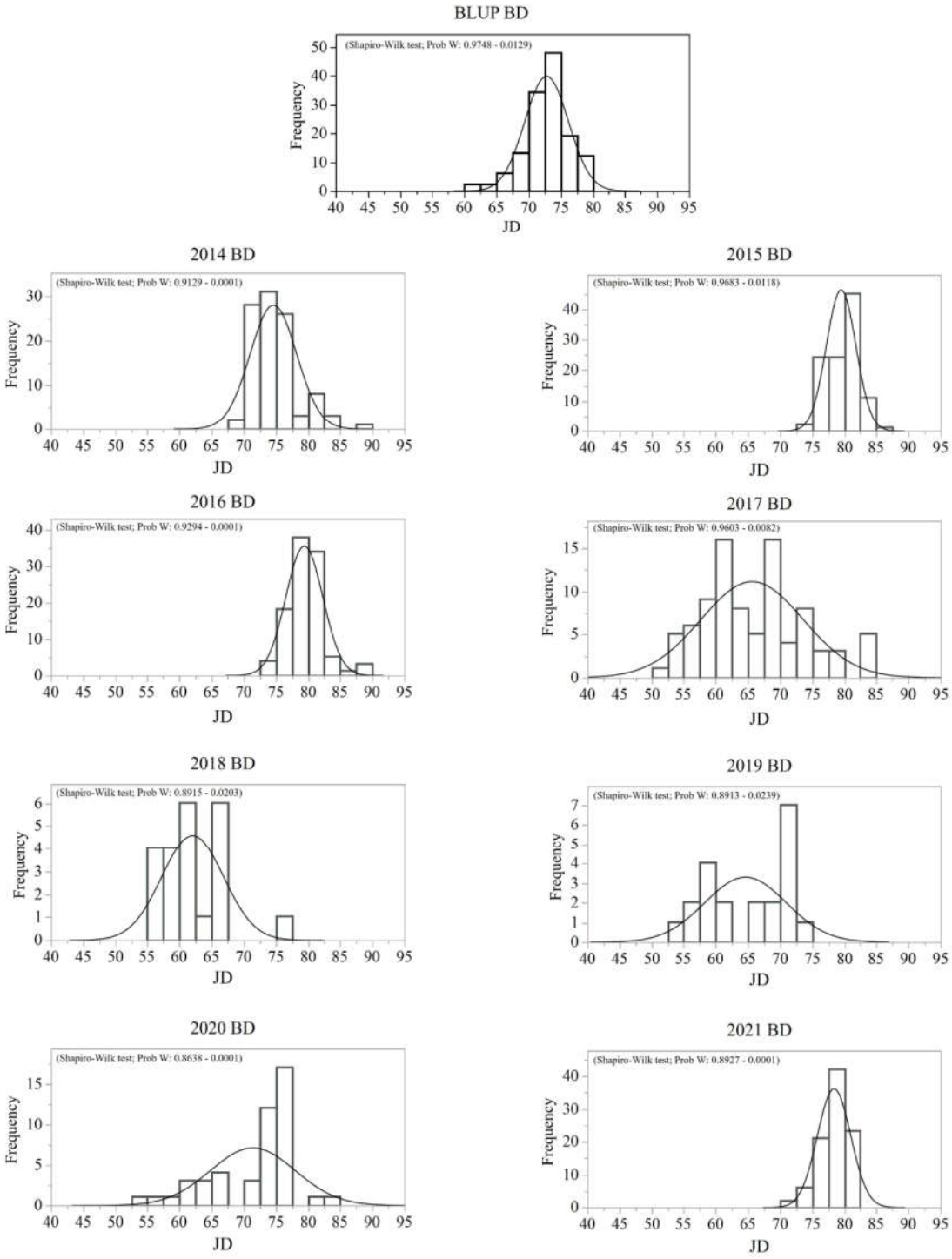


Figure S1. BLUP and annual (2014–2021) bloom date (BD) distributions. BD are expressed in Julian days (JD; days from 1 January).

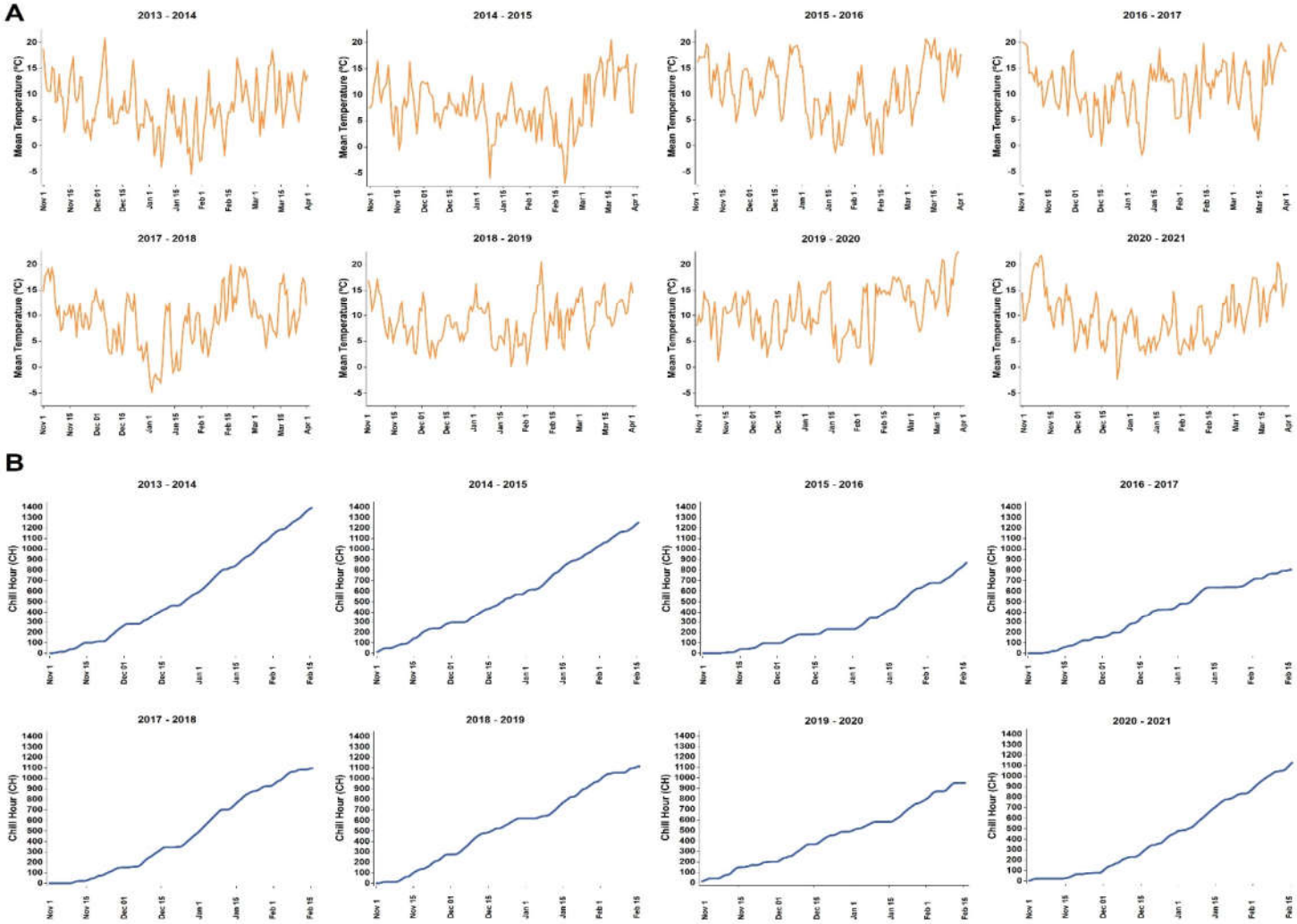


Figure S2. (A) Daily average air temperature in the eight seasons from 1 November to 1 April. **(B)** Season evolution of chill hours (CH) accumulation from 1 November until 15 February using Weinberger (1950) model.

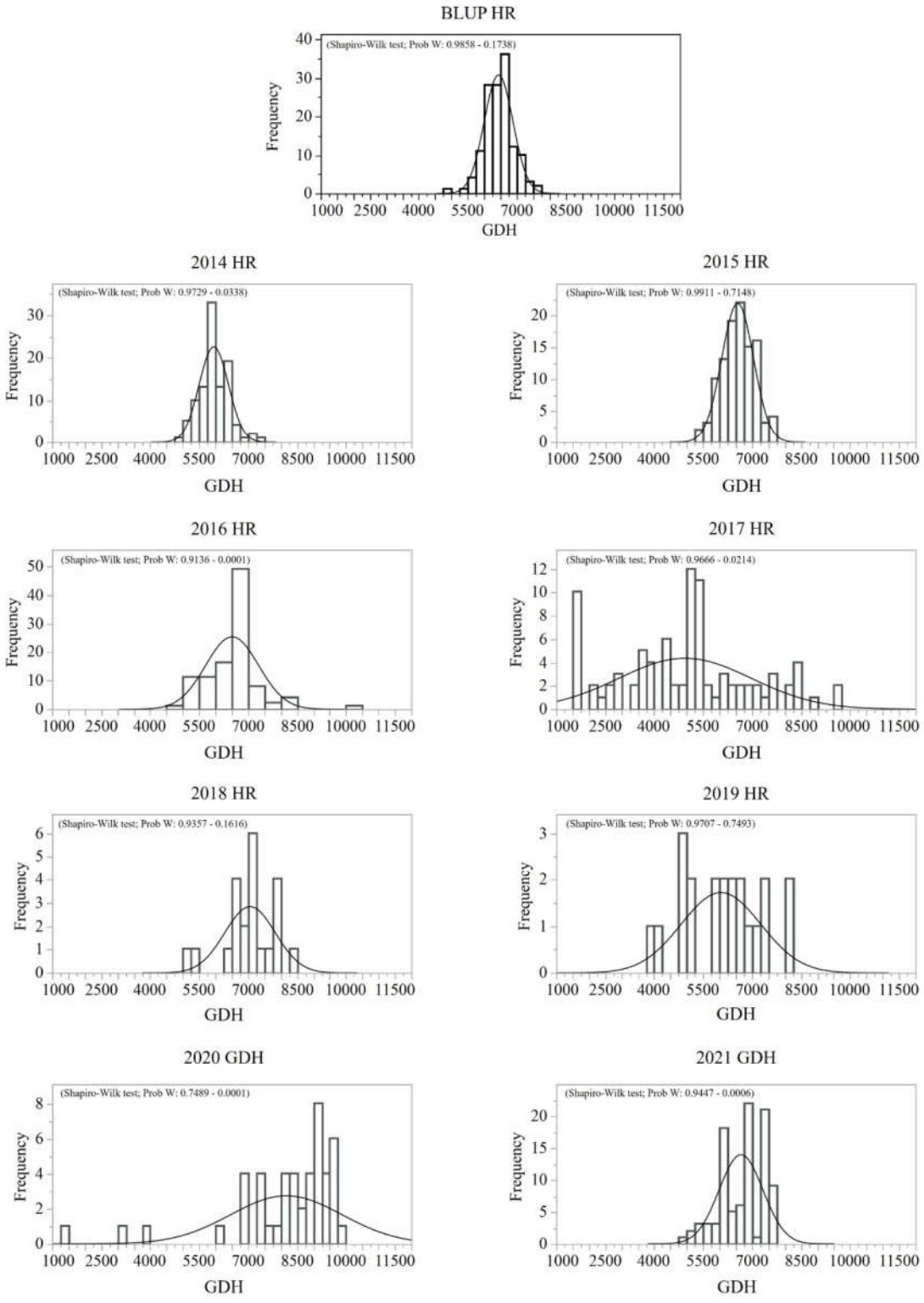


Figure S3. BLUP and annual (2014–2021) heat requirement (HR) distributions. HR are expressed in growing degree hours (GDH).