Supplementary table 1: The diverse bread wheat genotypes used in present GWAS analysis and their pedigree information

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| **Genotypes** | **Pedigree information** |
| Excalibur | RAC-177(Sr26)/UNICULM-492//RAC-311-S |
| SeriM82 | KAVKAZ/(SIB)BUHO//KALYANSONA/BLUEBIRD |
| Chirya-3 | CHINESE-SPRING/AG.CU//GLENNSON-81/3/ALONDRA/PAVON-76/4/NINGMAI-4/OLESEN//ALONDRA/YANGMAI-4 |
| Drysdale | HARTOG\*3/QUARRION |
| RAC875 | RAC-655/3/Sr21/4\*LANCE//4\*BAYONET |
| BTSchumurgk | Halberd/Aroona//3\*Schomburgk |
| Sunco | SUN-9-E-27\*4/3-AG-14//WW-15/3/3\*COOK |
| Westonia | CO-1190-203/84-W-127-501 |
| CPAN1676 | BON//CNO/SON64/3/KA L/BB |
| DBW14 | RAJ 3765/PBW 343 |
| GW322 | GW 173/GW 196 |
| GW366 | DL 802-3/GW 232 |
| HD2189 | HD 1963 / HD 1931 |
| HD2687 | CPAN2009/HD 2329 |
| HD2733 | ATTILA /3/TUI /CARC //CHEN / CHTO /4/ATTILA |
| HD2888 | C306/*T.sphaerococcum*//HW 2004 |
| HD2894 | HW 2002/WR 196 |
| HD2932 | KAUZ/STAR//HD 2643 |
| HD2967 | ALD/COC//URES/HD216 0M/HD2278 |
| HD2985 | PBW 343/ PASTOR |
| HD2987 | HI1011/HD2348//M ENDOS//IWP 72/DL153-2 |
| HD3059 | KAUZ//ALTAR84/ AOS/3/MILAN/KA UZ/4/HUITES |
| HD3086 | DBW14/HD2733//HUW468 |
| HD3118 | ATTILA\*2/PBW65 //WBLL1\*2/TUKU RU |
| HD3171 | PBW 343/HD 2879 |
| HD3237 | HD3016/HD2967 |
| HI1531 | HI 1182/ CPAN 1990 |
| HI1544 | HINDI62/BOBWHI TE/CPAN 2099 |
| HI1605 | BOW/VEE/5/ND/VG9 144//KAL/BB/3/YACO /4/CHIL/6/CASKOR/3 /CROC\_1/AE.SQUAR ROSA(224)//OPATA/ 7/PASTOR/MLAN/KAUZ/3/BAV92 |
| Hindi-62 | PBW-226/HW-1042//HD-2285 |
| Hira | YT54/N 10BIISN64 |
| HUW468 | CPAN-1962 / TONI //LIRA'S’/ PRL'S' |
| HUW510 | HD 2278/HUW 234//DL 230-16 |
| HW2004 | C 306 \*7 //TR 380-14 #7 /3 AG14 |
| K68 | NP773/K 13 |
| Halna | HD 1982/K816 |
| NIAW34 | CNO 79/PRL “S” |
| NP852 | KF/2\*NP 761 |
| NW1014 | HAHN ‘S’ |
| Pissilocal | LV-MADHYA-PRADESH |
| RAJ3765 | HD 2402/VL639 |
| VL829 | IBWSN149/CPAN 2099 |
| VL907 | DYBR 1982- 83/842 ABVD 50/VW9365//P BW 343 |
| WB-2 | T. DICOCCON CI9309/AE. SQUARROSA (409) /3/MILAN / S87230 // BAV92/4/2\*MILAN/S87320//BAV92 |
| WR544 | KALYANSONA/ HD 1999//HD2204/DW 38 |
| DBW43 | BA BAX/LR42// BABAX\*2/3/VIVITSI |
| CS5 | PUB94.15.1.12/WBLL1 |
| CS19 | MEX94.2.19/PUB94.15.1.12 |
| CS28 | W15.92/4/PASTOR//HXL7573/2\*BAU/3/WBLL1 |
| CS32 | BAV92/SERI |
| CS38 | PFAU/SERI-82(CID-93300//BOBWHITE |
| CS41 | SSRT16 |
| CS42 | BOBWHITE/NACOZARI-76//VEERY/3/BLUEJAY/COCORAQUE-75 |
| CS46 | BAV92/SERI |
| CS69 | KUKRI/RAC875 |
| CS86 | SB187 |
| CS94 | MEX94.2.19//SOKOLL/WBLL1 |
| CS101 | CROC-1/AE.TA(WX-224)//OPATA-M-85/3/PASTOR |
| CS108 | BOBWHITE/BUCKBUCK |
| CS110 | NORD-DESPREZ/VG-9144//KALYANSONA/BLUEBIRD/3/YACO/4/VEERY-5 |
| CS112 | 76ECN44/76ECN36//MADDEN/6\*RAC177 |
| CS128 | BAV92/SERI |
| CS129 | SB025 |
| CS143 | AUS30354 |
| CS144 | CIANO-79/PARULA//CHILERO |
| PBW771 | PBW550//YR15/6\*AVOCET/3/2\*PBW550) |
| WH1124 | MUNIA/CHTO/AM SEL |
| ANNUELLO | PAVON(SIB)/TM-56(VF-665)//JANZ |
| Sunlin | SUNELG\*2//SUNECA\*3/VPM-1 |
| DBW222 | KACHU/SAUAL\*ATTILA\*2/PBW65/6/PVN//CAR422/ANA/5/BOW/CROW//BUC/PVN/3/YR/4/TRAP#1/7/ATTILA/2\*PASTOR |
| IC42 | NA |
| IC43 | NA |
| QBP-13-12 | KINDE/4/CMH75A.66//H567.71/5\*PVN/3/SERI |
| IITR26 | Landrace |
| AUS30523 | CROC\_1/AE.SQUARROSA (224)//OPATA/3/RAC655 |
| AUS30518 | CROC\_1/AE.SQUARROSA (224)//OPATA/3/RAC655 |
| NAVRATTAN | Landrace |
| UP2672 | UP 2382/DLRSN-7 |
| QBP12-01 | KVZ/PPR47.89C//FRANCOLIN #1/3/2\*PAURAQ |
| QBP12-05 | VILLA JUAREZ F2009/SOLALA//WBLL1\*2/BRAMBLING |
| IST SAMNYT 406 | exotic |
| QBP12-8 | FRET2/TUKURU//FRET2\*2/3/T.SPELTA PI348530 |
| QBP12-10 | REH/HARE//2\*BCN/3/CROC\_1/AE.SQUARROSA (213)//PGO/4/HUITES/5/T.SPELTA PI348599/6/REH/HARE//2\*BCN/3/CROC\_1/AE.SQUARROSA (213)//PGO/4/HUITES/7/QUAIU |
| BAJ#1 | WAXWING/4/SONOITA-81/TRAP-1/3/KAUZ,MEX\*2/TRAP//KAUZ,MEX |
| Kukri | 76ECN44/76ECN36//MADDEN/6\*RAC177 |
| SEMONG 2 | NA |
| YangMai-6 | DAFENG-1087/ZAO-5 |
| PQW113 | NA |
| PQW114 | NA |
| QBP12-9 | BL 1724\*2/3/T.DICOCCON PI272533/AE.SQUARROSA (458)//CMH81A.1261/VEE#10 |
| HD3372 | KINDE\*2/4/T.DICOCCOMPI94625/AE.SQ(372)//TUI/CLMS/3/2\*PASTOR/5/WAXBI/6/BAJ #1/AKURI |
| QBI-19-1 | QUAIU #1/3/T.DICOCCON PI94625/AE.SQUARROSA (372)//3\*PASTOR/4/QUAIU #2\*2/5/SUP152/BECARD |
| PBW723 | PBW343+Lr57/Yr40+Lr37/Yr17 |
| QBP13-9 | REH/HARE//2\*BCN/3/CROC\_1/AE.SQUARROSA (213)//PGO/4/HUITES/5/T.SPELTA PI348599/6/REH/HARE//2\*BCN/3/CROC\_1/AE.SQUARROSA (213)//PGO/4/HUITES/7/QUAIU |
| Bob White | AVRORA//KALYANSONA/BLUEBIRD/3/(SIB)WOODPECKER |
| Krichauff | WARIQUAM//KLOKA/PITIC-62/3/WARIMEK/HALBERD/4/3-AG-3/AROONA |
| PBW689 | PBW442/WH576//DWR232 |
| RAJ4229 | HW2048/RAJ4000 |
| RAJ4238 | HW 2021/RAJ 3765 |
| HD3354 | QUAIU#1/3/T.DICOCCONPI94625/AE.SQ(372)//3\*PASTOR/4/QUAIU#2/5/VALI/6/B ECARD/QUAIU#1 |
| QBI-19-2 | WHEAR/KIRITATI/3/C80.1/3\*BATAVIA//2\*WBLL1/4/CMH75A.66/SERI/5/2\*VILLA JUAREZ F2009/3/T.DICOCCON PI94625/AE.SQUARROSA (372)//3\*PASTOR/4/WBLL1\*2/BRAMBLING |
| WH1080RF | 21ST SAWSN151 |
| PBW175RF | HD 2160 /WG 1025 |
| Lok1 | S308/S331 |
| QBI-19-3 | KOKILA/3/MUTUS\*2//ND643/2\*WBLL1/8/PSN/BOW//SERI/3/MILAN/4/ATTILA/5/KAUZ\*2/CHEN//BCN/3/MILAN/6/WBLL1\*2/SHAMA/7/IWA 8600211//2\*PBW343\*2/KUKUNA |
| QBI-19-4 | FRANCOLIN #1/3/IWA 8600211//2\*PBW343\*2/KUKUNA/4/MUCUY |
| QBI-19-5 | QUAIU #1/SOLALA//QUAIU #2/3/MANKU/4/KACHU #1/KIRITATI//KACHU |
| QBI-19-6 | SHAKTI/7/SERI.1B\*2/3/KAUZ\*2/BOW//KAUZ/4/KRONSTAD F2004/5/MUNAL/6/MUNAL #1/8/MP4010/MUNAL #1 |
| QBI-19-7 | MELON//FILIN/MILAN/3/FILIN/8/NAC/TH.AC//3\*PVN/3/MIRLO/BUC/4/2\*PASTOR/5/T.SPELTA PI348774/6/BACEU #1/7/WBLL1\*2/4/YACO/PBW65/3/KAUZ\*2/TRAP//KAUZ/9/KENYA SUNBIRD/2\*KACHU |
| HD3249 | PBW343\*2/KUKUNA//SRTU/3/PBW343\*2/KHVAKI |
| 2.38 | T. dicoccon PI94624/Ae. tauschii [409]//BCN |
| K1317 | K0307/K9162 |
| Janz | 3-AG-3/4\*CONDOR//COOK |
| 4HPAN-82 | KINDE/4/CMH75A.66//H567.71/5\*PVN/3/SERI |
| HI1612 | Kauz//Altar84/AO S/3/Milan/Kauz/4/Huites |
| HI1500 | HW 2002\*2// STREMPALLI/PN C 5 |
| HI617 | Selection from C 306 |
| C591 | PENJAB-TYPE-8-B/PENJAB-TYPE-9 |
| C273 | C591/C209 |
| 4HPAN-84 | KINDE/4/CMH75A.66//H567.71/5\*PVN/3/SERI |
| NP 770 | KONOSU/NP-4 |
| Lok Bold | S308/S311 |
| ASOCMAP-251 | NA |
| ASOCMAP-260 | NA |
| Kharchia65 | KHARCHIA LOCAL/EG 953 |
| QLD27 | NA |
| HS490 | HS 364/HPW 114//HS 240/HS 346 |
| Local Collection 1c 01 | Local Indian collection |
| C306 | RGN/CSK3//2\*C5 91/3/C217/N14 //C281 |
| CBW38 | CNDO/R 143/ENTE /MEXI\_2/3/Ae.SQU ARROSA (TAUS)/ 4/WEAVER/5/2\*PA STOR |
| LOK67 | NA |
| PBW681 | UP2338/KALYANSONA |
| HUW666 | NA |
| WH1129 | CS/TH.CS//3\*PVN/3/MIRLO/BUC/4/MILAN/5/TILHI |
| DBW51 | SITELLA/MILAN |
| HS543 | NA |
| HS611 | 69-1776/663//2\*BCN/3/7\*BCN/4/PARUS/PASTOR |
| Choti Lerma | LR64(SIB)/HUA.R |
| GW451 | GW324/4/CROC\_1/AE.RA RS,QUARROSA(205)//J U Vijapur P/JY/3/SKAUZ /4/KAUZ/5/GW339 |
| HB208 | SPO/MTA//MQ /2\*RNW//3/PJ' S'/P14/KT54B |
| HD2009 | LR 64A /NAI 60 |
| DBW16 | RAJ 3765/WR 484//HUW 468 |
| DBW17 | CMH79A.95/3\*CNO 79//RAJ3777 |
| DBW39 | ATTILA/HUI |
| DBW173 | KAUZ/AA//KAUZ/P BW602 |
| DBW187 | NAC/TH/AC//3\*PVN/3/MIRLO/BUC/4/ 2\*PASTOR/5/KACHU/6/KACHU |
| DL153-2 | TANORI 71/ NP 890 |
| DL788-2 | K7537/HD2160/ HD2278//L24/K4.14 |
| GW273 | CPAN 2084/VW 205 |
| HD2329 | HD 1962/E 4870/3/K 65/5/HD1553/4/UP262 |
| HD3226 | GRACKLE/HD2894 |
| HDR77 | PARTIZANKA /HD 2204 //HD2204 |
| HI1563 | MACS 2496\*2/MC 10 |
| HD2824 | PTO-1 /CNO79/PRL /GAA /3/HD 1951 |
| HD2833 | PBW 226 / HW 1042//HD 2285 |
| HD2851 | CPAN 3004/WR426//HW 2007 |
| HD2864 | DL 509-2/ DL 377-8 |
| HD2894 | HW 2002/WR 196 |
| HD2982 | NA |
| HD3090 | SFW/VAISHALI// UP2425 |
| MP1203 | FASN/2 TEPOKA/3/ CHEN/A.SQUARRO SA/TA |
| MP3224 | MP-403-2/GW-322 |
| NI5439 | REMP 80/3\*NP 710 |
| HW2045 | HD 2402 \*6 /SUNSTAR \*6 /C-80-1 |
| K307 | K 8321/UP2003 |
| K65 | C591/NP773 |
| K88 | VEERY "S"/WL 711 |
| K1006 | PBW343/HP1731 |
| Kundan | TANORI 71/ NP 890 |
| Lal Bahadur | S 54723 \* RS 31-1 ML 293 BB\*KAL2 ML 319 CNO-KAL\*CD1(KALINIA\* INIA-BB) ML328 BB-KAL2 ML 408 RONCHA\* KAL-NOR67 ML 414 TOB-INIA\*KAL |
| Lerma Rojo | Y50/N 10B//L 52/3/2\*LR |
| Raj4120 | PBW 343/V 1 |
| Safed Lerma | Y50//N10B/3/LR 52/3\*LR |
| Sharbati Sonara | Amber Mutant of S64 |
| PBW65 | USA 255/K 816 /3/ WL 202 |
| PBW752 | BW621/4/PBW343//. YR10/6\*AVOCET/3/3\*PBW343/5/PBW621 |
| RAJ4037 | DL 788-2/RAJ 3717 |
| RAJ1482 | NAPO-TOB 'S'/8156/KAL-BB |
| Raj3077 | HD 2267/RAJ 1482/5/BB/INIA66' S'/NAPO |
| UP1109 | UP 262 /UP 368 |
| UP262 | S 308/BAJIO 66 |
| UP2425 | HD 2320/UP 2263 |
| WH542 | JUP /BJY”S”//URES |
| WH1080 | 21ST SAWSN151 |