

**Supplementary Table S1** | Details of bread wheat accessions used in the study along with their IC/EC (Indigenous/Exotic Collection) number, alternate identity and original source of acquisition.

Sl. No.	Accession Number	Alternate id	Original Source	Year of Release/Collection	Parentage	Remarks	Recommended for cultivation (ecology and zone)
1.	IC443766	RAJ3765	RARI, Jaipur, Rajasthan	1996	HD 2402/VL639	Tolerance to terminal heat-stress	Irrigated, late sown conditions of CZ
2.	IC519900	HD2932	IARI, New Delhi	2008	KAUZ/STAR//HD 2643	Brown rust resistance and high zinc content	Irrigated, late sown conditions of CZ
3.	IC296383	WR544 (Pusa Gold)	IARI, New Delhi	2005	KALYANSONA/HD 1999//HD2204/DW38	Very early maturing, resistance to brown rust	Irrigated, late/very late sown, for Delhi state
4.	IC574476	HD2967	IARI, New Delhi	2011	ALD/COC//URES/HD2160M/HD2278	Wider adaptability and resistance to yellow and brown rust	Irrigated, timely sown conditions of NWPZ
5.	EC574731	8832	CIMMYT, Mexico	-	-	Germplasm line	-
6.	EC576707	E4828	CIMMYT, Mexico	-	-	Elite line/germplasm	-
7.	IC252725	HUW467	BHU, Varanasi	1999	-	Germplasm collection	Irrigated, Timely sown, NEPZ
8.	IC252816	KRL13	IIWBR, Karnal	1999	-	Germplasm line with salinity tolerance	-
9.	IC277741	Dharwad 680	Dharwad, Karnataka	2000	-	Germplasm collection	-
10.	IC536081	WL3226	PAU, Ludhiana	-	-	Germplasm line	-
11.	IC279617	KHH416	Tehri, Uttarakhand	2000	-	Germplasm collection (Safed Gehun)	-
12.	IC535176	WON-D14	IARI, New Delhi	-	-	Germplasm line	-
13.	IC401976	PHR1011	IIWBR, Karnal	-	-	Germplasm line with High protein (>13%) and high TGW (>40 g)	-
14.	IC539221	EIGN-I-(04-05)/149	IIWBR, Karnal	2005	-	Germplasm collection	-
15.	IC539287	MC2003-71	IIWBR, Karnal	-	-	Germplasm line	-
16.	IC539531	EIGN1 (03-04)/112	IIWBR, Karnal	-	-	Germplasm line	-
17.	IC443661	PHR1017	IIWBR, Karnal	-	-	Germplasm line	-
18.	EC534487	VEE/KOEL (PAU351)	USDA, USA	-	-	Germplasm line	-
19.	IC416018	PAU438 (W 7484)	PAU, Ludhiana	-	-	Germplasm line	-
20.	IC416075	PAU495 (W 8067)	PAU, Ludhiana	-	-	Germplasm line	-
21.	IC416078	PAU498 (W 8093)	PAU, Ludhiana	-	-	Germplasm line	-
22.	IC416019	PAU439 (W 7485)	PAU, Ludhiana	-	-	Germplasm line	-
23.	IC446713	PSR11489 (Godhumalu)	Nizamabad, Telangana	-	-	Germplasm line	-
24.	IC075240	C306	CCSHAU, Hisar	1969	RGN/CSK3//2*C591/3/C217/N14//C281	Good for <i>chapatti</i> making quality	Rainfed, timely sown conditions of NWPZ
25.	EC178071	NA	CIMMYT, Mexico	-	-	Germplasm line	-
26.	IC542509	PAU1453	PAU, Ludhiana	-	-	Germplasm line	-
27.	IC252348	AKW2294	PDKV, Akola	-	-	Germplasm line	-
28.	IC543293	PAU1218	PAU, Ludhiana	-	-	Germplasm line	-
29.	IC128454	HB602	Bhowali, Uttarakhand	-	-	Germplasm line	-
30.	IC416055	PAU475 (W 7883)	PAU, Ludhiana	-	-	Germplasm line	-

31.	IC111800	J1-7	JAU, Junagadh	1975	Selection from J1	Pink colour auricle and dark brown ear colour	Restricted irrigation, timely sown for CZ
32.	IC111931	K101 (Kundan)	CSUAT, Kanpur	1969	HYBRID65/ HYBRID 1-1	-	Irrigated, timely/late sown, NEPZ
33.	EC576317	E1804	CIMMYT, Mexico	-	-	Elite line/germplasm	-
34.	EC577013	E8826	CIMMYT, Mexico	-	-	Elite line/germplasm	-
35.	EC414149	CHNQIRR 95S OCHN	CIMMYT, Mexico	-	-	Elite line/germplasm	-
36.	IC252653	HI1433	IARI RS, Indore	1999	-	Elite germplasm	-
37.	IC252739	HW1058	Wellington, TN	-	-	Elite germplasm	-
38.	IC335792	KAUZ+ 1B.1R	IIWBR, Karnal	-	-	Germplasm line	-
39.	IC543425	10TH HTW YT38	IARI, New Delhi	-	-	Elite line for heat tolerance	-
40.	IC402055	K20008 (KRL35)	IIWBR, Karnal	2004	-	Elite germplasm	-
41.	IC265318	NKD2671	Sawai Madhopur, Rajasthan	-	-	Germplasm collection (Katha Gehun)	-
42.	IC445449	ET99745	IIWBR, Karnal	-	-	Germplasm line	-
43.	IC528965	VFW182	VPKAS, Almora	-	-	Germplasm line	-
44.	IC549437	PHR1032	IIWBR, Karnal	-	-	Germplasm line	-
45.	IC144911	VW120 (GW120)	RARS, Vijapur Gujarat	1985	INIA66/CNO//INI6 6/BB/3/Y50E/3*KAL	-	Irrigated, late sown conditions of NWPZ
46.	IC542578	PAU558	PAU, Ludhiana	-	-	Germplasm line	-
47.	IC535704	PBW124	PAU, Ludhiana	-	-	Elite germplasm	-
48.	EC542533	NA*	USDA, USA	-	-	Elite germplasm	-
49.	IC542652	PAU4061	PAU, Ludhiana	-	-	Germplasm line (Brochis susceptible)	-
50.	IC536468	K8415	CSUAT, Kanpur	-	-	Germplasm line	-
51.	IC536483	CPAN2039	IIWBR, Karnal	-	-	Germplasm line	-
52.	EC574735	8842	CIMMYT, Mexico	-	-	Germplasm line	-
53.	IC531191	PBW103	PAU, Ludhiana	-	-	Elite germplasm	-
54.	IC333095	NKD/YS R2910	Barwani, MP	-	-	Germplasm line (DL-803)	-
55.	IC572925	HPW185	Malan, Kangra (HP)	2009	-	Germplasm collection	-
56.	IC252867	NW1014	NDUAT, Ayodhya	1998	HAHN 'S'	High resistance against all the three rusts, leaf blight and Karnal bunt	Irrigated, late sown conditions of NEPZ
57.	IC524299	HW2012	IARI RS, Wellington	-	-	Elite germplasm	-
58.	IC573461	GW11 (GW396)	RARS, Vijapur, Gujarat	2013	LOK1/HW 1042// LOK1	High WUE variety and resistance to brown and black rusts	Gujarat state
59.	IC252444	BW/SH49	Kolkata, WB	1999	-	Germplasm collection	-
60.	IC529207	VFW2150	VPKAS, Almora	2005	-	Germplasm collection	-
61.	IC290191	HW971	Wellington, TN	2000	-	Germplasm collection	-
62.	IC112258	VL401	VPKAS, Almora	1978	FKN/N 10B	-	Timely sown, rain-fed for U.P. hills
63.	IC627711	CAZ/JSM/ AP/01	Jaisalmer, Rajasthan	2018	-	Registered germplasm for conserved moisture	Cultivated in conserved moisture of Khading Raj.
64.	IC443653	HD2851 (Pusa Vishesh)	IARI, New Delhi	2005	CPAN3004/WR426 // HW 2007	Resistance to yellow, brown and black rusts	Timely sown, irrigated for Delhi state
65.	IC252431	BW/SH30	Kolkata, WB	-	-	Germplasm line	-
66.	IC252619	HD2590	IARI, New Delhi	1999	-	Elite germplasm	-

67.	IC529242	VFW1290	VPKAS, Almora	2005	-	Germplasm collection	-
68.	IC536162	WL4996	PAU, Ludhiana	-	-	Germplasm line	-
69.	IC536050	WL1803	PAU, Ludhiana	-	-	Germplasm line	-
70.	IC252999	WH594	CCSHAU, Hisar	1999	-	Germplasm collection	-
71.	IC443640	DWR240	IIWBR, Karnal	2004	-	Germplasm line with early maturity	-
72.	IC445365	7 <sup>th</sup> EGPSN78	IIWBR, Karnal	2004	-	Elite line	-
73.	IC303071	RAJ3777	RARI, Jaipur	2006	RAJ3160/HD2449	Tolerance to terminal heat-stress	Late sown, Irrigated/ Rainfed for HP
74.	IC252414	BW1050	Kolkata, WB	1999	-	Germplasm collection	-
75.	IC372643	KRR/AK7	Mandi, HP	2002	-	Germplasm collection (Kanak)	-
76.	IC252620	HD2615	IARI, New Delhi	1999	-	Germplasm line	-
77.	IC240818	GW273	RARS, Vijapur, Gujarat	1998	CPAN 2084/VW205	Field resistance to brown and black rusts, high sedimentation value	Irrigated, timely sown conditions of CZ
78.	IC401940	K8962 (Indra)	CSUAT, Kanpur	1996	K7401/HD 2160	Tolerance to brown and black rust	Rainfed, late sown conditions of NEPZ
79.	IC443694	PBW527	PAU, Ludhiana	2008	PBW 175/PBW389	Resistance to yellow and brown rust	Timely sown, rain-fed for Punjab state
80.	IC542547	PAU4091	PAU, Ludhiana	-	-	Germplasm line	-
81.	EC190962	Cultivar No.30	CIMMYT, Mexico	-	-	Elite line/germplasm	-
82.	EC576066	410	CIMMYT, Mexico	-	-	Elite line/germplasm	-
83.	EC573527	3850	CIMMYT, Mexico	-	-	Elite line/germplasm	-
84.	EC576585	E3228	CIMMYT, Mexico	-	-	Elite line/germplasm	-
85.	EC190899	Cultivar No.37	CIMMYT, Mexico	-	-	Elite germplasm	-
86.	EC574849	9008	CIMMYT, Mexico	-	-	Elite line/germplasm	-
87.	EC576175	E10906	CIMMYT, Mexico	-	-	Elite line/germplasm	-
88.	IC582706	HPW240	Malan, Kangra (HP)	2009	-	Germplasm collection (Gehun Kanak)	-
89.	IC393878	WH157	CCSHAU, Hisar	1978	NP876/S308/CNO /8156	For saline/alkaline soil	Irrigated, timely sown conditions of NWPZ
90.	IC542544	PAU4088	PAU, Ludhiana	-	-	Germplasm collection	-
91.	IC566223	HS492	IARI RS, Shimla	2008	HPW42/CPAN2032/ UNATH K.S.	-	-
92.	IC342668	VKG21/72	Chatra, Jharkhand	2002	-	Germplasm collection	-
93.	IC535717	PBW139	PAU, Ludhiana	-	-	Germplasm collection	-
94.	IC553599	HI1544 (Purna)	IARI RS, Indore	2008	HINDI62/BOBWHI TE/CPAN 2099	Early maturing, field resistance to brown and black rusts	Irrigated, timely sown conditions of CZ
95.	EC277134	713	CIMMYT, Mexico	-	-	Elite line/germplasm	-
96.	NA	CUO/79/ Pru 11A	CIMMYT, Mexico	-	-	Elite line/germplasm	-

\*NA-Not available; **BHU**-Banaras Hindu University, Varanasi, Uttar Pradesh; **CIMMYT**-International Maize and Wheat Improvement Center, Mexico; **CSUAT**-Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh; **CCSHAU**- CCS Haryana Agricultural University, Hisar, Haryana; **IARI**-Indian Agriculture Research Institute, New Delhi; **IARI RS**: IARI Regional station; **IIWBR**-Indian Institute of Wheat and Barley Research, Karnal, Haryana; **JAU**: Junagadh Agricultural University, Junagadh, Gujarat; **NDUAT**-Acharya Narendra Deva University of Agriculture and Technology, Ayodhya, Uttar Pradesh; **PAU**-Punjab Agricultural University, Ludhiana, Punjab; **PDKV**-Panjabaro Deshmukh Krishi Vidyapeeth, Akola, Maharashtra; **RARI**-Rajasthan Agricultural Research Institute, Jaipur, Rajasthan; **RARS**: Regional Agricultural Research Station, Vijapur, Gujarat; **USDA**-United States Department of Agriculture, USA; **VPKAS**-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand; **HP**: Himachal Pradesh; **TN**: Tamil Nadu; **WB**: West Bengal.