Table S1. Genotypes used in the research

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| number | code | origin(place of collection) | number | code | origin(place of collection) |
| 1 | IUGB-00027 | Cite ceros | 52 | IUGB-00462 | Baneh |
| 2 | IUGB-00540 | Boroojerd | 53 | IUGB-00463 | Sanandaj-Shwesheh |
| 3 | IUGB-00037 | Pavon, fransooye aval | 54 | IUGB-00464 | Sanandaj |
| 4 | IUGB-00040 | ragham, Chenab | 55 | IUGB-00465 | Kermanshah |
| 5 | IUGB-00042 | ragham Bezostaya | 56 | IUGB-00466 | Sagez |
| 6 | IUGB-00045 | Iran-sefid boomi, risbak dar, moshabeh Sardari | 57 | IUGB-00467 | Qorveh |
| 7 | IUGB-00061 | ragham Gohar | 58 | IUGB-00468 | Qorveh |
| 8 | IUGB-00085 | Fardin, Graecum | 59 | IUGB-00469 | Kurdistan (Unknown place) |
| 9 | IUGB-00130 | Yazd, Graceum | 60 | IUGB-00470 | Qorveh |
| 10 | IUGB-00131 | Nahavand, Erythroleucum | 61 | IUGB-00471 | Mahabad |
| 11 | IUGB-00133 | Gonbad, Ferugineum | 62 | IUGB-00472 | Kermanshah (Unknown place) |
| 12 | IUGB-00541 | Lorestan | 63 | IUGB-00473 | Sanandaj |
| 13 | IUGB-00136 | Kermanshah, Subhostionum | 64 | IUGB-00474 | Dehgolan |
| 14 | IUGB-00138 | Khoramabad, Graceum | 65 | IUGB-00475 | Kermanshah (Unknown place) |
| 15 | IUGB-00264 | 40Km jadeh Esfahan-Shahr-Reza | 66 | IUGB-00548 | Hamadan |
| 16 | IUGB-00266 | 40Km jadeh Esfahan-Shahr-Reza | 67 | IUGB-00477 | Kurdistan (Unknown place) |
| 17 | IUGB-00282 | Havali Esfahan | 68 | IUGB-00478 | Mahabad |
| 18 | IUGB-00327 | Shoosh, Indicum | 69 | IUGB-00479 | Divandareh |
| 19 | IUGB-00341 | ragham Azadi | 70 | IUGB-00480 | Mahabad |
| 20 | IUGB-00342 | Songhor be Asadabad, roostay Zolfas | 71 | IUGB-00481 | Sarvabad |
| 21 | IUGB-00351 | ragham Sardari | 72 | IUGB-00482 | Kamyaran |
| 22 | IUGB-00352 | Razi Sorkheh | 73 | IUGB-00483 | Divandareh |
| 23 | IUGB-00356 | Back cross roushan | 74 | IUGB-00484 | Kurdistan (Unknown place) |
| 24 | IUGB-00397 | Selfchegan | 75 | IUGB-00485 | Urmiyeh |
| 25 | IUGB-00422 | Kermanshah | 76 | IUGB-00486 | Marivan |
| 26 | IUGB-00542 | Maian | 77 | IUGB-00487 | Kurdistan (Unknown place) |
| 27 | IUGB-00431 | ragham Varamin | 78 | IUGB-00488 | Qorveh |
| 28 | IUGB-00544 | Saghez | 79 | IUGB-00489 | Dehgolan |
| 29 | IUGB-00434 | ragham Aria | 80 | IUGB-00490 | Sagez |
| 30 | IUGB-00436 | Shiraz | 81 | IUGB-00491 | Kermanshah (Unknown place) |
| 31 | IUGB-00437 | Bijar | 82 | IUGB-00492 | Ilam |
| 32 | IUGB-00438 | Sanandaj | 83 | IUGB-00493 | Bokan |
| 33 | IUGB-00441 | Mahabad | 84 | IUGB-00494 | Kamyaran |
| 34 | IUGB-00442 | Kurdistan (Unknown place) | 85 | IUGB-00495 | Sanandaj |
| 35 | IUGB-00443 | Sanandaj | 86 | IUGB-00496 | Kurdistan (Unknown place) |
| 36 | IUGB-00444 | Divandareh | 87 | IUGB-00497 | Kurdistan (Unknown place) |
| 37 | IUGB-00547 | Behbahan | 88 | IUGB-00498 | Kurdistan (Unknown place) |
| 38 | IUGB-00446 | Kermanshah (Unknown place) | 89 | IUGB-00550 | Shoosh |
| 39 | IUGB-00447 | Sagez | 90 | IUGB-00500 | Kurdistan (Unknown place) |
| 40 | IUGB-00448 | Sagez | 91 | IUGB-00501 | Kurdistan (Unknown place) |
| 41 | IUGB-00449 | Bijar | 92 | IUGB-00502 | Kurdistan (Unknown place) |
| 42 | IUGB00451 | Ilam | 93 | IUGB-00552 | Ilam |
| 43 | IUGB-00452 | Kurdistan (Unknown place) | 94 | IUGB-00513 | Hamadan |
| 44 | IUGB-00453 | Khoy | 95 | IUGB-00515 | Shoosh |
| 45 | IUGB-00454 | Sanandaj | 96 | IUGB-00516 | Izeh |
| 46 | IUGB-00455 | Ravansar | 97 | IUGB-00518 | Kermanshah |
| 47 | IUGB-00456 | Kurdistan (Unknown place) | 98 | IUGB-00532 | ragham Saison |
| 48 | IUGB-00458 | Sanandaj | 99 | IUGB-00533 | unknown place (Iran) |
| 49 | IUGB-00459 | Bokan | 100 | IUGB-00534 | Ghorveh |
| 50 | IUGB-00460 | Zanjan | 101 | IUGB-00535 | Bijar |
| 51 | IUGB-00461 | Dehgolan | 102 | IUGB-00553 | Kurdistan |

Table S2. Temperature and time conditions of PCR program

|  |  |  |  |
| --- | --- | --- | --- |
|  | (C0)temperature | Time (sec) | cycle |
| Denaturation | 94 | 240 | 1 |
| Denaturation | 94 | 30 | 5 |
| Annealing | Tm+5 | 30 |
| Extension | 72 | 45 |
| Denaturation | 94 | 30 | 5 |
| Annealing | Tm | 30 |
| Extension | 72 | 45 |
| Denaturation | 94 | 30 | 24 |
| Annealing | Tm-5 | 30 |
| Extension | 72 | 45 |
| Final extention | 72 | 480 | 1 |

Table S3. A summary of descriptive statistics of traits related to the root structure at the embryonic and seedling stages and some agromorphological traits at the whole plant stage measured on a set of the 102 wheat genotypes.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| trait | Min | Max | mean | Se | CV% | range |
| semRN | 3 | 7 | 4.496732 | 0.080276 | 18.02961 | 4.00 |
| semRL | 8.173016 | 22.16667 | 13.45152 | 0.216142 | 16.22814 | 13.99 |
| semShL | 6.333333 | 15.66667 | 10.84477 | 0.171534 | 15.97461 | 9.33 |
| AllSemRL | 37.5 | 97.33333 | 59.5116 | 1.185288 | 20.11511 | 59.83 |
| RFW | 0.08 | 1.91 | 0.754755 | 0.027562 | 36.8818 | 1.83 |
| ShW | 0.15 | 2.08 | 0.885882 | 0.035016 | 39.91973 | 1.93 |
| RDW | 0.01 | 0.445 | 0.082059 | 0.005243 | 64.52616 | 0.44 |
| RV | 0.1 | 3 | 0.992157 | 0.044279 | 45.07347 | 2.90 |
| RL | 30.5 | 135 | 84.81373 | 1.878917 | 22.3739 | 104.50 |
| ShL | 19.5 | 37.5 | 27.0098 | 0.371002 | 13.87249 | 18.00 |
| TN | 1 | 4 | 1.946078 | 0.07879 | 40.88942 | 3.00 |
| LN | 3 | 12 | 6.259804 | 0.18625 | 30.04932 | 9.00 |
| RF | 35.32945 | 753.4958 | 154.4909 | 10.39258 | 67.93922 | 718.17 |
| RDM | 0.001084 | 0.01994 | 0.005888 | 0.000253 | 43.4177 | 0.15 |
| RWC | 52.40602 | 98.21153 | 88.91666 | 0.628557 | 7.139402 | 45.81 |
| SRL | 380.5556 | 7800 | 2018.601 | 159.5666 | 79.83468 | 7419.44 |
| RLD | 0.000675 | 0.002986 | 0.001879 | 0.00004 | 22.51266 | 0.002311129 |
| RSM | 0.0000002 | 0.000008 | 0.000002 | 0.0000001 | 57.57 | 0.0000007 |
| RMD | 0.000002 | 0.00004 | 0.000017 | 0.000001 | 36.94 | 0.00004 |
| RSA | 6.87 | 50.00 | 27.594 | 0.723 | 26.44 | 43.13 |
| RTD | 0.02 | 0.38 | 0.09 | 0.006 | 61.20 | 0.36 |
| pH | 40.00 | 106.25 | 72.64 | 1.51 | 20.97 | 66.25 |
| SL | 5.00 | 13.25 | 9.48 | 0.17 | 18.04 | 8.25 |
| AL | 0.00 | 7.75 | 3.65 | 0.16 | 43.75 | 7.75 |
| PL | 19.50 | 44.00 | 30.53 | 0.56 | 18.43 | 24.50 |
| SN | 1.00 | 16.00 | 6.13 | 0.24 | 39.41 | 15.00 |
| FS | 0.00 | 15.00 | 4.66 | 0.29 | 62.43 | 15.00 |
| IS | 0.00 | 6.00 | 1.47 | 0.16 | 110.46 | 6.00 |
| NSPS | 12.00 | 21.50 | 16.73 | 0.17 | 10.50 | 9.50 |
| stubbleW | 0.06 | 14.42 | 6.17 | 0.28 | 46.27 | 14.36 |
| SumSpikeDW | 0.12 | 12.65 | 3.42 | 0.20 | 57.69 | 12.53 |
| GN/allS | 0.00 | 257.00 | 76.07 | 5.76 | 76.43 | 257.00 |
| NG/PerS | 0.00 | 38.00 | 14.28 | 0.81 | 57.61 | 38.00 |
| allGW | 0.00 | 8.30 | 2.53 | 0.18 | 73.52 | 8.30 |
| TGW | 0.00 | 64.53 | 26.75 | 1.44 | 54.31 | 64.53 |
| DtSh | 107.00 | 131.00 | 120.69 | 0.58 | 4.85 | 24.00 |
| DtH | 128.50 | 176.00 | 150.81 | 1.03 | 6.92 | 47.50 |
| DtA | 140.00 | 190.00 | 165.44 | 1.05 | 6.41 | 50.00 |
| DtR | 164.50 | 208.00 | 187.11 | 0.90 | 4.84 | 43.50 |