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Supplementary Material

Characterisation and evaluation of wheat genetic resources for heat stress tolerance using stay-green traits

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Table S1. The mean value of days to heading (DH), days to anthesis (DA) and days to maturity (DM) in wheat genotypes under LS and VLS environments during *rabi* season 2018-20

Genotypes	DH (days)		DA (days)		DM (days)	
	LS	VLS	LS	VLS	LS	VLS
BWL 5179	93.50 ± 0.77	76.5 ± 0.72	98.00 ± 0.00	82.50 ± 0.19	116.50 ± 7.39	97.50 ± 7.85
BWL 5186	85.25 ± 0.18	73.25 ± 0.8	95.00 ± 0.37	78.00 ± 0.00	114.25 ± 8.41	95.00 ± 7.40
BWL 5233	87.50 ± 0.43	75.00 ± 0.79	94.00 ± 0.74	80.50 ± 0.19	116.25 ± 8.62	96.50 ± 7.19
BWL 5388	86.50 ± 0.61	74.00 ± 1.20	95.00 ± 0.37	79.00 ± 0.37	113.25 ± 7.95	96.25 ± 7.96
BWL 5391	90.00 ± 0.45	76.25 ± 1.28	96.00 ± 0.00	82.50 ± 0.19	115.50 ± 7.39	98.00 ± 7.66
BWL 5410	93.34 ± 0.62	76.25 ± 0.48	97.00 ± 0.37	81.50 ± 0.55	116.00 ± 7.17	97.00 ± 6.28
BWL 5422	93.00 ± 1.35	76.25 ± 0.80	99.00 ± 0.00	80.50 ± 0.19	116.00 ± 7.17	96.75 ± 6.83
DBW 173	86.75 ± 0.58	74.50 ± 0.23	93.00 ± 0.37	78.00 ± 0.00	112.00 ± 7.17	96.50 ± 6.96
DBW 71	82.75 ± 0.66	71.00 ± 0.52	92.00 ± 0.74	75.00 ± 0.00	111.00 ± 8.08	93.50 ± 7.39
DBW 88	88.75 ± 1.08	74.75 ± 0.41	96.00 ± 0.00	78.00 ± 0.00	113.75 ± 7.73	96.25 ± 6.63
DBW 90	86.25 ± 0.69	75.75 ± 0.58	96.00 ± 0.00	80.00 ± 0.00	114.75 ± 7.75	97.25 ± 6.86
DHTW 60	82.75 ± 1.02	71.75 ± 0.41	94.00 ± 0.00	75.00 ± 0.00	109.00 ± 8.28	95.25 ± 7.51
DPW 621-50	89.00 ± 0.94	73.75 ± 0.69	96.00 ± 0.00	78.50 ± 0.19	114.50 ± 7.84	95.50 ± 7.20
HD 2967	91.75 ± 0.88	74.25 ± 0.52	99.00 ± 0.00	79.50 ± 0.19	116.50 ± 7.40	97.00 ± 7.40
HD 3059	86.75 ± 0.97	73.00 ± 0.47	94.00 ± 0.74	76.50 ± 0.55	114.25 ± 8.39	94.50 ± 6.72
HD 3086	84.25 ± 0.36	72.75 ± 0.52	96.00 ± 0.00	77.50 ± 0.92	113.25 ± 8.85	94.50 ± 6.94
HTW 11	92.00 ± 1.40	76.75 ± 0.58	98.00 ± 0.00	80.00 ± 0.00	116.00 ± 7.63	98.50 ± 7.16
HTW 14	83.75 ± 0.58	72.50 ± 0.35	95.00 ± 0.74	77.50 ± 0.92	112.25 ± 8.84	96.25 ± 7.31
HTW 6	91.75 ± 0.73	76.25 ± 0.88	97.50 ± 0.55	82.00 ± 0.37	116.75 ± 7.30	98.25 ± 7.51
HTW 64	82.00 ± 0.47	71.75 ± 0.41	93.00 ± 1.10	76.50 ± 0.55	108.75 ± 7.72	93.50 ± 6.74
HTW 65	86.25 ± 0.69	72.25 ± 0.18	94.00 ± 0.00	77.00 ± 0.74	111.25 ± 7.27	96.75 ± 7.74
HTW 66	85.75 ± 0.52	71.75 ± 0.41	92.50 ± 0.55	75.00 ± 0.00	116.00 ± 8.74	95.25 ± 7.51
HTW 67	88.25 ± 1.24	75.50 ± 0.61	96.00 ± 0.00	81.50 ± 0.19	113.25 ± 7.94	97.75 ± 7.27
PB 2017-1	81.25 ± 0.58	73.00 ± 0.60	90.00 ± 0.00	76.50 ± 0.55	110.50 ± 8.07	95.25 ± 7.08
PB 2017-2	86.75 ± 0.78	75.00 ± 0.82	96.00 ± 0.00	77.50 ± 0.92	114.25 ± 8.39	98.00 ± 7.18
PBW 723	90.5 ± 2.03	76.50 ± 0.68	98.50 ± 0.19	81.00 ± 0.00	113.50 ± 7.83	98.25 ± 7.27
WB 2	88.00 ± 1.37	74.50 ± 0.35	96.00 ± 0.00	78.00 ± 0.00	114.50 ± 8.73	96.75 ± 7.08
WH 1105	85.25 ± 0.41	72.50 ± 0.71	94.00 ± 0.00	76.50 ± 0.55	112.50 ± 7.62	95.00 ± 7.40
WH 1124	84.25 ± 0.36	73.00 ± 0.47	94.00 ± 0.00	77.50 ± 0.92	113.25 ± 8.85	94.75 ± 6.83
WH 730	86.50 ± 0.89	72.75 ± 0.52	94.00 ± 0.00	76.50 ± 0.55	110.75 ± 7.05	95.00 ± 7.17

DH=days to heading, DA=days to anthesis, DM= days to maturity, LS= late sown, VLS very late sown

Table S2. The mean value of Canopy temperature (CT), Plant Height (PH) and Number of productive tillers m⁻² (NPT) in wheat genotypes under LS and VLS environments during *rabi* season 2018-20

Genotypes	CT (°C)		PH (cm)		NPT	
	LS	VLS	LS	VLS	LS	VLS
BWL 5179	26.55 ± 0.92	31.83 ± 0.55	95.34 ± 1.38	87.75 ± 2.46	190.50 ± 4.55	154.36 ± 9.94
BWL 5186	28.40 ± 0.90	33.25 ± 0.50	96.50 ± 2.15	92.17 ± 4.00	181.75 ± 4.81	147.01 ± 9.61
BWL 5233	26.33 ± 0.76	31.70 ± 0.30	104.84 ± 1.12	96.75 ± 3.15	179.50 ± 3.43	164.63 ± 5.81
BWL 5388	26.35 ± 0.88	31.95 ± 0.70	101.75 ± 1.78	88.01 ± 1.16	193.00 ± 13.96	175.84 ± 9.60
BWL 5391	28.75 ± 0.33	29.68 ± 1.12	95.84 ± 1.98	89.84 ± 0.95	202.00 ± 3.60	186.53 ± 5.78
BWL 5410	28.53 ± 1.07	34.25 ± 0.28	88.59 ± 1.41	81.09 ± 0.78	165.00 ± 5.91	151.29 ± 9.82
BWL 5422	27.68 ± 1.41	33.68 ± 0.47	90.96 ± 1.78	80.25 ± 0.63	181.50 ± 1.51	142.45 ± 11.93
DBW 173	27.00 ± 0.63	32.23 ± 0.49	103.67 ± 1.45	98.09 ± 3.97	186.75 ± 3.87	156.44 ± 6.84
DBW 71	28.90 ± 0.39	33.65 ± 0.34	97.67 ± 2.90	85.84 ± 0.78	182.50 ± 6.63	172.25 ± 3.48
DBW 88	27.18 ± 0.22	32.05 ± 0.55	100.50 ± 3.62	95.09 ± 3.72	187.00 ± 2.95	167.57 ± 3.47
DBW 90	26.95 ± 0.87	32.60 ± 0.58	100.59 ± 0.91	90.92 ± 0.76	206.5 ± 14.28	180.57 ± 4.51
DHTW 60	29.93 ± 1.44	33.13 ± 0.89	128.51 ± 0.44	125.00 ± 3.36	209.25 ± 8.57	190.55 ± 2.46
DPW 621-50	26.75 ± 0.38	32.98 ± 0.41	101.34 ± 1.92	87.00 ± 2.14	193.00 ± 5.92	117.06 ± 12.88
HD 2967	26.48 ± 0.41	31.73 ± 0.63	92.67 ± 3.09	89.50 ± 1.32	190.50 ± 5.84	163.24 ± 10.86
HD 3059	26.85 ± 0.81	31.50 ± 0.91	97.76 ± 3.40	97.00 ± 2.81	188.00 ± 2.71	165.29 ± 4.50
HD 3086	28.45 ± 0.45	32.65 ± 0.62	93.26 ± 3.26	92.34 ± 1.39	240.00 ± 8.26	175.22 ± 18.12
HTW 11	26.03 ± 0.78	31.98 ± 1.11	98.17 ± 0.94	91.34 ± 2.05	183.00 ± 2.48	152.53 ± 11.26
HTW 14	28.63 ± 0.22	32.43 ± 0.51	97.59 ± 4.34	85.42 ± 0.93	173.75 ± 1.96	144.62 ± 11.76
HTW 6	27.65 ± 0.93	31.40 ± 0.86	111.34 ± 2.09	102.17 ± 2.18	214.00 ± 2.34	171.38 ± 11.97
HTW 64	28.75 ± 0.65	33.03 ± 0.94	84.84 ± 1.58	82.84 ± 3.11	227.00 ± 8.80	173.59 ± 8.48
HTW 65	28.83 ± 0.99	32.48 ± 0.57	120.92 ± 2.58	120.75 ± 2.66	221.00 ± 3.29	186.73 ± 8.92
HTW 66	30.13 ± 0.10	32.70 ± 0.80	113.25 ± 3.17	113.09 ± 3.72	214.25 ± 8.95	180.92 ± 12.42
HTW 67	26.73 ± 1.10	31.20 ± 0.77	131.67 ± 3.13	116.92 ± 2.52	207.75 ± 6.07	187.03 ± 3.71
PB 2017-1	30.45 ± 0.45	32.35 ± 0.96	82.67 ± 3.94	76.50 ± 2.64	200.00 ± 9.03	166.83 ± 14.11
PB 2017-2	27.03 ± 0.57	32.70 ± 0.37	101.92 ± 2.96	91.17 ± 1.95	201.00 ± 10.61	166.37 ± 13.74
PBW 723	27.05 ± 0.44	32.45 ± 0.59	97.75 ± 1.51	89.17 ± 2.28	182.00 ± 2.46	150.17 ± 7.46
WB 2	28.93 ± 0.51	32.35 ± 0.49	104.25 ± 4.67	96.34 ± 3.05	189.00 ± 5.56	155.95 ± 13.55
WH 1105	27.33 ± 0.81	33.38 ± 0.23	94.42 ± 3.24	87.34 ± 1.15	179.00 ± 7.73	159.74 ± 7.88
WH 1124	28.95 ± 0.39	33.25 ± 0.19	95.75 ± 2.70	91.92 ± 1.48	197.00 ± 1.44	174.57 ± 7.59
WH 730	28.68 ± 1.02	32.03 ± 1.09	106.5 ± 2.27	103.59 ± 3.96	194.00 ± 4.80	176.16 ± 6.33

CT= canopy temperature, PH=plant height, NPT= number of productive tiller per meter square, LS= late sown, VLS very late sown

Table S3. The mean value of number of grain per spike (NGS) and grain weight per spike (GWS) in wheat genotypes under LS and VLS environments during *rabi* season 2018-20

Genotypes	NGS		GWS (g)	
	LS	VLS	LS	VLS
BWL 5179	43.13 ± 1.46	41.17 ± 3.58	2.12 ± 0.13	1.36 ± 0.17
BWL 5186	40.75 ± 1.26	55.00 ± 2.95	1.96 ± 0.06	1.98 ± 0.03
BWL 5233	46.29 ± 0.84	46.50 ± 3.49	2.53 ± 0.05	1.89 ± 0.11
BWL 5388	34.38 ± 1.24	47.17 ± 3.77	1.66 ± 0.06	1.86 ± 0.16
BWL 5391	45.50 ± 0.80	42.50 ± 4.93	1.97 ± 0.09	1.69 ± 0.21
BWL 5410	45.00 ± 0.93	58.34 ± 2.66	1.72 ± 0.08	2.01 ± 0.11
BWL 5422	47.59 ± 1.12	49.50 ± 3.13	1.68 ± 0.15	1.67 ± 0.10
DBW 173	40.92 ± 2.51	56.00 ± 4.03	1.85 ± 0.24	2.14 ± 0.22
DBW 71	44.29 ± 1.41	42.67 ± 5.80	1.92 ± 0.07	1.74 ± 0.24
DBW 88	55.59 ± 1.43	52.34 ± 1.57	2.28 ± 0.16	1.60 ± 0.16
DBW 90	43.96 ± 0.85	47.34 ± 2.47	2.03 ± 0.11	1.62 ± 0.09
DHTW 60	37.42 ± 2.23	41.01 ± 2.49	1.45 ± 0.02	1.32 ± 0.10
DPW 621-50	51.50 ± 2.02	57.34 ± 1.59	1.97 ± 0.07	1.93 ± 0.06
HD 2967	50.84 ± 8.13	59.34 ± 1.65	2.22 ± 0.23	2.09 ± 0.10
HD 3059	43.29 ± 0.45	58.84 ± 3.02	1.95 ± 0.08	2.22 ± 0.13
HD 3086	41.84 ± 1.56	45.67 ± 2.11	2.08 ± 0.06	1.54 ± 0.15
HTW 11	48.17 ± 1.01	47.50 ± 3.39	2.14 ± 0.17	1.64 ± 0.16
HTW 14	40.46 ± 0.67	42.67 ± 3.02	2.16 ± 0.07	1.74 ± 0.06
HTW 6	36.13 ± 1.41	47.84 ± 0.67	1.56 ± 0.01	1.63 ± 0.05
HTW 64	25.25 ± 1.72	32.51 ± 2.36	1.49 ± 0.05	1.42 ± 0.09
HTW 65	33.71 ± 3.20	38.17 ± 2.81	1.45 ± 0.12	1.41 ± 0.09
HTW 66	32.54 ± 4.59	47.67 ± 2.33	1.66 ± 0.13	1.78 ± 0.09
HTW 67	36.04 ± 1.24	33.84 ± 1.60	1.74 ± 0.1	1.22 ± 0.13
PB 2017-1	41.75 ± 2.88	48.34 ± 4.30	1.87 ± 0.23	1.66 ± 0.12
PB 2017-2	42.50 ± 3.45	59.84 ± 3.69	1.84 ± 0.14	2.18 ± 0.15
PBW 723	45.34 ± 1.28	35.51 ± 1.8	2.21 ± 0.05	1.64 ± 0.07
WB 2	42.46 ± 3.57	50.67 ± 4.70	2.00 ± 0.12	1.91 ± 0.12
WH 1105	47.92 ± 2.62	58.17 ± 1.59	2.30 ± 0.03	2.02 ± 0.08
WH 1124	36.67 ± 2.92	42.51 ± 3.18	1.68 ± 0.12	1.54 ± 0.11
WH 730	37.96 ± 2.11	52.00 ± 1.49	1.79 ± 0.06	1.94 ± 0.06

NGS=number of grains per spike, GWS=grain weight per spike, LS= late sown, VLS very late sown

Table S4. The mean value of 100 grain weight (100GW) and Biomass per plot (BM) in wheat genotypes under LS and VLS environments during *rabi* season 2018-20

Genotypes	100GW (g)		BM (g)	
	LS	VLS	LS	VLS
BWL 5179	4.31 ± 0.21	3.24 ± 0.13	4127.38 ± 48.66	3761.95 ± 34.93
BWL 5186	4.42 ± 0.22	3.64 ± 0.21	4094.00 ± 83.60	3745.64 ± 27.02
BWL 5233	4.8 ± 0.15	4.10 ± 0.13	3985.00 ± 61.30	3897.00 ± 30.04
BWL 5388	4.36 ± 0.08	3.92 ± 0.09	4004.13 ± 43.02	3601.65 ± 95.13
BWL 5391	3.76 ± 0.08	3.95 ± 0.07	4082.50 ± 48.15	3694.45 ± 38.43
BWL 5410	3.47 ± 0.21	3.44 ± 0.06	3816.63 ± 65.51	3443.75 ± 110.62
BWL 5422	3.29 ± 0.3	3.36 ± 0.05	3622.52 ± 201.11	3537.11 ± 153.88
DBW 173	3.74 ± 0.25	3.79 ± 0.14	3949.89 ± 27.46	3724.59 ± 29.23
DBW 71	3.8 ± 0.03	4.07 ± 0.05	4019.95 ± 45.00	3935.84 ± 67.19
DBW 88	3.75 ± 0.17	3.04 ± 0.23	4053.63 ± 153.95	3592.20 ± 49.37
DBW 90	4.22 ± 0.28	3.40 ± 0.03	4304.32 ± 45.40	3737.13 ± 40.17
DHTW 60	3.45 ± 0.25	3.24 ± 0.24	3880.65 ± 99.36	3338.60 ± 42.75
DPW 621-50	3.91 ± 0.08	3.36 ± 0.03	4163.00 ± 133.92	3832.21 ± 166.35
HD 2967	4.11 ± 0.23	3.52 ± 0.08	3734.95 ± 62.74	3576.31 ± 46.47
HD 3059	3.88 ± 0.08	3.77 ± 0.08	4292.99 ± 133.68	3897.11 ± 136.28
HD 3086	4.34 ± 0.10	3.33 ± 0.17	3977.96 ± 57.91	3827.95 ± 68.51
HTW 11	4.09 ± 0.20	3.42 ± 0.10	3871.64 ± 93.73	3708.20 ± 18.69
HTW 14	4.82 ± 0.15	4.13 ± 0.21	3833.18 ± 34.01	3484.78 ± 128.31
HTW 6	3.76 ± 0.15	3.40 ± 0.09	3910.60 ± 77.52	3610.09 ± 44.89
HTW 64	4.67 ± 0.09	4.38 ± 0.13	3773.70 ± 79.00	3594.75 ± 16.09
HTW 65	3.64 ± 0.03	3.71 ± 0.06	3939.75 ± 79.69	3862.82 ± 142.77
HTW 66	4.61 ± 0.32	3.73 ± 0.03	4122.74 ± 213.96	3687.70 ± 82.79
HTW 67	4.10 ± 0.08	3.56 ± 0.25	4221.95 ± 173.12	3922.63 ± 127.02
PB 2017-1	4.17 ± 0.17	3.45 ± 0.08	3820.31 ± 39.26	3376.50 ± 81.98
PB 2017-2	3.78 ± 0.02	3.65 ± 0.08	3827.25 ± 74.20	3790.45 ± 42.58
PBW 723	4.50 ± 0.03	4.63 ± 0.12	3978.50 ± 53.32	3537.53 ± 152.12
WB 2	4.18 ± 0.13	3.82 ± 0.14	4010.25 ± 55.64	3985.91 ± 80.32
WH 1105	4.53 ± 0.18	3.48 ± 0.11	3764.66 ± 41.93	3676.78 ± 16.65
WH 1124	3.92 ± 0.06	3.62 ± 0.05	4193.00 ± 132.01	4002.77 ± 94.52
WH 730	3.97 ± 0.25	3.74 ± 0.06	3927.31 ± 78.55	3640.13 ± 60.04

100GW=hundred grain weight, BM= biomass, LS= late sown, VLS very late sown

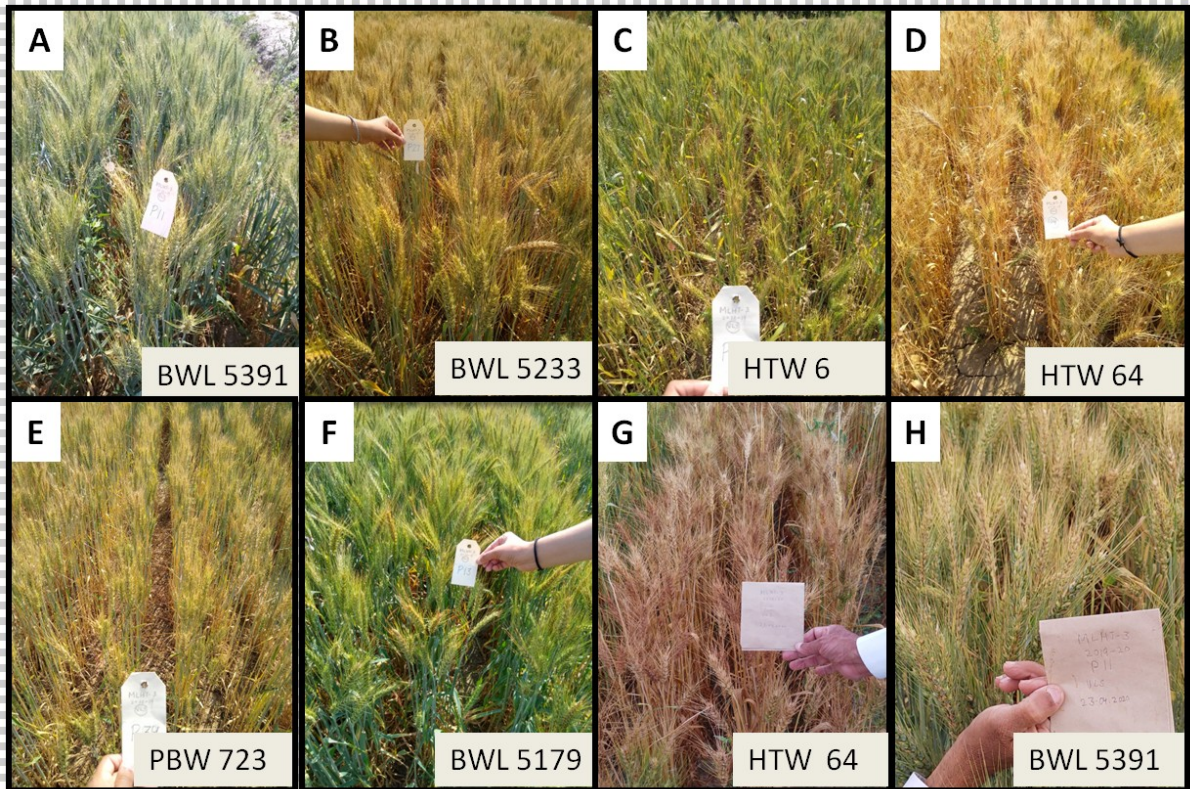


Fig. S1.

Fig. S1. Images showing the different genotypes in VLS environment during *rabi* season 2018-20. A, B, C, D, E, and F show the genotypes BWL 5391, BWL 5233, HTW 6 (W), HTW 64 (W), PBW 723 and BWL 5179 during the year 2018-19 whereas G and H show the genotype HTW 64 (W) and BWL 5391 during the year 2019-20. Pictures were taken on 101 and 113 days after sowing in year 2018-19 and 2019-20, respectively