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Supplementary Table 1. Monthly weather data (mean maximum and minimum temperature and total rainfall) during the crop period at the experimental site, Varanasi

Season	Geo-position	Altitude (m)	Month	Rain (mm)	T min (°C)	T max (°C)
Rabi 2017–18	25°15′ N / 83°03′ E	75.5	Nov	0.0	8.5	26.4
			Dec	0.0	9.4	24.2
			Jan	0.0	6.6	20.2
			Feb	0.0	10.9	25.9
			Mar	0.0	15.4	32.6
			Apr	9.4	20.0	33.8
Rabi 2018–19	25°15′ N / 83°03′ E	75.5	Dec	0.0	6.2	23.3
			Jan	17.8	7.0	21.5
			Feb	9.8	9.0	23.9
			Mar	1.8	12.8	29.2
			Apr	0.0	19.2	37.7

Geo-position: geographic coordinates; T min: minimum temperature; T max: maximum temperature. Values cover the crop period only, from sowing to maturity. Weekly data were assigned to the month containing.

Supplementary Table 2. Tests of analysis of variance (ANOVA) assumptions on residuals of the randomised block model for 9 traits in 79 wheat genotypes (57 F_1 crosses, 19 lines and 3 testers)

Trait	Shapiro–Wilk test		Skewness	Excess kurtosis	Levene's test	
	W	*p*			*F*	*p*
Days to 50 % heading	0.990	0.099	−0.19	0.68	1.994	0.138
Days to maturity	0.986	0.017	−0.27	0.97	7.914	<0.001
Plant height	0.993	0.375	−0.09	−0.37	0.260	0.771
Spike length	0.997	0.910	0.01	−0.07	0.133	0.875
Flag leaf length	0.988	0.038	−0.06	−0.71	0.531	0.589
Tillers per plant	0.987	0.031	0.26	0.19	2.482	0.086
Grains per spike	0.984	0.010	0.24	−0.59	0.207	0.813
Test weight	0.974	<0.001	−0.27	1.71	1.211	0.300
Single plant yield	0.984	0.009	0.38	1.15	0.789	0.456

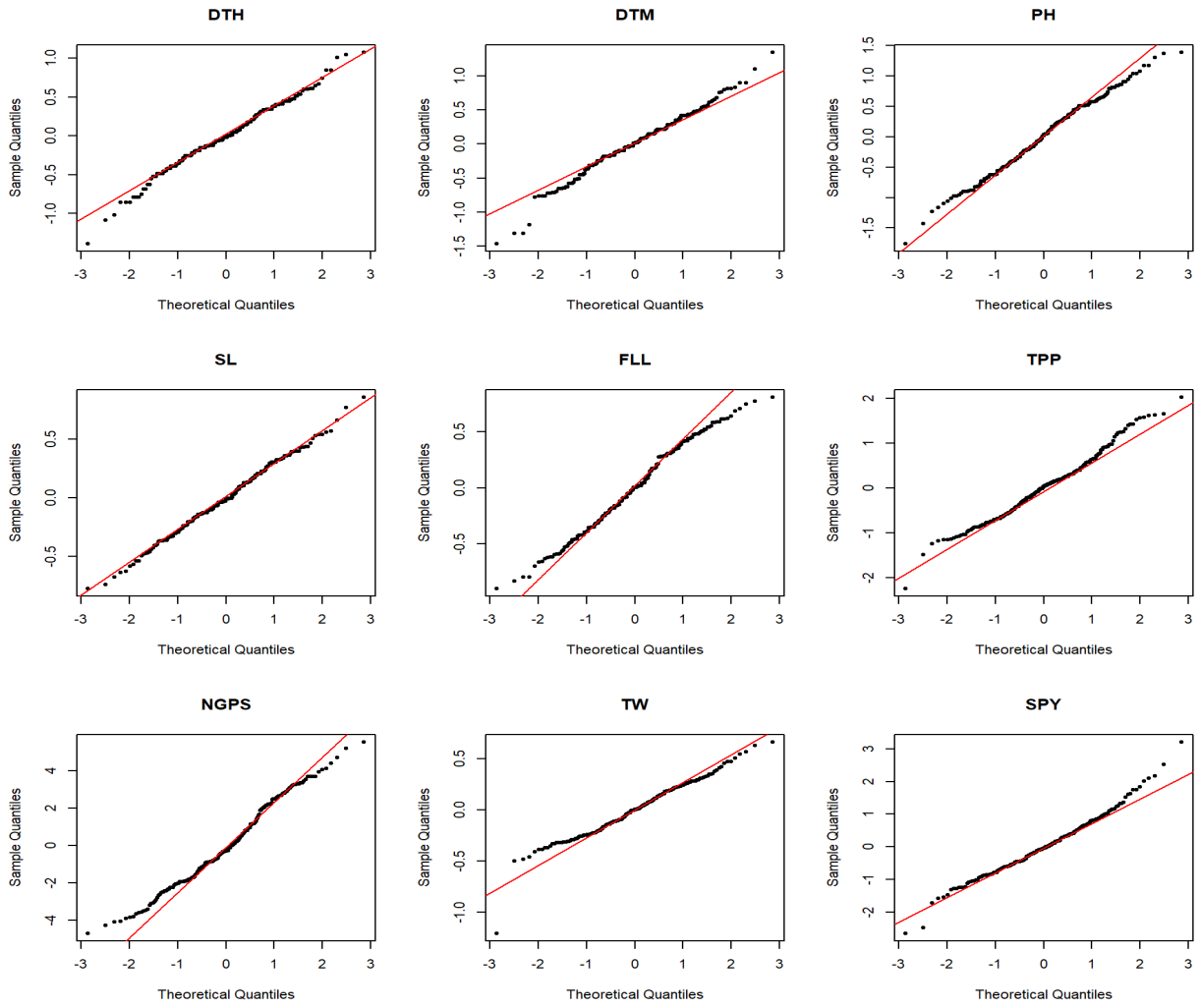
Shapiro–Wilk tests were based on 237 residuals per trait. Levene's test (median-centred) compared error variance among crosses, lines and testers (df = 2, 234). $p < 0.05$ indicates a significant departure from the assumption.

Supplementary Table 3. Specific combining ability (SCA) effects of all 57 F_1 hybrids for 9 yield traits in wheat (*Triticum aestivum*)

Crosses	DTH (Days)	DTM (Days)	Plant height (cm)	Spike length (cm)	Flag leaf length (cm)	No. of tillers per plant	No. of grains perspike	Test weight (gm)	Single plant yield (g)
HUW-234 × DBW88	-0.369	1.700**	-1.278**	-0.237	1.511**	-1.133*	4.674**	-0.362*	-1.254*
HUW-234 × DBW173	-0.302	-0.422	1.578**	-0.370	-0.433	-0.178	-0.504	-1.492**	-1.971**
HUW-234 × HD3171	0.020	-0.678*	-0.945*	-0.759**	-0.844**	0.211	0.263	0.325	-0.174
HUW-234 × HI 1612	0.420	0.400	0.300	0.110	-0.600*	1.067*	3.152*	0.165	3.163**
HUW-234 × K 1317	-0.347	-0.400	-1.978**	0.541**	0.834**	-1.100*	-2.848	-0.745**	-3.829**
HUW-234 × PBW723	-0.158	0.033	-1.445**	0.107	-1.200**	0.067	-2.659	2.201**	2.054**
HUW-234 × DBW150	-0.058	-0.189	-3.689**	0.174	-1.100**	0.311	3.219*	0.995**	1.257*
HUW-234 × KBRL82-2	1.531**	0.744*	2.522**	-0.526*	-0.744**	0.022	-2.404	-0.130	-1.001
HUW-234 × AKAW4899	-0.225	0.122	-4.045**	-0.870**	-0.689**	-0.011	-3.570*	-8.189**	-4.887**
HUW-234 × HI 1609	1.031**	0.922**	2.055**	-0.415*	-0.700**	0.633	4.430**	-0.406*	0.791
HUW-234 × DBW129	-0.302	-0.667*	3.411**	-0.093	-1.189**	0.711	-4.670**	3.155**	2.045**
HUW-234 × DBW-187	-0.402	-0.100	0.355	-0.037	-0.611*	-0.378	1.974	2.790**	1.544**
HUW-234 × KRL386	-1.680**	-1.578**	5.600**	1.063**	0.778**	1.111*	-0.415	-1.388**	0.631
HUW-234 × HUWL-1730	1.442**	1.800**	4.064**	0.019	0.900**	0.456	1.685	-1.339**	0.449
HUW-234 × HUWL-1727	-0.258	-0.567	-0.694	0.119	-0.295	-0.156	0.443	0.573**	0.327
HUW-234 × HUWL-1726	0.364	-0.078	-2.611**	0.241	-0.855**	-0.522	1.796	1.118**	1.325*
HUW-234 × HUWL-1725	-1.025**	-0.100	-1.767**	0.174	2.223**	-0.978*	1.396	3.490**	0.438
HUW-234 × HUWL-1723	0.675*	-0.589	1.522**	0.652**	1.756**	-0.956	-9.115**	-0.367*	-2.304**
HUW-234 × HUWL-1731	-0.358	-0.356	-2.956**	0.107	1.256**	0.822	3.152*	-0.396*	1.396*
Attila × DBW88	-0.232	-0.491	1.063*	0.166	-1.424**	0.902	-2.383	-0.001	-0.548
Attila × DBW173	-0.265	-0.147	-2.914**	0.133	0.198	1.057*	-0.394	-2.007**	0.592
Attila × HD3171	-0.177	0.598*	2.163**	1.244**	2.454**	0.613	0.006	-0.380*	0.182
Attila × HI1612	1.957**	1.209**	-1.692**	-0.074	-0.035	0.502	0.728	2.624**	1.379*
Attila × K1317	0.023	0.742*	0.197	-0.156	-0.769**	0.568	4.095**	-0.336	3.301**
Attila × PBW 723	0.112	-0.291	0.063	-0.223	1.198**	0.035	1.251	-2.474**	-0.177
Attila × DBW150	-0.288	0.020	1.886**	0.344	1.365**	-1.254*	-1.038	-1.730**	-2.527**
Attila × KBRL82-2	0.668*	1.420**	-1.837**	0.044	1.054**	-0.809	1.406	3.255**	1.842**
Attila × AKAW4899	-1.154**	-1.536**	0.397	-0.034	0.143	0.024	0.606	5.446**	2.759**
Attila × HI1609	1.368**	0.464	-1.037*	-0.212	-0.102	-0.032	-4.794**	0.079	-1.056

Attila × DBW129	0.068	0.342	1.352**	0.610**	0.743**	1.213*	4.873**	-1.453**	1.754**
Attila × DBW187	0.001	0.042	-1.537**	0.466*	-0.713**	0.624	1.584	-2.132**	-0.270
Attila × KRL386	-0.410	-1.102**	-4.492**	-0.801**	-0.757**	-0.187	-0.272	-0.186	-1.696**
Attila × HUWL-1730	1.312**	1.142**	0.579	0.055	-0.835**	0.057	0.495	-0.094	-0.204
Attila × HUWL-1727	-0.988**	0.175	1.888**	0.355	0.746**	0.080	-1.800	0.958**	-0.393
Attila × HUWL-1726	-0.265	-0.102	1.230**	0.277	0.309	-0.854	-2.527	-2.337**	-2.879**
Attila × HUWL-1725	-1.221**	-2.491**	-0.025	-0.623**	-1.013**	-1.876**	-7.860**	-3.059**	-5.252**
Attila × HUWL-1723	-0.088	0.420	0.830*	-1.279**	-1.713**	-0.520	7.728**	1.891**	2.952**
Attila × HUWL-1731	-0.421	-0.413	1.886**	-0.290	-0.846**	-0.143	-1.705	1.936**	0.239
HD-3118 × DBW88	0.601*	-1.209**	0.215	0.071	-0.087	0.232	-2.291	0.363*	1.802**
HD-3118 × DBW173	0.568*	0.569	1.337**	0.238	0.235	-0.880	0.897	3.500**	1.379*
HD-3118 × HD 3171	0.157	0.080	-1.219**	-0.484*	-1.610**	-0.824	-0.269	0.054	-0.008
HD-3118 × HI1612	-2.377**	-1.609**	1.392**	-0.036	0.635*	-1.568**	-3.880*	-2.789**	-4.541**
HD-3118 × K1317	0.323	-0.342	1.781**	-0.384	-0.065	0.532	-1.247	1.081**	0.527
HD-3118 × PBW723	0.046	0.258	1.381**	0.116	0.002	-0.102	1.409	0.273	-1.877**
HD-3118 × DBW150	0.346	0.169	1.804**	-0.518*	-0.265	0.943	-2.180	0.734**	1.270*
HD-3118 × KBRL82-2	-2.199**	-2.164**	-0.685	0.482*	-0.310	0.787	0.997	-3.125**	-0.841
HD-3118 × AKAW4899	1.379**	1.413**	3.648**	0.904**	0.546*	-0.013	2.964*	2.743**	2.129**
HD-3118 × HI1609	-2.399**	-1.387**	-1.019*	0.627**	0.802**	-0.602	0.364	0.326	0.264
HD-3118 × DBW129	0.235	0.325	-4.763**	-0.518*	0.446	-1.924**	-0.203	-1.702**	-3.799**
HD-3118 × DBW187	0.401	0.058	1.181**	-0.429*	1.324**	-0.246	-3.558*	-0.658**	-1.274*
HD-3118 × KRL386	2.090**	2.680**	-1.108**	-0.262	-0.021	-0.924	0.686	1.574**	1.064
HD-3118 × HUWL-1730	-2.754**	-2.942**	-4.643**	-0.073	-0.065	-0.513	-2.180	1.433**	-0.245
HD-3118 × HUWL-1727	1.246**	0.391	-1.194**	-0.473*	-0.451	0.076	1.357	-1.531**	0.066
HD-3118 × HUWL-1726	-0.099	0.180	1.381**	-0.518*	0.546*	1.376**	0.731	1.220**	1.554**
HD-3118 × HUWL-1725	2.246**	2.591**	1.792**	0.449*	-1.210**	2.854**	6.464**	-0.431*	4.814**
HD-3118 × HUWL-1723	-0.588*	0.169	-2.352**	0.627**	-0.043	1.476**	1.386	-1.525**	-0.648
HD-3118 × HUWL-1731	0.779**	0.769*	1.070**	0.182	-0.410	-0.680	-1.447	-1.540**	-1.635**
Sij	**0.272**	**0.280**	**0.406**	**0.203**	**0.257**	**0.483**	**1.496**	**0.172**	**0.584**
N	**25**	**24**	**47**	**24**	**38**	**14**	**17**	**46**	**33**
N+ve	**15**	**13**	**25**	**11**	**18**	**7**	**10**	**21**	**19**
N-ve	**10**	**11**	**22**	**13**	**20**	**7**	**7**	**25**	**14**

DTH: days to heading; DTM: days to maturity. *, **, Significant at 5 %,1 %; SE(Sij) = Standard error of hybrids; N, N+ve, N-ve = total no. of crosses, positive and negative significant SCA effects, respectively.



Supplementary Fig. 1. Normal Q–Q plots of residuals from the randomised block ANOVA for 9 traits in 79 wheat genotypes (57 F_1 crosses, 19 lines and 3 testers). DTH: days to 50 % heading; DTM: days to maturity; PH: plant height; SL: spike length; FLL: flag leaf length; TPP: tillers per plant; NGPS: grains per spike; TW: test weight; SPY: single plant yield.