**Table S1.** Details on QTLs/genomic segments identified for target traits in pigeonpea

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Trait** | **Mapping population** | **Population size** | **Parental lines used** | **QTLs/genomic segment** | **Flanking markers** | **LG** | **PVE (%)** | **Reference** |
| **Cleistogamy** | RIL | 80 | ICPL 99010 × ICP 5529 | qCl3.1 | Affx123353193-Affx123309962 | 3 | 9.10 | Yadav et al. 2019 |
| qCl3.2 | Affx123348752-Affx123306383 | 3 | 38.00 |
| qCl6.1 | Affx123312002-Affx123348721 | 6 | 19.70 |
| qCl10.1 | Affx123353812-Affx-123311709 | 10 | 9.10 |
| qCl3.2 | Affx123348752-Affx-123306383 | 3 | 50.60 |
| **Seed shape** | qShS6.2 | Affx123310260-Affx123332664 | 6 | 33.30 |
| qShS6.1 | Affx123342177-Affx123320773 | 6 | 37.20 |
| qShS9.1 | Affx123351506-Affx123335276 | 9 | 11.80 |
| **Seed size** | qSS6.1 | Affx123312002-Affx123348721 | 6 | 29.50 |
| qSS6.1 | Affx123312002-Affx-123348721 | 6 | 33.90 |
| **Seed protein content** | F2 | 178 | ICP 11605 × ICP 14209 | *qPROT-cim-3.2* | S3\_23699007 - S3\_18226407 | 3 | 10.30 | Obala et al. 2020 |
| *qPROT-cim-11.1* | S11\_11249294 - S11\_9768899 | 11 | 16.60 |
| *qPROT-cim-11.2* | S11\_20646423 - S11\_24857528 | 11 | 13.80 |
| 175 | ICP 8863 × ICP 11605 | *qPROT-cim-3.1* | S3\_17193829 - S3\_14758073 | 3 | 12.80 |
| *qPROT-icim-11.1* | S11\_2019429 - S11\_22353396 | 11 | 12.30 |
| 157 | HPL 24 × ICP 11605 | *qPROT-cim-2.1* | S2\_18621223 - S2\_5077845 | 2 | 23.50 |
| *qPROT-icim-2.2* | S2\_17642300 - S2\_27324059 | 2 | 10.00 |
| 179 | ICP 5529 × ICP 11605 | *qPROT-icim-2.1* | S2\_10279728 - S2\_32698493 | 2 | 16.50 |
| *qPROT-cim-2.2* | S2\_10279728 - S2\_32698493 | 2 | 17.50 |
| *qPROT-cim-2.4* | S2\_4297468 - S2\_13394656 | 2 | 11.80 |
| *qPROT-icim-2.2* | S2\_16519107 - S2\_16348673 | 2 | 11.50 |
| 137 | ICP 8863 × ICPL 87119 | *qPROT-icim-2.2* | S2\_9426717 - S2\_24073225 | 2 | 18.90 |
| *qPROT-icim-6.1* | S6\_20608121 - S6\_12302413 | 6 | 10.60 |
| *qPROT-cim-6.1* | S6\_12302413 - S6\_1292942 | 6 | 16.30 |
| *qPROT-cim-7.1* | S7\_462935 - S7\_1601723 | 7 | 11.30 |
| Germplasm | 6 | HPL 24, ICP 5529, ICP 11605, ICPL 87119, ICPW 90 and UQ 50 | spc003 (CAPS) | *C.cajan\_04622* | 2 | 3.50 | Obala et al. 2019 |
| spc107 (CAPS) | *C.cajan\_05609* | 2 | 3.70 |
| spc017 (dCAPS) | *C.cajan\_15445* | 8 | 2.20 |
| spc100 (CAPS) | *C.cajan\_06086* | 2 | 2.80 |
| **100 seed weight** | **F**2 | 178 | ICP 11605 × ICP 14209 | *qSW-cim-8.1* | S8\_5787667 - S8\_11399561 | 8 | 10.6 | Obala et al. 2020 |
| *qSW-cim-8.2* | S8\_13310192 - S8\_4675310 | 8 | 12.3 |
| *qSW-icim-8.1* | S8\_7083582 - S8\_6388803 | 8 | 15 |
| 175 | ICP 8863 × ICP 11605 | qSW-icim-1.1 | S1\_5944791 - S1\_9033631 | 1 | 29.1 |
| 157 | HPL 24 × ICP 11605 | qSW-cim-1.1 | S1\_11314974 - S1\_4759267 | 1 | 44.4 |
| qSW-cim-1.2 | S1\_9401795 - S1\_5944791 | 1 | 46.6 |
| qSW-icim-1.1 | S1\_5944791 - S1\_5441596 | 1 | 35.7 |
| qSW-cim-1.3 | S1\_15394802 - S1\_6218143 | 1 | 10.3 |
| qSW-cim-8.1 | S8\_388862 - S8\_648217 | 8 | 16 |
| 179 | ICP 5529 × ICP 11605 | qSW-cim-1.1 | S1\_7127752 - S1\_5944791 | 1 | 10.4 |
| qSW-icim-1.1 | S1\_5944791 - S1\_5173345 | 1 | 31.5 |
| 137 | ICP 8863 × ICPL 87119 | qSW-cim-2.1 | S2\_28067626 - S2\_2334639 | 2 | 26.7 |
| qSW-cim-2.2 | S2\_11771536 - S2\_10960200 | 2 | 10.1 |
| qSW-cim-2.3 | S2\_6037523 - S2\_5078598 | 2 | 14.3 |
| qSW-cim-3.1 | S3\_6422339 - S3\_16299670 | 3 | 16.9 |
| qSW-icim-8.1 | S8\_18946297 - S8\_11986619 | 8 | 13.1 |
| qSW-cim-11.1 | S11\_27825757 - S11\_9769716 | 11 | 13 |
| qSW-icim-11.1 | S11\_14467653 - S11\_11799692 | 11 | 12.3 |
| **Seed yield** | **F2** | 178 | ICP 11605 × ICP 14209 | *qSY-icim-3.1* | S3\_8561649 - S3\_8569720 | 3 | 10.2 | Obala et al. 2020 |
| *qSY-cim-10.1* | S10\_4202839 - S10\_1984771 | 10 | 15.4 |
| 175 | ICP 8863 × ICP 11605 | qSY-icim-3.1 | S3\_22234078 - S3\_19578263 | 3 | 16 |
| qSY-cim-3.1 | S3\_19578263 - S3\_21274904 | 3 | 11.8 |
| qSY-icim-11.1 | S11\_9114357 - S11\_4453854 | 11 | 11.3 |
| 157 | HPL 24 × ICP 11605 | qSY-cim-2.1 | S2\_33896199 -S2\_36167974 | 2 | 16 |
| qSY-cim-2.2 | S2\_19392910 - S2\_6254553 | 2 | 14.4 |
| qSY-icim-4.1 | S4\_3592410 - S4\_2761907 | 4 | 20.3 |
| qSY-cim-10.1 | S10\_22177883 - S10\_12463946 | 10 | 40.2 |
| qSY-cim-11.2 | S11\_6081367 - S11\_45330880 | 11 | 11.3 |
| 179 | ICP 5529 × ICP 11605 | qSY-icim-1.2 | S1\_3905217 - S1\_17462230 | 1 | 14.8 |
| 137 | ICP 8863 × ICPL 87119 | qSY-icim-1.1 | S1\_1145802 - S1\_14036679 | 1 | 10.3 |
| qSY-cim-4.1 | S4\_11052197 - S4\_10704406 | 4 | 11.3 |
| qSY-cim-5.1 | S5\_2134830 - S5\_2134832 | 5 | 39 |
| qSY-icim-7.1 | S7\_8660317 - S7\_1644160 | 7 | 10.7 |
| qSY-cim-10.1 | S10\_15140940 - S10\_632618 | 10 | 53 |
| qSY-icim-11.1 | S11\_39685164 - S11\_2994853 | 11 | 10.7 |
| qSY-cim-11.2 | S11\_10379800 - S11\_39387203 | 11 | 10.3 |
| **Growth habit** | **F2** | 178 | ICP 11605 × ICP 14209 | *qGH-cim-3.1* | S3\_28498782 - S3\_21310513 | 3 | 10.9 | Obala et al. 2020 |
| *qGH-cim-3.2* | S3\_17441541 - S3\_21244595 | 3 | 91.3 |
| *qGH-cim-3.3* | S3\_14813065 - S3\_14778845 | 3 | 12.9 |
| 175 | ICP 8863 × ICP 11605 | qGH-cim-3.1 | S3\_22234078 - S3\_19578263 | 3 | 13.1 |
| qGH-cim-3.2 | S3\_21274904 - S3\_28538775 | 3 | 37 |
| qGH-icim-3.1 | S3\_28933239 - S3\_21244595 | 3 | 23.9 |
| qGH-cim-3.3 | S3\_21244595 - S3\_18933167 | 3 | 36.6 |
| qGH-icim-3.2 | S3\_18929445 - S3\_18929378 | 3 | 25.4 |
| qGH-cim-3.4 | S3\_18929378 - S3\_17193829 | 3 | 64.7 |
| 157 | HPL 24 × ICP 11605 | qGH-icim-3.1 | S3\_21244595 - S3\_22913898 | 3 | 54.4 |
| qGH-icim-3.2 | S3\_17628375 - S3\_17145449 | 3 | 14.3 |
| qGH-cim-3.3 | S3\_18154848 - S3\_17193829 | 3 | 13.3 |
| 179 | ICP 5529 × ICP 11605 | qGH-cim-2.1 | S2\_206675 - s2\_1204754 | 3 | 20.7 |
| qGH-cim-3.2 | S3\_28538775 -S3\_21244595 | 3 | 19.6 |
| qGH-icim-3.1 | S3\_24127385 - S3\_21274904 | 3 | 12 |
| qGH-cim-3.3 | S3\_20631155 - S3\_22234078 | 3 | 47 |
| qGH-icim-3.2 | s3\_20698771 - S3\_18430894 | 3 | 61.6 |
| qGH-cim-3.5 | S3\_18154848 - S3\_17193829 | 3 | 42.1 |
| qGH-icim-4.1 | s4\_496463 - S4\_487510 | 4 | 13.1 |
| qGH-cim-11.1 | S11\_6210775 - S11\_39507811 | 11 | 27.2 |
| qGH-icim-11.1 | S11\_8456082 - S11\_44938548 | 11 | 14 |
| **Days to first flowering** | **F2** | 178 | ICP 11605 × ICP 14209 | *qDFF-cim-3.1* | S3\_28498782 - S3\_21310513 | 3 | 14.5 | Obala et al. 2020 |
| *qDFF-icim-3.1* | S3\_21244595 - S3\_28538775 | 3 | 25.4 |
| 175 | ICP 8863 × ICP 11605 | qDFF-cim-3.1 | S3\_22234078 - S3\_19578263 | 3 | 16 |
| qDFF-cim-3.2 | S3\_21244595 - S3\_18933167 | 3 | 19.1 |
| qDFF-cim-3.3 | S3\_18929445 - S3\_18929378 | 3 | 28.2 |
| qDFF-cim-11.3 | S11\_26422066 - S11\_32080647 | 11 | 36.3 |
| 157 | HPL 24 × ICP 11605 | qDFF-icim-3.1 | S3\_21244595 - S3\_22913898 | 3 | 14.7 |
| qDFF-cim-3.1 | S3\_25402258 - S3\_18933167 | 3 | 13.2 |
| qDFF-icim-3.2 | S3\_17628375 - S3\_17145449 | 3 | 31.9 |
| qDFF-cim-3.2 | S3\_18154848 - S3\_17193829 | 3 | 40.3 |
| qDFF-cim-3.3 | S3\_18154875 - S3\_14813065 | 3 | 39.7 |
| 179 | ICP 5529 × ICP 11605 | qDFF-cim-3.1 | S3\_22234078 - S3\_16681929 | 3 | 39.6 |
| qDFF-cim-3.3 | S3\_18430894 - S3\_18154848 | 3 | 47.6 |
| qDFF-cim-3.4 | S3\_18154848 - S3\_17193829 | 3 | 16.2 |
| 137 | ICP 8863 × ICPL 87119 | qDFF-icim-1.1 | S1\_14036679 - S1\_11242012 | 1 | 15.2 |
| qDFF-cim-1.1 | S1\_11242012 - S1\_15951980 | 1 | 14 |
| qDFF-cim-1.2 | S1\_16743053 - S1\_11236611 | 1 | 11.1 |
| qDFF-cim-2.2 | S2\_11771536 - S2\_10960200 | 2 | 11.2 |
| qDFF-icim-6.1 | S6\_18172388 - S6\_12492736 | 6 | 14.9 |
| qDFF-icim-6.2 | S6\_21912913 - S6\_11368997 | 6 | 10.9 |
| qDFF-cim-6.2 | S6\_11368993 - S6\_16630543 | 6 | 14.2 |
| qDFF-icim-8.1 | S8\_1870690 - S8\_14893200 | 8 | 12 |
| qDFF-cim-8.1 | S8\_1870690 - S8\_14893200 | 8 | 32.4 |
| qDFF-cim-10.1 | S10\_8436572 - S10\_8682299 | 10 | 10.9 |
| qDFF-icim-11.1 | S11\_6866243 - S11\_22800082 | 11 | 11.2 |
| qDFF-cim-11.1 | S11\_22800082 - S11\_27825774 | 11 | 11.1 |
| qDFF-cim-11.2 | S11\_25088688 - S11\_12824405 | 11 | 43.8 |
| qDFF-cim-11.3 | S11\_38856677 - S11\_1583891 | 11 | 28.5 |

**Table S2.** List of 100 elite lines used for evaluation for grain yield in pigeonpea

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Super-early duration** | | | | | |
| 1 | ICPL 11242 | 11 | ICPL 11279 | 21 | ICPL 20326 |
| 2 | ICPL 11244 | 12 | ICPL 11285 | 22 | ICPL 20327 |
| 3 | ICPL 11245 | 13 | ICPL 11292 | 23 | ICPL 20328 |
| 4 | ICPL 11249 | 14 | ICPL 11296 | 24 | ICPL 20329 |
| 5 | ICPL 11252 | 15 | ICPL 11298 | 25 | ICPL 20333 |
| 6 | ICPL 11253 | 16 | ICPL 11300 | 26 | ICPL 20336 |
| 7 | ICPL 11255 | 17 | ICPL 11301 | 27 | ICPL 20338 |
| 8 | ICPL 11256 | 18 | ICPL 11303 | 28 | ICPL 20340 |
| 9 | ICPL 11273 | 19 | ICPL 11326 | 29 | ICPL 20341 |
| 10 | ICPL 11276 | 20 | ICPL 20325 | 30 | MN1 (Ch) |
| **Early duration** | | | | | |
| 1 | ICP 28 | 11 | ICPL 88034 | 21 | IPA 15-02 |
| 2 | ICPH 2433 | 12 | ICPL 88039 (Ch) | 22 | IPA 15-03 |
| 3 | ICPH 2438 | 13 | ICPL89 | 23 | IPA 15-05 |
| 4 | ICPL 149 | 14 | ICPL 90048 | 24 | IPA 15-06 |
| 5 | ICPL 151 | 15 | ICPL 91030 | 25 | IPA 15-07 |
| 6 | ICPL 161 | 16 | ICPL 92043 | 26 | IPA 15-08 |
| 7 | ICPL 81-3 | 17 | ICPL 92047 | 27 | IPAM 16-01 |
| 8 | ICPL 84031 | 18 | ICPL 93106 | 28 | IPAM 16-03 |
| 9 | ICPL 86022 | 19 | ICPL 98011 | 29 | IPAM 16-04 |
| 10 | ICPL 87 | 20 | IPA 15-01 | 30 | PRG 176 |
| **Medium duration** | | | | | |
| 1 | AGL1603-4 | 16 | ICPH2671 | 31 | LRG52(Ch) |
| 2 | ASHA(Ch) | 17 | ICPH2740 | 32 | MARUTI(Ch) |
| 3 | BDN2011-1 | 18 | ICPH3762 | 33 | RVSA15-10 |
| 4 | BDN2013-41 | 19 | ICPH3933 | 34 | RVSA15-5 |
| 5 | BDN2013-45 | 20 | ICPL20096 | 35 | RVSA15-6 |
| 6 | BDN2014-1 | 21 | ICPL20098 | 36 | TDRG-4(Ch) |
| 7 | BDN2014-2 | 22 | ICPL20103 | 37 | TDRG-58 |
| 8 | BDN711(Ch) | 23 | ICPL20108 | 38 | TDRG-60 |
| 9 | GRG152 | 24 | ICPL20116 | 39 | TJT501 |
| 10 | GRG177 | 25 | ICPL99050 | 40 | TS3R(Ch) |
| 11 | GRG333 | 26 | JKM189(Ch) |  |  |
| 12 | IBTDRG-3 | 27 | LAXMI |  |  |
| 13 | IBTDRG-4 | 28 | LRG105 |  |  |
| 14 | IBTDRG-5 | 29 | LRG160 |  |  |
| 15 | IBTDRG-6 | 30 | LRG41 |  |  |

**Table S3**. Mean, range and ANOVA for grain yield of multi-location trials during cropping season 2017-18 and 2018-19

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Super-early duration trial** | | | | | | | | |  |
|  | 2017-18 | | | | | 2018-19 | | |  |
| Kalaburagi | Kanpur | Patancheru | Tandur | Lam | Tandur | Kanpur | Lam |  |
| Mean | 431 | 194.8 | 532.1 | 1345.8 | 1305.3 | 1000.4 | 112 | 2000.4 |  |
| Range (minimum) | 149 | 80 | 215 | 614 | 286.6 | 466.3 | 8.7 | 1440.7 |  |
| Range (maximum) | 940.7 | 584.5 | 996 | 1845.7 | 2111.1 | 1512.3 | 323.6 | 2416.7 |  |
| C.D. | 183.9 | 41.6 | 148.9 | 243.34 | 787.8 | 211.7 | 87.4 | 526.9 |  |
| SE(m) | 64.8 | 14.7 | 52.5 | 85.9 | 278.2 | 74.8 | 30.9 | 186.1 |  |
| SE (d) | 91.6 | 20.8 | 74.2 | 121.5 | 393.5 | 105.8 | 43.7 | 263.2 |  |
| C.V. | 26 | 13.1 | 22.5 | 11.1 | 36.9 | 13 | 47.8 | 16.1 |  |
| F | 12.8\*\* | 43.9\*\* | 9.0\*\* | 12.9\*\* | 2.17\*\* | 16.3\*\* | 7.1\*\* | 2.0\*\* |  |
|  |  |  |  |  |  |  |  |  |  |
| **Early duration trial** | | | | | | | | | |
|  | 2017-18 | | | | | 2018-19 | | | |
| Kanpur | Tandur | Lam | Patancheru | Kalaburagi | Kanpur | Tandur | Lam | Badnapur |
| Mean | 1377.3 | 1980.5 | 2249.3 | 749 | 896.7 | 230.8 | 1512 | 1258.9 | 648.8 |
| Range (minimum) | 622.9 | 779 | 629.4 | 209.3 | 150 | 25 | 560.7 | 1123.5 | 446.5 |
| Range (Maximum) | 2709.7 | 2827.3 | 3961.7 | 1244.8 | 1975 | 489.9 | 2128.7 | 1407.4 | 1077.8 |
| C.D. | 275.5 | 342.9 | 908.6 | N/A | 552.1 | 152.3 | 212.9 | 170.3 | 166.3 |
| SE(m) | 97.3 | 121.1 | 321 | 247.2 | 189.9 | 53.8 | 75.2 | 60.2 | 57.5 |
| SE(d) | 137.6 | 171.3 | 453.9 | 349.6 | 268.6 | 76.1 | 106.4 | 85.1 | 81.3 |
| C.V. | 12.2 | 10.6 | 24.7 | 57.1 | 30 | 20.4 | 8.6 | 8.3 | 12.5 |
| F | 30.6\*\* | 13.8\*\* | 4.3\*\* | 1.3NS | 5.8\*\* | 4.9\*\* | 28.3\*\* | 1.0NS | 8.4\*\* |
| **Medium duration trial** | | | | | | | | | |
|  | **2017-18** | | | | **2018-19** | | | | |
| Kalaburagi | Tandur | Lam | Patancheru | Kalaburagi | Tandur | Lam | Badnapur | Sehore |
| Mean | 725.6 | 1929.6 | 1836.1 | 874 | 902 | 1316.5 | 1395.7 | 839.9 | 809.9 |
| Range (Minimum) | 247.7 | 1047.3 | 1725.7 | 538.3 | 409.5 | 372.3 | 1133.3 | 548.6 | 199.5 |
| Range (Maximum) | 1335.3 | 2689 | 2357 | 1247.2 | 1566 | 2140.3 | 1650 | 839.9 | 2018.5 |
| C.D. | 333.4 | 353.6 | 523.8 | 253.8 | 259.4 | 197.3 | 117 | 286.8 | 163.6 |
| SE(m) | 118.2 | 125.6 | 186 | 90 | 90.6 | 70.1 | 41.6 | 100.3 | 57.2 |
| SE(d) | 167.2 | 177.6 | 263.1 | 127.2 | 128.1 | 99.1 | 58.8 | 141.8 | 80.9 |
| C.V. | 28.2 | 11.3 | 17.6 | 17.8 | 14.2 | 9.2 | 5.2 | 16.9 | 9.5 |
| F | 4.6\*\* | 7.0\*\* | 2.1\*\* | 4.1\*\* | 9.6\*\* | 29.5\*\* | 9.1\*\* | 3.1\*\* | 70.8\*\* |
| \*\*: significant at 0.01 probability level, **NS:** non-significant at 0.001and 0.05 probability level | | | | | | | | | |



**Table S4**. Mean grain yield data of super-early duration trials during cropping season 2017-18 and 2018-19

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Entry** | **2017-18** | | | | | **2018-19** | | | **Mean** |
| **Kalaburagi** | **Kanpur** | **Patancheru** | **Tandur** | **Lam** | **Tandur** | **Kanpur** | **Lam** |
| 1 | ICPL 11242 | 824 | 171.6 | 505.6 | 1009.3 | 1391.2 | 552.7 | 181.6 | 2287 | 865.4 |
| 2 | ICPL 11244 | 607.3 | 171.6 | 751 | 1266.7 | 833 | 771 | 42.4 | 2242.6 | 835.7 |
| 3 | ICPL 11245 | 296.3 | 137.4 | 324.9 | 1705.7 | 1583 | 1512.3 | 49.3 | 2209.3 | 977.3 |
| 4 | ICPL 11252 | 184 | 151.5 | 316.1 | 938 | 1276.1 | 643.7 | 42 | 1966.7 | 689.8 |
| 5 | ICPL 11253 | 149 | 322 | 256.3 | 1247.3 | 807.2 | 963.3 | 31.6 | 1650 | 678.4 |
| 6 | ICPL 11255 | 301 | 114.3 | 379.6 | 1381 | 1665 | 1070.3 | 48.8 | 1644.4 | 825.5 |
| 7 | ICPL 11256 | 164.7 | 119.4 | 173.2 | 1655 | 1776.1 | 1226.7 | 36.1 | 2103.7 | 906.9 |
| 8 | ICPL 11279 | 535.3 | 584.5 | 331.6 | 1437 | 1250 | 1043.3 | 35.8 | 2316.7 | 941.8 |
| 9 | ICPL 11285 | 815 | 179 | 289.9 | 1303.3 | 1165 | 903.7 | 113 | 1927.8 | 837.1 |
| 10 | ICPL 11292 | 321.3 | 265.4 | 423.8 | 1682.7 | 1028.1 | 1440.7 | 80.9 | 2416.7 | 957.4 |
| 11 | ICPL 11296 | 384.3 | 166.5 | 332.7 | 1511 | 965 | 1111 | 83.3 | 1892.6 | 805.8 |
| 12 | ICPL 11298 | 324.7 | 206.9 | 261.4 | 614 | 1028.1 | 487 | 126.7 | 2037 | 635.7 |
| 13 | ICPL 11300 | 497.3 | 185.2 | 272 | 1430.3 | 1776.1 | 1010 | 216 | 2388.9 | 972 |
| 14 | ICPL 11301 | 659.3 | 137.4 | 756.8 | 1406.3 | 1222.2 | 1079 | 169.8 | 2151.9 | 947.9 |
| 15 | ICPL 11303 | 435 | 157 | 327.1 | 1254.7 | 1284.9 | 934.3 | 179.9 | 2101.9 | 834.3 |
| 16 | ICPL 11326 | 356.3 | 217.3 | 351.9 | 1678 | 1557.2 | 1388.3 | 195.8 | 2074.1 | 977.4 |
| 17 | ICPL 20325 | 477 | 228.8 | 687.5 | 1845.7 | 2111.1 | 1385.3 | 323.6 | 1981.5 | 1130.1 |
| 18 | ICPL 20326 | 940.7 | 141.5 | 527.5 | 992.3 | 1392.2 | 678.7 | 179.2 | 2216.7 | 883.6 |
| 19 | ICPL 20327 | 674 | 299.5 | 620.1 | 768 | 1665 | 566 | 178.5 | 2305.6 | 884.6 |
| 20 | ICPL 20328 | 833.7 | 208.1 | 533.5 | 1204 | 1000 | 850.7 | 184.6 | 2013 | 853.4 |
| 21 | ICPL 20329 | 705.7 | 138.5 | 595.1 | 1119 | 1390.2 | 645.7 | 282.3 | 2120.4 | 874.6 |
| 22 | ICPL 20333 | 318.3 | 90 | 359.9 | 1205.3 | 1266 | 926.7 | 175.3 | 2007.4 | 793.6 |
| 23 | ICPL 20336 | 172.3 | 180.5 | 252.8 | 1297 | 1776.1 | 834.7 | 40.3 | 1731.5 | 785.7 |
| 24 | ICPL 20338 | 175 | 306.6 | 482.8 | 1579 | 1946.1 | 1268.3 | 21.5 | 1787 | 945.8 |
| 25 | ICPL 20340 | 194.7 | 141.5 | 337.2 | 1658.7 | 286.7 | 1253.3 | 19.1 | 1531.5 | 677.8 |
| 26 | ICPL 20341 | 416.7 | 80 | 306.4 | 1628.7 | 1722.2 | 1326.3 | 88.5 | 1440.7 | 876.2 |
| 27 | MN-1(C) | 450 | 170.1 | 470.4 | 1549.7 | 1160 | 1171.3 | 69.7 | 2244.4 | 910.7 |
| 28 | ICPL 11249 | 155 | 134.9 | 327.3 | 1524.3 | - | 1285.3 | 8.7 | 1620.4 | 722.3 |
| 29 | ICPL 11273 | 245.3 | - | 410.3 | 1618.3 | 667 | 1217 | 95.1 | 1768.5 | 860.2 |
| 30 | ICPL 11276 | 318 | 134.4 | 162.2 | 864 | - | 466.3 | 59.7 | 1833.3 | 548.3 |

**Table S5**. Mean grain yield data of early duration trials during cropping season 2017-18 and 2018-19

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S. No. | Entry/Location | 2017-18 | | | | | 2018-19 | | | | Mean |
|
| Lam | Kanpur | Kalaburagi | Tandur | Patancheru | Kanpur | Badnapur | Lam | Tandur |
| 1 | ICP 28 | 2536.3 | 1256.8 | 629 | 1916.3 | 814.1 | 41.3 | 637 | 1376.5 | 831.7 | 1115.4 |
| 2 | ICPL 149 | 1851.3 | 1493.2 | 979 | 1579.3 | 675.9 | 176.7 | 539.5 | 1314.8 | 1740.3 | 1150 |
| 3 | ICPL 151 | 2925 | 1414 | 671 | 2158.7 | 343.7 | 228.5 | 614.5 | 1327.2 | 1037.3 | 1191.1 |
| 4 | ICPL 161 | 2406.7 | 1493.6 | 1375 | 2099.7 | 588.1 | 437.2 | 655.5 | 1203.7 | 1638.7 | 1322 |
| 5 | ICPL 18-3 | 2073.4 | 1516.5 | 1191.5 | 1755 | 1019.6 | 270.1 | 454 | 1259.3 | 1306.3 | 1205.1 |
| 6 | ICPL 84031 | 2536.3 | 1651.1 | 1829 | 2174 | 943 | 365.3 | 827.5 | 1222.2 | 1126.3 | 1408.3 |
| 7 | ICPL 86022 | 1925.3 | 626.5 | 237.5 | 1456.3 | 803 | 193.8 | 497 | 1172.8 | 1735.7 | 960.9 |
| 8 | ICPL 87 | 2684.4 | 1085.8 | 704.5 | 2241.7 | 319.6 | 280.6 | 461.5 | 1179 | 1621 | 1175.3 |
| 9 | ICPL 88034 | 2295.6 | 1665.5 | 150 | 2118.3 | 1011.1 | 160.1 | 618 | 1277.8 | 1525.3 | 1202.4 |
| 10 | ICPL 88039 | 1277.4 | 1005.4 | 929 | 1855.7 | 1193 | 314.2 | 494 | 1216 | 1463.3 | 1083.1 |
| 11 | ICPL 89 | 629.4 | 640.2 | 229 | 779 | 938.5 | 104.9 | 484.5 | 1123.5 | 560.7 | 610 |
| 12 | ICPL 90048 | 2425.2 | 1155.2 | 195.5 | 2173 | 1221.1 | 110.1 | 472.5 | 1308.6 | 1203.7 | 1140.5 |
| 13 | ICPL 91030 | 1777.2 | 632.1 | 433 | 1602 | 621.9 | 182.6 | 637 | 1246.9 | 1880 | 1001.4 |
| 14 | ICPL 92043 | 2166 | 622.9 | 817 | 2358 | 916.3 | 233.3 | 653 | 1191.4 | 1476.3 | 1159.4 |
| 15 | ICPL 92047 | 1925.3 | 1258.7 | 695.5 | 1983.3 | 492.2 | 291.7 | 1078 | 1308.6 | 1419.7 | 1161.4 |
| 16 | ICPL 93106 | 1481 | 1327.6 | 329 | 1728.3 | 848.9 | 99.7 | 600.5 | 1290.1 | 920 | 958.4 |
| 17 | ICPL 98011 | 2036.4 | 804.5 | 620.5 | 2079.7 | 373.3 | 267.4 | 553 | 1222.2 | 2064.7 | 1113.5 |
| 18 | IPA 15-01 | 2499.2 | 1288.9 | 1171 | 2613 | 407.8 | 426.4 | 884.5 | 1259.3 | 1684.3 | 1359.4 |
| 19 | IPA 15-02 | 2406.7 | 2114.4 | 1062.5 | 2127.7 | 209.3 | 386.8 | 604.5 | 1234.6 | 1772.7 | 1324.3 |
| 20 | IPA 15-03 | 2462.2 | 1292.9 | 900 | 2141 | 1109.6 | 106.3 | 917 | 1290.1 | 1794.7 | 1334.9 |
| 21 | IPA 15-05 | 3961.7 | 1919.6 | 1425 | 2739 | 868.5 | 174.3 | 519.5 | 1222.2 | 2015.7 | 1649.5 |
| 22 | IPA 15-06 | 2665.8 | 2709.7 | 967 | 2486.3 | 482.6 | 298.6 | 686.5 | 1172.8 | 1939.3 | 1489.9 |
| 23 | IPA 15-07 | 2147.5 | 1980.4 | 1304 | 2236.3 | 503.3 | 489.9 | 851.5 | 1228.4 | 1494.3 | 1359.5 |
| 24 | IPA 15-08 | 1999.4 | 1932.4 | 1458.5 | 1476 | 1244.8 | 245.8 | 568 | 1302.5 | 1630 | 1317.5 |
| 25 | IPAM 16-01 | 2665.8 | 1193.1 | 1141.5 | 2300.3 | 893.7 | 194.8 | 819.5 | 1246.9 | 1228.7 | 1298.3 |
| 26 | IPAM 16-03 | 1610.6 | 782.9 | 1975 | 1497.7 | 494.1 | 307.6 | 709.5 | 1265.4 | 1877 | 1168.9 |
| 27 | IPAM16-04 | 1147.8 | 873.5 | 1062.5 | 1586 | 847.4 | 269.1 | 707 | 1271.6 | 1897.7 | 1073.6 |
| 28 | PRG 176 | 2610.3 | 1179.6 | 866.5 | 1248.7 | 608.9 | 196.9 | 951 | 1314.8 | 827.3 | 1089.3 |
| 29 | ICPH 2433 | 2869.5 | 2166 | 720.5 | 2077 | 1025.9 | - | 501.5 | 1308.6 | 2128.7 | 1599.7 |
| 30 | ICPH 2438 | 3480.4 | 2235 | 833 | 2827.3 | 668.1 | - | 445.5 | 1407.4 | 1519.3 | 1677 |



**Table S6.** Mean grain yield data of medium duration trials during cropping season 2017-18 and 2018-19

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SN | Entry | 2017-18 | | | | 2018-19 | | | | | Mean |
| Tandur | Kalaburagi | Lam | Patancheru | Kalaburagi | Sehore | Badnapur | Tandur | Lam |
| 1 | AGL 1603-4 | 2194.3 | 792 | 1851.7 | 1247.2 | 902.5 | 452.2 | 679.2 | 1540.3 | 1447.9 | 1234.2 |
| 2 | ASHA (Ch) | 2352.7 | 895.7 | 2093.3 | 781.5 | 1333 | 1644.4 | 894.4 | 1835.7 | 1618.8 | 1494.4 |
| 3 | BDN 2011-1 | 1941.7 | 965.3 | 1813.4 | 1010.4 | 673.5 | 979.4 | 1013.2 | 1403 | 1878.8 | 1297.6 |
| 4 | BDN 2013-41 | 1741.3 | 477 | 1771.2 | 850.7 | 982.5 | 311.1 | 1175 | 1361.7 | 2020.8 | 1187.9 |
| 5 | BDN 2013-45 | 1886.3 | 634 | 1615.8 | 960.4 | 955 | 1453.3 | 863.9 | 1656.3 | 1822.9 | 1316.4 |
| 6 | BDN 2014-1 | 1047.3 | 736 | 1532.5 | 708.8 | 461.5 | 252.8 | 946.5 | 372.3 | 1754.2 | 868 |
| 7 | BDN 2014-2 | 1939 | 551 | 1886.2 | 1114.2 | 1211.5 | 550.6 | 1040.3 | 1545.3 | 1839.6 | 1297.5 |
| 8 | BDN 711 (Ch) | 1808.3 | 757 | 1307.6 | 1096.5 | 611.5 | 450.6 | 1102.8 | 1039.3 | 1377.1 | 1061.2 |
| 9 | GRG 152 | 2347.3 | 1171.3 | 2241.8 | 1050.3 | 989.5 | 1782.8 | 723.6 | 1597 | 1639.6 | 1504.8 |
| 10 | GRG 177 | 1838.7 | 1307.7 | 2046.1 | 1102.6 | 861 | 537.8 | 615.3 | 899.7 | 1882.5 | 1232.4 |
| 11 | GRG 333 | 1419.3 | 1067.3 | 1523.3 | 882.5 | 722.5 | 1644.4 | 1016.7 | 784.7 | 1708.3 | 1196.6 |
| 12 | IBT DRG 3 | 1833.3 | 782.3 | 1857.3 | 742.2 | 889 | 221.7 | 873.6 | 1328 | 1731.3 | 1139.9 |
| 13 | IBT DRG 4 | 1972 | 363.3 | 1847.6 | 569.4 | 475.5 | 293.3 | 629.9 | 1199 | 1885.4 | 1026.2 |
| 14 | IBT DRG 5 | 1872.3 | 865.7 | 1726.8 | 1047.4 | 764 | 758.9 | 852.1 | 1157.3 | 1602.1 | 1183 |
| 15 | IBT DRG 6 | 1786 | 546.3 | 1529.7 | 627.2 | 774.5 | 1082.2 | 638.9 | 1131.3 | 1827.1 | 1104.8 |
| 16 | ICPH 2671 | 1722.3 | 854.3 | 2087.7 | 970.8 | 1000 | 1057.2 | 661.1 | 969.7 | 1687.7 | 1223.4 |
| 17 | ICPH 2740 | 1997.3 | 879.3 | 2201.5 | 957.4 | 1173.5 | 1675 | 921.5 | 1158.7 | 1801.5 | 1418.4 |
| 18 | ICPH 3762 | 2308.7 | 965.3 | 2015.5 | 1094.7 | 1295.5 | 757.8 | 805.6 | 1580 | 1615.5 | 1382.1 |
| 19 | ICPH 3933 | 1850 | 407.3 | 1779.5 | 611.1 | 1298.5 | 385.6 | 552.1 | 778 | 1379.5 | 1004.6 |
| 20 | ICPL 20096 | 2105.7 | 900.3 | 1507.8 | 589.4 | 993 | 626.1 | 1140.3 | 1413.3 | 1541.7 | 1202 |
| 21 | ICPL 20098 | 1786.3 | 622.7 | 1354.8 | 906.4 | 1233 | 1331.7 | 709 | 944.3 | 1566.7 | 1161.7 |
| 22 | ICPL 20103 | 1780.3 | 608.7 | 1249.3 | 538.3 | 885 | 810 | 1170.8 | 1391.7 | 1572.9 | 1111.9 |
| 23 | ICPL 20108 | 2689 | 743 | 1930 | 739.4 | 1292 | 330.6 | 1108.3 | 1646 | 1800 | 1364.3 |
| 24 | ICPL 20116 | 1561 | 543.7 | 1549.1 | 828.1 | 1566 | 938.9 | 618.1 | 882.7 | 1416.7 | 1100.5 |
| 25 | ICPL 99050 | 1769.7 | 928 | 2096 | 804.9 | 1388.5 | 2242.8 | 807.6 | 1701.7 | 1504.2 | 1471.5 |
| 26 | JKM 189 (Ch) | 2075 | 618 | 2152.9 | 831.1 | 812.5 | 1310 | 706.3 | 1540.7 | 1810.4 | 1317.4 |
| 27 | LAXMI | 1680.7 | 713 | 1725.7 | 908.3 | 409.5 | 436.1 | 860.4 | 810 | 1810.4 | 1039.3 |
| 28 | LRG 105 | 2611.3 | 837.7 | 2357 | 971.9 | 1035 | 1336.1 | 668.1 | 1808 | 1718.8 | 1482.7 |
| 29 | LRG 160 | 2058.3 | 303.3 | 1807.3 | 714.3 | 750 | 266.7 | 807.6 | 1193 | 1691.7 | 1065.8 |
| 30 | LRG 41 | 1711.3 | 247.7 | 2215.4 | 593.6 | 802 | 336.1 | 548.6 | 1256.7 | 1677.1 | 1043.2 |
| 31 | LRG 52 (Ch) | 2013.7 | 400.3 | 2144.9 | 672.5 | 200 | 527.8 | 1128.5 | 1334.3 | 1843.8 | 1140.6 |
| 32 | MARUTHI (Ch) | 1805.7 | 925.7 | 2028 | 1055.8 | 697.5 | 1341.7 | 984 | 2009 | 1764.6 | 1401.3 |
| 33 | RVSA 15-10 | 1583.3 | 703.7 | 1776.8 | 913.8 | 826 | 743.3 | 645.8 | 1061.7 | 1822.9 | 1119.7 |
| 34 | RVSA 15-5 | 1614 | 678.3 | 1554.7 | 1099.3 | 1024.5 | 1358.9 | 713.9 | 1004.7 | 1920.8 | 1218.8 |
| 35 | RVSA 15-6 | 1622 | 430.7 | 1789.3 | 926.9 | 566 | 828.3 | 715.3 | 1121.7 | 1862.5 | 1095.9 |
| 36 | TDRG 4 (Ch) | 2625.3 | 620.3 | 2186.3 | 1080.8 | 437.5 | 1813.3 | 811.1 | 1840.3 | 1722.9 | 1459.8 |
| 37 | TDRG 58 | 2164 | 791.7 | 1913.6 | 850.3 | 753 | 735.6 | 905.6 | 1341 | 1729.2 | 1242.7 |
| 38 | TDRG 60 | 2402.7 | 606.7 | 1832.3 | 893.2 | 885.5 | 312.2 | 741.7 | 2140.3 | 1804.2 | 1291 |
| 39 | TJT 501 | 1830.3 | 446.7 | 1769.6 | 637.8 | 819.5 | 698.3 | 1178.5 | 1084.3 | 1820.8 | 1142.9 |
| 40 | TS 3 R (Ch) | 1836 | 1335.3 | 1774 | 976.9 | 628.5 | 1380.6 | 622.2 | 1787.3 | 1650 | 1332.3 |



**Table S7.** Mean performance of selected cultivars of FPVS trials conducted in Karnataka for grain yield during cropping season 2017-18 and 2018-19

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Entry** | **Bidar** | | | **Kalaburagi** | | | | **Yadgir** | | | | | **Karnataka** | | | | | |
| **2017** | **2018** | **Mean** | **2017** | **2018** | **Mean** | **2017** | | **2018** | **Mean** | | **2017** | | **2018** | | **Mean** | |
| BSMR736 | 1627.26 | 1692.87 | 1660.07 | 1501.06 | 1251.11 | 1376.09 | 1437.50 | | 1145.92 | 1291.71 | | 1521.94 | | 1363.30 | | 1442.62 | |
| GRG811 | 1322.16 | 1333.52 | 1327.84 | 1338.75 | 1184.57 | 1261.66 | 1237.50 | | 1144.47 | 1190.99 | | 1299.47 | | 1220.85 | | 1260.16 | |
| ICPH2433 | 1024.54 | - | 1024.54 | 993.91 | - | 993.91 | 937.50 | | - | 937.50 | | 985.32 | | - | | 985.32 | |
| ICPL332 | 1281.25 | 1302.67 | 1291.96 | 1208.75 | 1043.33 | 1126.04 | 1212.50 | | 1042.00 | 1127.25 | | 1234.17 | | 1129.33 | | 1181.75 | |
| TS3R | 1343.59 | 1204.77 | 1274.18 | 1331.25 | 1197.78 | 1264.52 | 1137.50 | | 1240.00 | 1188.75 | | 1270.78 | | 1214.18 | | 1242.48 | |
|  |  |  |  |  |  |  |  | |  |  | |  | |  | |  | |
| **Mutiple comparison analysis in FPVS trials of Karnataka** | | | | | | | | | | |  | |  | |  | |  | |
|  | **Effect** | **Entry1** | **Entry2** | **Estimate** | **Standard Error** | **DF** | **t Value** | | **Pr > |t|** |  | |  | |  | |  | |
| Mean | Entry | BSMR736 | GRG811 | 222.47 | 68.9085 | 32.5 | 3.23 | | 0.0028 |  | |  | |  | |  | |
| Mean | Entry | BSMR736 | ICPH2433 | 536.62 | 69.4173 | 33 | 7.73 | | 0.0001 |  | |  | |  | |  | |
| Mean | Entry | BSMR736 | ICPL332 | 287.77 | 68.5539 | 31.9 | 4.2 | | 0.0002 |  | |  | |  | |  | |
| Mean | Entry | BSMR736 | TS3R | 251.16 | 68.9085 | 32.5 | 3.64 | | 0.0009 |  | |  | |  | |  | |
| 2017 | Entry | GRG811 | ICPH2433 | 314.15 | 68.9085 | 32.5 | 4.56 | | 0.0001 |  | |  | |  | |  | |
| 2017 | Entry | GRG811 | ICPL332 | 65.3029 | 67.6172 | 30.8 | 0.97 | | 0.3417 |  | |  | |  | |  | |
| 2017 | Entry | GRG811 | TS3R | 28.6905 | 67.7891 | 31.1 | 0.42 | | 0.675 |  | |  | |  | |  | |
| 2017 | Entry | ICPH2433 | ICPL332 | -248.85 | 68.5539 | 31.9 | -3.63 | | 0.001 |  | |  | |  | |  | |
| 2017 | Entry | ICPH2433 | TS3R | -285.46 | 68.9085 | 32.5 | -4.14 | | 0.0002 |  | |  | |  | |  | |
| 2017 | Entry | ICPL332 | TS3R | -36.6124 | 67.6172 | 30.8 | -0.54 | | 0.5921 |  | |  | |  | |  | |
| 2018 | Entry | BSMR736 | GRG811 | 142.44 | 69.2307 | 58 | 2.06 | | 0.0441 |  | |  | |  | |  | |
| 2018 | Entry | BSMR736 | ICPL332 | 233.96 | 67.274 | 55.1 | 3.48 | | 0.001 |  | |  | |  | |  | |
| 2018 | Entry | BSMR736 | TS3R | 149.12 | 67.4212 | 55.2 | 2.21 | | 0.0311 |  | |  | |  | |  | |
| 2018 | Entry | GRG811 | ICPL332 | 91.52 | 68.6604 | 57.1 | 1.33 | | 0.1878 |  | |  | |  | |  | |
| 2018 | Entry | GRG811 | TS3R | 6.6721 | 67.8612 | 57.2 | 0.1 | | 0.922 |  | |  | |  | |  | |
| 2018 | Entry | ICPL332 | TS3R | -84.8479 | 66.8729 | 54.3 | -1.27 | | 0.2099 |  | |  | |  | |  | |



**Table S8.** Mean performance of selected cultivars of FPVS trials conducted in Maharashtra for grain yield during cropping season 2018-19

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Entry** | **Aurangabad** | **Jalna** | **Parbhani** | **Maharashtra** |  |  |  |
| BDN711 | 930.00 | 955.00 | 938.00 | 941.00 |  |  |  |
| BDN716 | 913.33 | 912.50 | 902.00 | 909.28 |  |  |  |
| BSMR736 | 783.33 | 706.25 | 723.00 | 737.53 |  |  |  |
| BSMR853 | 788.89 | 716.25 | 708.00 | 737.71 |  |  |  |
|  |  |  |  |  |  |  |  |
| **Mutiple comparison analysis in FPVS trials of Maharashtra** | | | | | | | |
| **Effect** | **Entry1** | **Entry2** | **Estimate** | **Standard Error** | **DF** | **t Value** | **Pr > |t|** |
| Entry | BDN711 | BDN716 | 0.3172 | 0.1929 | 67.2 | 1.64 | 0.1048 |
| Entry | BDN711 | BSMR736 | 2.0347 | 0.1929 | 67.2 | 10.55 | 0.0001 |
| Entry | BDN711 | BSMR853 | 2.0329 | 0.1929 | 67.2 | 10.54 | 0.0001 |
| Entry | BDN716 | BSMR736 | 1.7175 | 0.1929 | 67.2 | 8.9 | 0.0001 |
| Entry | BDN716 | BSMR853 | 1.7156 | 0.1929 | 67.2 | 8.89 | 0.0001 |
| Entry | BSMR736 | BSMR853 | -0.0019 | 0.1929 | 67.2 | -0.01 | 0.9924 |