Supplemental Table 1. Indian wheat cultivars used for puroindolines gene diversity study

8A	CDWR9504	CPAN4208	DHT20	DL2186
A115	CDWR95101	CPAN4209	DHT21	DL2305
A90	CDWR95102	CPAN4210	DHT22	DL277
AC240	CDWR95104	CPAN4212	DHT23	DL3371
AC82	CDWR95105	CPAN4213	DHT24	DL5472
ACC.NO.8226	CDWR9529	CPAN4214	DHT25	DL7843
AGRALOCAL	CHHOTILERMA	CPAN4216	DHT26	DL7882
AJANTA	CIMMYT	CPAN4217	DHT27	DL8033
AKAW2264	CITR4910	CPAN4218	DHT28	DLRRI5
AKAW4627	CITR5420	CPAN4219	DHT29	DLRRL16
AKW1071	COOK	CPAN4220	DHT3	DLRRL32
AKW318	CPAN1796	CPAN4221	DHT30	DLRRL34
AKW3294	CPAN1968	CPAN4222	DHT32	DLRRL35
AKW370	CPAN2092	CPAN4223	DHT33	DUCKSEL
AKW381	CPAN3004	D134	DHT34	DURANTI
AM2006	CPAN3016	DBW14	DHT35	DURGAPURA65
B.SEL166	CPAN3046	DBW16	DHT36	DW21
BANDASHARBATI	CPAN4107	DBW17	DHT37	DW694
BARCHEALOCAL	CPAN4108	DBW39	DHT38	DW698
BAROW	CPAN4135	DBW46	DHT39	DW774
BAWAJI	CPAN4136	DBW49	DHT4	DW776
BAXI26	CPAN4137	DBW50	DHT40	DW812
BOBWHITE	CPAN4138	DBW51	DHT42	DW853
BR291	CPAN4196	DBW52	DHT43	DWR1
BW/SH2	CPAN4197	DHT1	DHT44	DWR16
BW/SH35	CPAN4198	DHT10	DHT45	DWR195
BW/SH43	CPAN4199	DHT11	DHT46	DWR21
C16	CPAN4200	DHT12	DHT47	DWR24
C285	CPAN4202	DHT13	DHT48	DWR39
C286	CPAN4203	DHT14	DHT5	EGPSN3RD22
C306	CPAN4204	DHT15	DHT7	EGPSN3RD24
CBW38(I)	CPAN4205	DHT16	DHT8	EGPSN3RD26
CDWR9425	CPAN4206	DHT17	DL1532(KUNDAN)	EGPSN3RD31
CDWR9426	CPAN4207	DHT2	DL2051	EGPSN3RD4
EGPSN3RD49	HD2189	HD3014	HPW315	HUW612
EGPSN3RD55	HD2236(KSHIPRA)	HD3016	HPW39	HUW616
EGPSN3RD56	HD2270	HDR77	HPW42	HUW620
EGPSN3RD65	HD2278	HI1077	HPW89	HUW625
EGPSN3RD70	HD2281	HI1287	HS109717	HUW626
GL1	HD2285(GOBIND)	HI1418	HS113864	HUW629
GL5	HD2307	HI1454	HS207	HUW7
GW116	HD2329	HI1500	HS240	HW1076
GW120	HD2380	HI1531	HS27	HW1078
GW173	HD2385	HI1544	HS277	HW1085
GW18	HD2402	HI1560	HS295	HW2004
GW190	HD2501	HI1563	HS365	HW2044
GW244	HD2643	HI784(SWATI)	HS375	HW2045
GW273	HD2687	HI8073	HS420	HW5207
GW322	HD2733	HI8078	HS505	HW52071

GW366	HD2781	HI977	HS507	HW5209
GW391	HD2824	HP1102	HS508	HW5210
GW40	HD2864	HP1493	HS511	HW657
GW406	HD2888	HP1633	HS512	HW741
GW496	HD29	HP1731	HS513	HY12
GW503	HD2932	HP1761	HS521	HY5
GW89	HD2967	HP1913	HS522	HYB11
H867	HD2982	HP3288	HS523	HYB633
H943	HD2983	HP803	HS62	HYB65
HB10062	HD2985	HP833	HS86	IC26756
HB208	HD2987	HPW147	HUW12	IC4937
HBW42	HD2997	HPW184	HUW206	IC8572
HD1925	HD2998	HPW251	HUW213	IWP72
HD1941(HIRA)	HD30	HPW289	HUW219	J17
HD1949(MOTI)	HD3002	HPW296	HUW229	J24
HD1982(JANAK)	HD3003	HPW297	HUW234	J405
HD2009(ARJUN)	HD3007	HPW30	HUW37	JWS17(SWAPNIL)
HD2135	HD3012	HPW308	HUW468	K0307
HD2177	HD3013	HPW309	HUW55	K0607
K0616	MP1203(I)	NP745	PBW596(I)	SARBATISONARA
K0617	MP1218	NP770	PBW610	SONALIKA
K0707	MP1224	NP771	PBW612	SONARA
K0708	MP1225	NP792	PBW613	SONORA64
K0710	MP3224	NP799	PBW617	TAWA267
K0711	MP4010	NP809	PBW618	TL2942
K0716	MP4080	NP818	PBW620	TL2963
K53	MP4106	NP823	PBW621	TL2966
K65	NARBADA4	NP824	PBW623	UAS304
K7410	NARMADA112	NP825	PBW624	UAS305
K78	NARMADA195	NP836	PBW625	UAS315
K7903	NEPAL10	NP839	PBW626	UAS316
K8020	NEPAL4	NP852	PBW628	UP1109
K8027	NEPAL40	NP884	PBW629	UP115
K816	NI179	NP890	PBW65	UP2003
K8434	NI345	NW1076	PI143783	UP2121
K88(K8804)	NI5439	NW2036	PV18	UP215
K8962	NI5643	NW4035	RAJ1114	UP2338
K9006	NIAW1395	PBCTYPE11	RAJ1482	UP2425
K9162	NIAW1415	PBN142	RAJ2184	UP2565
K9351	NIAW301	PBN51	RAJ3077	UP262
K9533	NIAW34	PBW12	RAJ3765	UP2744
K9644	NIAW917	PBW120	RAJ3777	UP2771
KENPHAD25	NP101	PBW138	Raj4037	UP2772
KHARCHIA65	NP111	PBW154	Raj4083	UP368
KRL14	NP114	PBW175	Raj4120(I)	UTKALIKA
KRL19	NP120	PBW226	Raj4176	VL401
KSML3	NP165	PBW343	RAJ821	VL404
LALBAHADUR	NP4	PBW373	RSP561	VL421
LOK1	NP710	PBW396	RW3016	VL616
MACS6222	NP715	PBW443	RW346	VL738
MACS6273	NP718	PBW54	RW3673	VL804

MLKS11	NP721	PBW550	SAFEDLARMA	VL829
MONDHYA32	NP737	PBW590(I)	SAGARIKA	VL832
VL892	VL935	WH1080	WL410	WWONIR226
VL907	WG357	WH1081	WL444	WWONIR228
VL916	WG377	WH147	WL711	WWONIR232
VL920	WH1021	WH291	WWONIR205	WWONIR240
VL921	WH1061	WH416	WWONIR207	WWONIR252
VL924	WH1062	WH533	WWONIR213	WWONIR258
VL925	WH1063	WH542	WWONIR215	WWONIR268
VL933	WH1073	WH711	WH1076	WL1562
VL934				

Supplemental Table 2. Indian wheat cultivars and their pedigree used for sequencing puroindoline genes

S. no.	Variety name	Pedigree	Year of release	Institute/ place of release
1	A115	A 113'S'	1915-18	AKOLAS
2	A90	SEL.PUNJAB LOCAL LALKUSURWALA	1919	LYALLPUR
3	AGRALOCAL	LANDRACE	—	UTTAR PRADESH
4	AKW318	S 308/NI5439	1991	AKOLA
5	C306	RGN/CSK3//2*C591/3/C127/N14//C281	1965	PAU/DPB HR
6	CHHOTILERMA	LR 64 'S'//HUAR	1969	NEW DELHI
7	DBW17	CMH79A.95/3*CNO 79//RAJ3777	2006	DWR, Karnal
8	DBW39	ATTILA/HUI	2010	DWR, Karnal
9	DBW46	PBW343/INQ21	2011-12	DWR KARNAL
10	DHT12	GERMPLASM	—	—
11	DHT23	GERMPLASM	—	—
12	DLLR35	GERMPLASM	—	—
13	GW89	KAL'S'/LR 64A//SKA	1984	VIJAPUR
14	H867	GERMPLASM	—	—
15	HB208	SPO/MTA/MQ/2*RNW//3/PJ'S'/P14/KT54B	1981	BHOWALI
16	HD2135	H41-3 (HD1962*(R4870*K65	1975	NEW DELHI
17	HD2967	ALD/COC//URES/HD2160m/HD2278	2011	IARI NEWDELHI
18	HD3002	UP2433/HD 2687	2008-09	NEW DELHI
19	HD3014	C306/STMPALLI//HW2003/WR956//DL153-2	2008-09	NEW DELHI
20	HPW251	WW24/LEHMI/P2-II149	2007	PALAMPUR
21	HPW296	PUNJAB96-PALAMPUR CSKHPKV	2007-08	PALAMPUR CSKHPKV
22	HS113	GERMPLASM	—	SHIMLA
23	HS1138	E 4870/SONALIKA	1978	SHIMLA
24	HS277	KAVKAZ/CIGUENA	1992	SHIMLA
25	HS295	CQT/AZ//IA 555/ALDML'S'/NAFN/4/PJN'S'/PEL1276.69	1992	SHIMLA
26	HS490	HS364/HPW114//HS240/HS346	2007	SHIMLA
27	HS505	ATTILA*219/K7/BAGE//FN/3/BZA/4/TRM/5/ALDAN/6/SERI/7/VEE3#10/8/DPATA	—	SHIMLA
28	HS508	ATTILA/3/VORRONA/CNO79//KAUZ	2008-09	SHIMLA
29	HS512	BAU/3/GLEN//MAYA/NAC/4/NL456/VEE#5	2008-09	SHIMLA-TUTIKANDI,IARI
30	HS513	HS413/HD2643//HW2044 (GERMPLASM)	—	SHIMLA
31	HUW12	NP 876 / CIANI 66	1980	VARANSI
32	HUW612	HUW202/HUW300//HUW395	—	VARANSI
33	HW5210	HW3081//HW2084	1988	PKV-AK
34	HYB11	A 115/WIS 245'S'	1953-54	POWERKHEDA
35	HYB65	GB-AUS/A115	1976	POWERKHEDA
36	K0307(SHATABDI)	K 8321/UP 2003	2006	KANPUR

37	K0607	HUW468/HD2402	2011	KANPUR
38	K0710	PBW343/K9162	2011	KANPUR
39	K53	SEL.LOCAL OF JHANSI	1951	KANPUR
40	K65	C591/NP773	1964	KANPUR
41	K816	CNO SIB//SN64/KLRE/3/8156	1974	KANPUR
42	KSML3	MULTILINE(KALYANSONA) OF SIX COMPONENTS	1981	PAU
43	LOK1	S308/S331	1981	SANOSARA
44	MACS6222	HD2189*2/MACS2496	2009-10	ARI PUNE
45	NAPHAL	LANDRACE	—	DWR KARNAl
46	NARBADA 4	GB-AVS/N14/3/PW5//TH/NP165	1971	POWERKHEDA
47	NARMAD A112	HY65/C306	1982	POWERKHEDA
48	NARMAD A195	C306/HY65(SELECTION OF N-112)	1979	POWERKHEDA
49	NI5643	NEW THATCH /D221 NI 284-S	—	NIPHAD
50	NP715	NP 710'S'	—	NEW DELHI
51	NP809	DO/C 518/SPP//NP 114/3/WIS 245'S'	—	SHIMLA
52	NP818	DO/E518//SPP/NP114/3/WIS245'S'	1965	SHIMLA
53	NP824	WIS245'S'/NP 165//NP 770/3/C 518NP 165	1960S	NEW DELHI
54	NP825	NP 824'S'	1960S	NEW DELHI
55	NP852	KF/2*NP 761	1969	PUSA, BIHAR
56	PBW343	ND/VG 9144//KAL/BB/3/YACO/4/VEE#5-	1996	LUDHIANA PAU
57	PBW550	WH594/RAJ3858//W485	2007	LUDHIANA PAU
58	PBW613	PBW438/343//PBW457 (GERMPLASM)	—	LUDHIANA PAU
59	PBW621	KAUZ/ALTAR84/AOS/3/MILAN/KAUZ/4/HUITES	2011-12	LUDHIANA PAU
60	PBW628	PBW175/PBW396//PBW343 (GERMPLASM)	—	LUDHIANA PAU
61	RAJ4120	PBW343/V1	2008	DURGAPURA
62	SAFEDLER MA	Y50/N10B//L52/3/3*LR	1968	IARI NEWDELHI
63	SHARBATI SONORA	AMBER MUTANT OF SON.64	1969	N.DELHI
64	SONALIK A	II54-388/AN/3/YT54/N10B/LR64	1965	NEW DELHI
65	UAS315	DWR163/DHARWAD DRY//DWR225	1973	UAS DHARWAD
66	UP215	TZPP*SON.64	1975	PANTNAGAR
67	UP2771	HPW89/UP2520//UP2382	—	UTTAR PRADESH
68	UP2772	UP2425/VL721	—	UTTAR PRADESH
69	VL401	PENJAMO (TRIGOENANO)SELECTION	1978	ALMORA
70	VL616	SKA/CPAN 1507	1986	ALMORA
71	VL829	IBWSN 149/CPAN 2099	2003	ALMORA
72	VL916	VW9917/ID13.1/MLT	2007-08	ALMORA VPKAS
73	VL921	VEE/SNB//BUC/PVN/3/DARU	2007-08	ALMORA VPKAS
74	VL924	PBW373/VL795	2008-09	ALMORA VPKAS
75	VL925	BPRE'S'//CNO'S'/GLL/HD 30//VL 804	2008-09	ALMORA VPKAS

76	VL934	UP 2425/PCK/TTM'S'	2008-09	ALMORA VPKAS
77	VL935	VL804/UP2425	2008-09	ALMORA VPKAS
78	WH1061	WEAWER/WL2926//SW89.3064 (GERMPLASM)	—	HISAR (CCSHAU)
79	WH1062	WEAWER/WL2926//SW89.3064 (GERMPLASM)	—	HISAR (CCSHAU)
80	WH1073	JVP/ZP/COL/3/PVN/4/PEN/5/BOW/BUC/BUL/6/ VEE #5/DOVE/BUC/7/WH291	2007-08	HISAR (CCSHAU)
81	WH1081	218tSAWSAN171	2008-09	HISAR (CCSHAU)
82	WWONIR205	GERMPLASM	—	—

Supplemental Table 3. Primers used for amplification of puroindoline genes in Indian wheat cultivars

Primer Name	Primer Sequence (5'-3')	Tm (ºC)	Product length (bp)	References
Pina-D1_F IV	CATCTATTCATCTCCACCTGC	61.1	520	Lilemo et al., 2006
Pina-D1_R IV	GTGACAGTTTATTAGCTAGT	47.7		
pin a-D1_F	CCCTGTAGAGACAAAGCTAA	56.2	480	Massa et al., 2004
pin a-D1_R	TCACCAGTAATAGCCAATAGTG	58.2		
Pina-D1_F-III	ATGAAGGCCCTCTTCCTCA	63.7	330	Gautier et al., 1994
Pina-D1_R III	TCACCAGTAATAGCCAATAGTG	58.2		
Pinb-D1_FII	AATAAAGGGGAGCCTCAACC	63.0	530	Tranquilli et al., 2002
Pinb-D1_RII	CGAATAGAGGCTATATCATCACCA	62.8		
pinb-D1_FI	ATGAAGACCTTATTCCTCCTA	55.9	480	Tranquilli et al., 2002
pinb-D1_RI	TCACCAGTAATAGCCACTAGGGAA	64.5		

Supplementary Table 4. Comparative analysis of 82 cultivars for Grain hardness, moisture, weight and diametre

Sr. No.	Variety Name	Grain Hardness	Grain Moisture	Grain Weight	Grain Diametre
		Mean±S.E.	Mean±S.E.	Mean±S.E.	Mean±S.E.
1	A 115	79.490±1.401	13.370±0.429	42.680±1.764	3.160±0.535
2	A 90	91.240±1.061	8.990±0.850	25.320±0.605	2.650±0.269
3	AGRALOCAL	77.890±1.414	10.990±0.396	45.420±0.511	3.080±0.341
4	AKW318	60.000±4.117	10.570±0.597	51.720±1.693	3.060±0.243
5	C306	95.000±1.495	8.700±1.294	25.420±0.609	2.950±0.298
6	CHHOTI LERMA	31.150±1.002	13.200±0.761	35.600±0.860	2.600±0.251
7	DBW 17	77.720±2.500	13.830±0.700	44.760±0.876	3.070±0.127
8	DBW 39	82.510±0.992	9.870±0.235	35.340±2.140	3.290±0.263
9	DBW46	85.330±1.540	9.720±0.659	34.680±2.518	2.880±0.327
10	DHT12	101.860±1.023	13.260±0.620	37.070±0.834	2.820±0.297
11	DHT23	69.710±2.244	10.740±0.610	39.980±0.963	3.050±0.491
12	DLLR35	23.000±1.004	11.330±0.520	41.300±1.090	2.930±0.214
13	GW 89	33.550±2.844	10.410±0.814	47.960±2.427	2.990±0.429
14	H867	25.000±1.601	10.930±1.169	46.470±1.533	3.100±0.291
15	HB208	51.070±1.176	10.110±0.920	58.680±1.274	3.160±0.119
16	HD 2135	78.000±2.296	10.230±0.810	42.830±0.551	2.880±0.103
17	HD2967	83.000±0.872	10.340±0.700	44.320±0.686	2.980±0.217
18	HD3002	84.990±1.118	9.550±1.427	33.970±2.275	2.880±0.133
19	HD3014	86.320±1.635	9.090±0.853	31.110±0.667	2.790±0.353
20	HPW251	84.970±1.861	8.860±0.505	32.510±2.211	2.770±0.110
21	HPW296	73.070±1.838	13.070±0.566	44.110±1.063	3.070±0.270
22	HS 113	70.660±1.745	9.120±0.977	27.030±0.517	2.600±0.122
23	HS 277	73.300±2.989	9.410±0.357	24.590±1.095	2.520±0.154
24	HS 295	75.150±2.023	9.310±1.285	28.940±1.701	2.800±0.140
25	HS1138	70.660±0.863	9.120±0.909	27.030±0.517	2.600±0.200
26	HS490	41.000±1.442	10.230±1.084	45.340±0.685	2.870±0.240
27	HS505	78.570±1.261	8.980±0.883	32.460±0.982	2.880±0.210
28	HS508	75.650±1.850	9.210±0.677	40.510±0.563	3.110±0.125
29	HS512	79.450±2.159	9.310±1.620	30.900±0.891	2.730±0.056
30	HS513	85.720±2.741	8.190±0.449	23.830±0.650	2.510±0.166
31	HUW12	83.670±3.673	8.870±1.143	30.920±0.825	2.700±0.068
32	HW5210	76.300±1.223	12.940±0.550	49.850±1.111	3.130±0.136
33	HUW612	83.670±1.919	8.870±0.693	30.920±0.570	2.700±0.136
34	HYB 11	59.670±1.384	11.070±0.639	45.610±1.097	2.890±0.254
35	HYB 65	59.370±2.520	11.100±0.790	51.220±1.136	3.280±0.199
36	K 53	81.300±1.198	9.320±0.497	33.170±1.480	2.850±0.232

37	K65	91.570±2.583	9.600±0.430	47.510±1.357	3.310±0.295
38	K 816	75.480±1.421	9.130±0.510	31.160±1.240	2.710±0.129
39	K0307(SHATABDI)	87.310±0.990	9.370±0.436	30.430±1.045	2.840±0.195
40	KO607	76.430±1.611	9.590±0.602	32.390±0.788	2.820±0.318
41	KO710	95.080±2.214	9.290±0.978	30.580±0.686	2.880±0.261
42	KSML3	80.360±1.924	9.510±0.467	30.890±1.143	2.780±0.135
43	LOK1	87.200±1.971	9.130±0.604	31.160±0.681	2.890±0.314
44	MACS6222	76.190±2.237	9.480±0.416	32.480±0.552	2.960±0.167
45	NARMADA 112	61.380±2.965	10.720±1.283	56.670±1.429	3.470±0.160
46	NARMADA 195	74.510±1.907	10.430±0.891	57.890±0.893	3.510±0.165
47	NARMADA 4	74.190±2.148	10.480±0.506	50.760±0.865	3.230±0.290
48	NI 5643	82.080±1.533	11.460±0.476	37.540±1.853	2.910±0.098
49	NP 715	76.230±1.183	9.450±0.511	30.910±1.096	2.820±0.171
50	NP 818	73.260±2.394	9.420±0.360	52.260±3.009	2.750±0.290
51	NP 824	76.190±1.064	9.180±1.026	32.480±1.172	2.860±0.081
52	NP 825	81.400±1.712	9.110±1.490	30.690±1.180	2.760±0.136
53	NP 852	84.490±0.901	9.150±0.332	31.350±1.211	2.870±0.155
54	NP809	44.380±1.312	9.380±1.100	30.520±1.178	2.840±0.183
55	NAPHAL	28.370±1.941	10.230±1.288	34.560±0.893	2.900±0.064
56	PBW 343	80.890±1.412	9.450±1.020	33.580±1.888	2.960±0.161
57	PBW 550	78.500±1.784	9.080±1.067	35.040±1.078	3.000±0.064
58	PBW613	77.140±1.047	9.150±0.737	36.510±0.865	2.890±0.032
59	PBW621	77.230±2.771	9.380±0.856	33.040±2.534	3.400±0.211
60	PBW628	86.120±1.588	9.200±0.424	30.650±1.181	2.670±0.103
61	RAJ 4120	78.900±1.201	9.370±0.704	38.930±1.134	3.080±0.137
62	SAFED LERMA	28.000±2.731	12.830±0.886	35.840±0.953	2.700±0.258
63	SHARBATI SONORA	57.700±1.317	11.230±0.734	36.510±0.924	2.710±0.064
64	SONALIKA	59.300±1.451	11.460±1.432	37.540±1.312	2.870±0.131
65	UAS315	79.540±2.026	9.230±0.689	31.050±1.303	2.760±0.157
66	UP 215	74.180±2.603	8.980±0.420	31.900±0.587	2.860±0.110
67	UP2771	79.470±1.999	9.530±0.495	33.020±0.823	2.830±0.136
68	UP2772	82.510±1.038	9.030±0.525	52.510±2.591	2.730±0.165
69	VL 401	66.200±1.850	11.620±0.444	51.490±1.241	3.100±0.127
70	VL 616	73.070±2.127	9.080±0.806	36.750±0.927	3.150±0.100
71	VL 829	84.340±2.891	9.390±1.282	31.290±0.958	2.820±0.105
72	VL916	82.400±1.575	11.880±0.415	34.880±1.344	2.940±0.062
73	VL921	80.890±0.875	9.240±0.443	34.770±0.853	2.950±0.085
74	VL924	89.090±3.406	8.670±1.125	27.360±1.478	2.680±0.053
75	VL925	78.970±1.171	9.180±0.841	35.440±0.944	2.960±0.335
76	VL934	70.660±1.199	9.450±0.815	27.080±1.344	2.680±0.047
77	VL935	71.460±1.086	9.190±1.572	44.890±0.917	3.040±0.046

78	WH1061	73.173±2.586	9.190±0.987	42.000±1.640	3.050±0.083
79	WH1062	76.483±0.423	9.160±0.730	36.490±1.198	2.910±0.036
80	WH1073	76.583±0.422	9.310±0.983	31.810±1.617	2.910±0.070
81	WH1081	76.673±0.422	9.410±0.290	38.280±3.538	2.977±0.172
82	WWONIR205	64.000±2.050	11.930±1.401	29.990±1.338	2.480±0.076
	C.D.	5.289	2.364	3.786	N/A
	SE(m)	1.892	0.846	1.355	0.208
	SE(d)	2.676	1.196	1.916	0.295
	C.V.	4.523	14.631	6.319	12.406

C.V. - Coefficient of variation
SE- Standard error