**Table S1.** Code, name, and pedigree of eight wheat genotypes utilized in this study.

|  |  |  |
| --- | --- | --- |
| **Parent** | **Name** | **Pedigree** |
| **P1** | Gemmeiza12 | OTUS./3/.SARA/.THB//VEECMSS97Y00227S-5y-010M 010Y-010M 2Y-1M-0Y OGM |
| **P2** | Sids12 | BUC.//7C/.ALD/5/.MAYA74/.ON//.1160-147/3/ BB-/GLL/4/ CHAT"S" /6/MAYA /VUL // CMH74 A. 630/4\*SX |
| **P3** | Line-117 | CIMMYT/C. 2008/29ESWYT/OCC. 549/Plot141/ Rep1/Block 9/Entry 142 |
| **P4** | Line-144 | CIMMYT/C. 2008/29ESWYT/OCC. 549/Plot136/Rep1/Block 8/Entry 136 |
| **P5** | Line-123 | SOKOLL/WBLL1 |
| **P6** | Line-125 | CHEN/.AE.SQ.//2\*-WEAVER./3/BAV92./4/JARU./5/OLI2./SALMEJA /6/CROC-1/AE-SQUARROSA(205)-//-BORL-95/3/PRL./SARA//TSI./VEE#5/4/FRET2 |
| **P7** | Gemmeiza7 | CMH74630./5X//SERI82./3/.AGENTCGM4611 2GM.3GM.1GM.0GM |
| **P8** | Line-121 | CHEN./AE-SQ.//2\*OPATA./3/FINSI |

**Table S2.** Physical and chemical soil properties of experimental sites across the two growing seasons.

|  |  |  |
| --- | --- | --- |
| **Properties** | **Season 1** | **Season2** |
| Soil texture  | Clay | Clay |
| Sand (%) | 14.70 | 13.30 |
| Silt (%) | 32.40 | 32.20 |
| Clay (%) | 52.90 | 54.50 |
| pH  | 8.52 | 8.32 |
| EC (dS/m) | 3.74 | 3.43 |
| Organic matter (%) | 1.95 | 1.86 |
| Available Nitrogen (N) (mg kg-1) | 38.58 | 36.85 |
| Available phosphorus (P) (mg kg-1)  | 11.46 | 10.76 |
| Available potassium (K) (mg kg-1)  | 262.63 | 248.80 |

Table S3. Heterosis relative to better parent for all studied traits under well-watered (NOR) and water-deficit (WAD) conditions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cross** | **Days****to heading** | **Plant height****(cm)** | **Spike length****(cm)** | **No. of spikelets/****spike** |
| NOR | WAD | NOR | WAD | NOR | WAD | NOR | WAD |
| P 1×P 2 | 4.98\*\* | 6.67\*\* | 6.44  | 13.22\*  | -8.57\*  | -8.20  | -4.92  | -11.98\*\* |
| P 1×P 3 | -3.17\*  | -1.08  | -2.86  | -0.46  | -15.32\*\* | -13.90\*\* | -12.02\*\* | -6.94\*  |
| P 1×P 4 | 0.00  | 0.36  | -5.49  | 1.71  | -7.28  | -5.53  | -6.42  | -7.14\*  |
| P 1×P 5 | -0.71  | 1.11  | -3.77  | -11.21\*  | -12.69\*\* | -12.76\*\* | -11.20\*\* | -13.78\*\* |
| P 1×P 6 | 2.17  | -1.10  | -7.26  | -6.57  | -11.65\*\* | -8.88\*  | -12.57\*\* | -13.49\*\* |
| P 1×P 7 | 2.16  | 2.91  | -11.32\*\* | -8.71  | -3.17  | -4.78  | -22.13\*\* | -23.75\*\* |
| P 1×P8 | 0.71  | 0.72  | -6.69  | -10.88\*  | -3.14  | -1.82  | -7.79\*  | -4.99  |
| P 2×P 3 | 6.51\*\* | 7.45\*\* | 6.66  | 11.06\*  | -12.35\*\* | -21.06\*\* | -15.74\*\* | -28.11\*\* |
| P 2×P 4 | 5.75\*\* | 2.75  | -1.89  | -1.69  | 0.84  | -0.68  | -5.84  | -15.94\*\* |
| P 2×P 5 | 6.51\*\* | 5.88\*\* | 6.08  | 9.06  | -12.69\*\* | -13.19\*\* | -16.20\*\* | -19.34\*\* |
| P 2×P 6 | 6.90\*\* | 7.45\*\* | 6.93  | 7.15  | -7.10  | -4.63  | -5.03  | -16.51\*\* |
| P 2×P7 | 9.20\*\* | 7.45\*\* | 2.90  | 9.56  | -1.39  | 0.58  | -1.89  | -20.75\*\* |
| P 2×P8 | 8.43\*\* | 7.06\*\* | 3.98  | 12.55\*  | -1.13  | -2.78  | -10.15\*\* | -17.36\*\* |
| P 3×P 4 | -1.40  | -0.72  | 11.55\*  | 12.07\*  | -2.91  | -15.00\*\* | -0.93  | -4.37  |
| P 3×P 5 | 2.49  | 3.69\*  | 10.29\*  | 15.15\*\* | 6.38  | 12.38\*  | -5.78  | -8.41\*  |
| P 3×P6 | 3.62\*  | 0.37  | 4.75  | 12.30\*  | 0.92  | -1.10  | -7.37  | -13.11\*\* |
| P 3×P 7 | -0.36  | 0.36  | 5.73  | 12.10\*  | -0.40  | -0.71  | -11.76\*\* | -6.63  |
| P 3×P8 | 2.14  | -0.36  | 16.97\*\* | 17.90\*\* | 4.96  | -0.76  | 1.26  | 5.18  |
| P 4×P5 | 1.07  | 2.95  | -6.29  | -3.27  | 7.16  | -1.59  | 2.17  | 2.19  |
| P 4×P6 | 1.45  | -3.30  | 4.66  | 3.75  | 4.77  | -5.07  | -0.15  | -0.94  |
| P 4×P7 | -3.24\*  | -5.45\*\* | -0.27  | 3.37  | 8.44\*  | 0.68  | -3.52  | 0.90  |
| P 4×P8 | 1.07  | 2.17  | 5.49  | 6.89  | 9.96\*  | -1.44  | 4.04  | 6.25  |
| P 5×P6 | 2.17  | 1.11  | 6.01  | 6.57  | 4.07  | 11.53\*  | 2.89  | 6.30  |
| P 5×P7 | -1.08  | 0.74  | 2.22  | 7.49  | 2.44  | 2.43  | -4.80  | -3.92  |
| P 5×P8 | 1.43  | 2.58  | -8.57\*  | -6.51  | 7.84  | 1.02  | -1.42  | 1.63  |
| P 6×P7 | 0.00  | 0.73  | 11.94\*\* | 7.78  | 2.28  | 0.00  | -1.59  | -1.20  |
| P 6×P8 | -2.17  | -2.20  | 8.75\*  | 2.16  | -5.48  | -11.68\*  | -5.27  | 0.99  |
| P 7×P8 | 0.00  | 0.00  | 1.89  | 3.01  | 4.08  | -1.90  | -6.84  | -7.23\*  |

Table S4. Cont.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cross** | **No. of spikes /plant** | **No. of kernels / spike** | **1000-kernel weight****(g)** | **Grain yield/plant****(g)** |
| NOR | WAD | NOR | WAD | NOR | WAD | NOR | WAD |
| P 1×P 2 | -17.20 | -1.11 | -5.24 | -8.77\* | 11.47\* | -3.33 | -3.79 | 9.23 |
| P 1×P 3 | -21.83 | -9.47 | -11.52\*\* | -7.02 | -0.66 | -3.92 | -19.81\* | 5.68 |
| P 1×P 4 | -15.85 | 3.01 | -8.90\*\* | -7.02 | 2.27 | -6.46 | -12.14 | -13.68 |
| P 1×P 5 | -7.16 | -3.72 | -4.19 | -20.47\*\* | 6.26 | -10.64 | 28.26\*\* | 36.86\*\* |
| P 1×P 6 | -31.10\* | -22.11 | -14.14\*\* | -5.26 | -11.75\* | -20.82\*\* | -27.39\*\* | -23.77 |
| P 1×P7 | -18.70 | -38.72\* | -19.90\*\* | -24.56\*\* | -7.41 | -14.16\* | -28.26\*\* | -22.29 |
| P 1×P8 | -0.27 | -16.27 | -6.98\* | -4.68 | 6.65 | -12.84\* | -11.54 | -32.75\*\* |
| P 2×P 3 | -29.31\* | -39.21\*\* | -17.49\*\* | -20.37\*\* | 1.97 | 7.56 | -24.43\*\* | -45.11\*\* |
| P 2×P 4 | -13.13 | -31.49 | -3.28 | -12.35\*\* | 7.52 | -8.36 | 9.33 | -29.80\*\* |
| P 2×P 5 | -16.43 | -47.27\*\* | -6.01 | -12.35\*\* | 8.60 | -11.99\* | 24.50\* | -0.68 |
| P 2×P 6 | -15.10 | -26.84 | -16.39\*\* | -8.02\* | 10.15 | -6.05 | -4.87 | -8.73 |
| P 2×P7 | -21.59 | -42.03\* | -7.53\* | -24.24\*\* | -1.85 | -9.25 | -1.91 | -4.91 |
| P 2×P8 | -19.61 | -51.97\*\* | -7.65\* | -9.88\* | -2.44 | -14.32\*\* | -0.79 | -30.26\*\* |
| P 3×P 4 | -3.62 | 7.89 | -3.49 | -10.00\*\* | 5.32 | -19.39\*\* | -13.99 | -19.10 |
| P 3×P 5 | -6.44 | -13.15 | -5.78 | -8.39\* | -5.05 | -8.32 | 7.51 | 25.33\* |
| P 3×P 6 | -2.70 | 18.42 | -6.36 | -13.55\*\* | 9.18 | 1.80 | -5.54 | 6.46 |
| P 3×P7 | -16.29 | -17.54 | -10.75\*\* | -5.45 | -5.56 | -4.63 | -2.60 | -22.07 |
| P 3×P8 | 14.79 | 13.66 | 16.76\*\* | 16.13\*\* | 4.27 | 5.87 | 22.56\* | 31.63\*\* |
| P 4×P 5 | -16.26 | -15.63 | 4.77 | 5.88 | 5.51 | 6.03 | 13.34 | 21.92 |
| P 4×P6 | 36.96\*\* | -12.82 | 1.68 | 1.76 | -2.57 | 4.03 | -0.96 | 15.12 |
| P 4×P 7 | -2.36 | 2.52 | -5.38 | -7.65\* | 1.67 | 12.46\* | -21.24\* | -2.23 |
| P 4×P8 | -18.14 | -14.09 | 3.40 | 0.59 | 1.71 | -10.58 | 3.48 | 11.10 |
| P 5×P6 | -22.16 | -33.67\* | 0.00 | -2.58 | 1.93 | -1.25 | 8.43 | -2.84 |
| P 5×P7 | -0.36 | -15.51 | -4.39 | -3.03 | -8.15 | -5.47 | 17.14 | 36.32\* |
| P 5×P8 | -2.83 | -12.78 | -1.74 | 1.29 | -10.30\* | -8.32 | 1.57 | 10.92 |
| P 6×P7 | 0.43 | -8.95 | -0.54 | -0.61 | -2.16 | 1.49 | 13.21 | 35.68\*\* |
| P 6×P8 | -18.44 | -33.91\* | 4.62 | 0.00 | 8.29 | -18.77\*\* | -11.24 | -10.34 |
| P 7×P8 | 12.08 | -13.54 | -6.45\* | -6.67 | 0.79 | 2.97 | 1.12 | -32.84\*\* |