

Table S1. Code, name, pedigree and source of the eight parental wheat genotypes used in the present study.

| Name | Code | Pedigree | Source |
|-------------|----------------|---|---------------|
| Gemmeiza-12 | P ₁ | OTUS /3/ SARA / THB // VEE | ARC-Egypt |
| Sids-12 | P ₂ | BUC // 7C / ALD /5/ MAYA74 / ON // 1160.147 /3/ BB / GLL /4/ CHAT"S" /6/ MAYA / VUL // CMH74A.630 / 4*SX | ARC-Egypt |
| Misr-2 | P ₃ | SKAUZ / BAV92 | ARC-Egypt |
| Line-144 | P ₄ | BAJ #1 | CIMMYT-Mexico |
| Line-128 | P ₅ | SOKOLL/3/PASTOR//HXL7573/2*BAU/4/SRMA/TUI | CIMMYT-Mexico |
| Sahel-1 | P ₆ | NS 732/PIMA//Veery'S | ICARDA |
| Gemmeiza-7 | P ₇ | CMH 74A.630 / 5X // SERI 82 /3/ AGENT | ARC-Egypt |
| Line-121 | P ₈ | CHEN/AE.SQ//2*OPATA/3/FINSI | CIMMYT-Mexico |

Table S2. Main soil physico-chemical analysis before wheat cultivation at the experimental site.

| Depth (cm) | Sand (%) | Silt (%) | Clay (%) | texture | θ _s (%) | LL (%) | DUL (%) | OC (%) | qb (g cm ⁻³) | Ks (cm h ⁻¹) |
|------------|----------|---------------------------------------|----------|---------------------------------------|--------------------|---------------------------------------|---------|-----------|-----------------------------|-----------------------------|
| 0-20 | 16.0 | 30.1 | 53.9 | clay | 62.7 | 22.0 | 40.6 | 0.8 | 1.20 | 0.40 |
| 20-40 | 15.5 | 32.5 | 52.0 | Clay | 65.2 | 21.5 | 40.5 | 0.7 | 1.22 | 0.38 |
| 40-60 | 14.5 | 37.0 | 48.5 | clay | 65.5 | 21.0 | 41.2 | 0.5 | 1.23 | 0.31 |
| pH | | Available N (mg kg ⁻¹) | | Available P (mg kg ⁻¹) | | Available K (mg kg ⁻¹) | | OM (%) | | |
| 0-20 | 8.0 | 35.2 | | 10.5 | | 620 | | 1.37 | | |
| 20-40 | 7.8 | 32.5 | | 9.5 | | 602 | | 1.21 | | |
| 40-60 | 8.2 | 28.9 | | 9.2 | | 585 | | 0.86 | | |

θ_s: saturation percentage (%), LL: wilting point (%), DUL: field capacity (%), OC: organic carbon (%),
qb: bulk density, K_s: saturated hydraulic conductivity, OM: organic matter

Table S3. Drought tolerance indices for wheat parental genotypes and their corresponding F1s crosses.

| Gen | Geometric mean productivity (GMP) | Mean productivity (MP) | Yield index (YI) | Stress tolerance index (STI) |
|-------|-----------------------------------|------------------------|------------------|------------------------------|
| P1 | 24.92 | 25.43 | 0.91 | 0.70 |
| P2 | 24.58 | 24.83 | 0.96 | 0.68 |
| P3 | 28.87 | 29.13 | 1.13 | 0.94 |
| P4 | 26.60 | 26.90 | 1.03 | 0.80 |
| P5 | 20.67 | 21.03 | 0.77 | 0.48 |
| P6 | 25.28 | 25.42 | 1.02 | 0.72 |
| P7 | 20.98 | 21.33 | 0.78 | 0.49 |
| P8 | 28.46 | 28.63 | 1.14 | 0.91 |
| P1×P2 | 25.91 | 26.54 | 0.93 | 0.75 |
| P1×P3 | 26.42 | 26.69 | 1.03 | 0.79 |
| P1×P4 | 27.37 | 27.72 | 1.05 | 0.84 |
| P1×P5 | 27.28 | 27.83 | 1.00 | 0.84 |
| P1×P6 | 24.79 | 25.00 | 0.98 | 0.69 |
| P1×P7 | 19.97 | 20.47 | 0.72 | 0.45 |
| P1×P8 | 28.18 | 28.90 | 1.01 | 0.89 |
| P2×P3 | 19.83 | 20.47 | 0.69 | 0.44 |
| P2×P4 | 29.04 | 29.50 | 1.09 | 0.95 |
| P2×P5 | 24.56 | 25.00 | 0.91 | 0.68 |
| P2×P6 | 23.19 | 23.36 | 0.92 | 0.60 |
| P2×P7 | 20.74 | 20.90 | 0.82 | 0.48 |
| P2×P8 | 27.18 | 27.50 | 1.05 | 0.83 |
| P3×P4 | 25.73 | 25.85 | 1.05 | 0.74 |
| P3×P5 | 30.06 | 30.28 | 1.20 | 1.02 |
| P3×P6 | 27.26 | 27.44 | 1.09 | 0.84 |
| P3×P7 | 25.97 | 26.51 | 0.95 | 0.76 |
| P3×P8 | 34.15 | 34.31 | 1.39 | 1.31 |
| P4×P5 | 26.60 | 27.01 | 1.00 | 0.80 |
| P4×P6 | 26.81 | 26.94 | 1.09 | 0.81 |
| P4×P7 | 23.04 | 23.29 | 0.89 | 0.60 |
| P4×P8 | 31.47 | 31.54 | 1.32 | 1.11 |
| P5×P6 | 27.72 | 27.80 | 1.16 | 0.86 |
| P5×P7 | 18.80 | 18.94 | 0.75 | 0.40 |
| P5×P8 | 27.93 | 28.36 | 1.05 | 0.88 |
| P6×P7 | 27.95 | 27.97 | 1.21 | 0.88 |
| P6×P8 | 22.07 | 22.47 | 0.82 | 0.55 |
| P7×P8 | 26.56 | 26.70 | 1.08 | 0.79 |

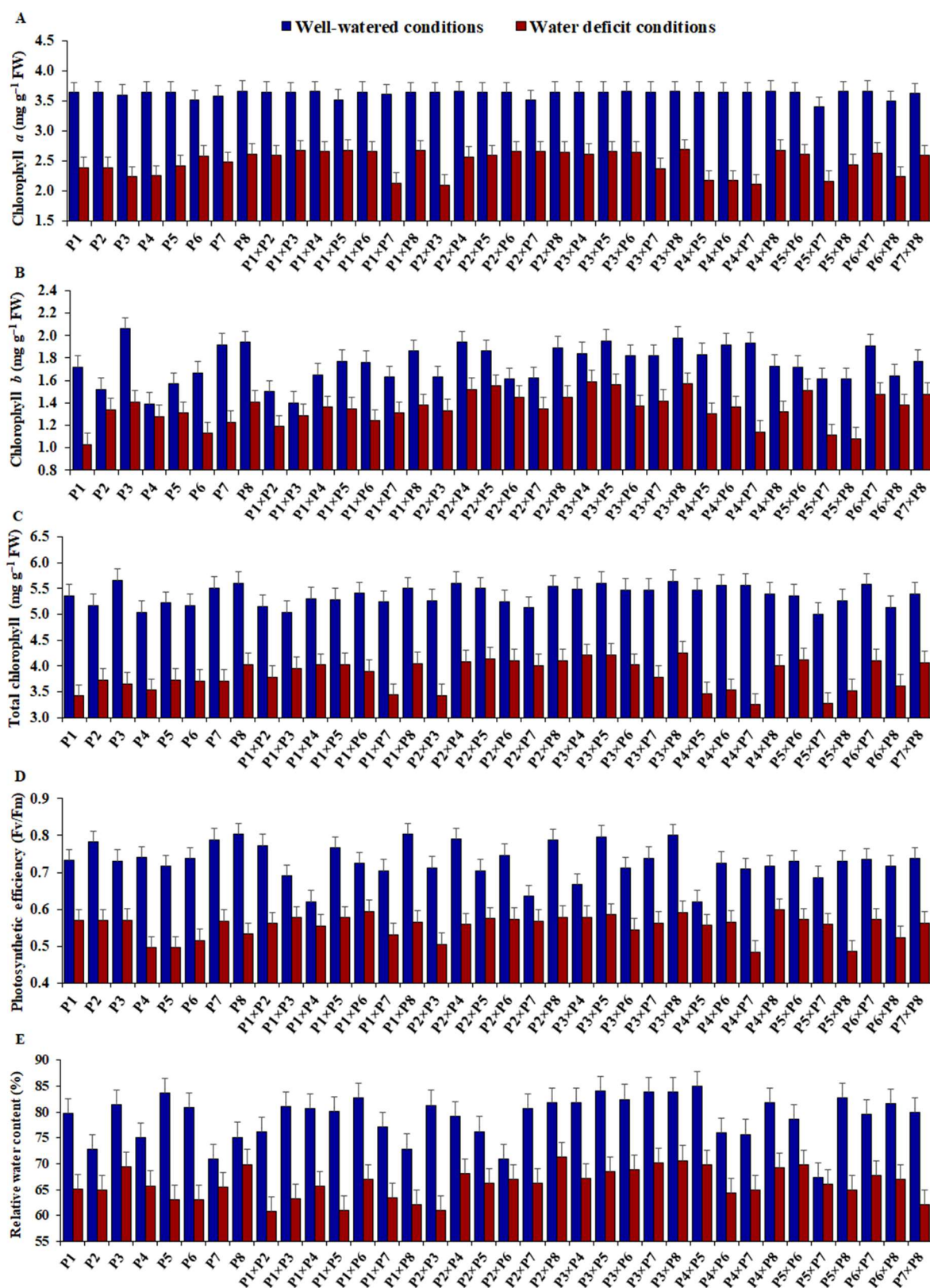


Figure S1. Mean performance of the thirty-six wheat genotypes for chlorophyll *a* (A), chlorophyll *b* (B), total chlorophyll content (C), photosynthetic efficiency (D), and relative water content (E). The bars on the columns represent LSD ($p < 0.05$).

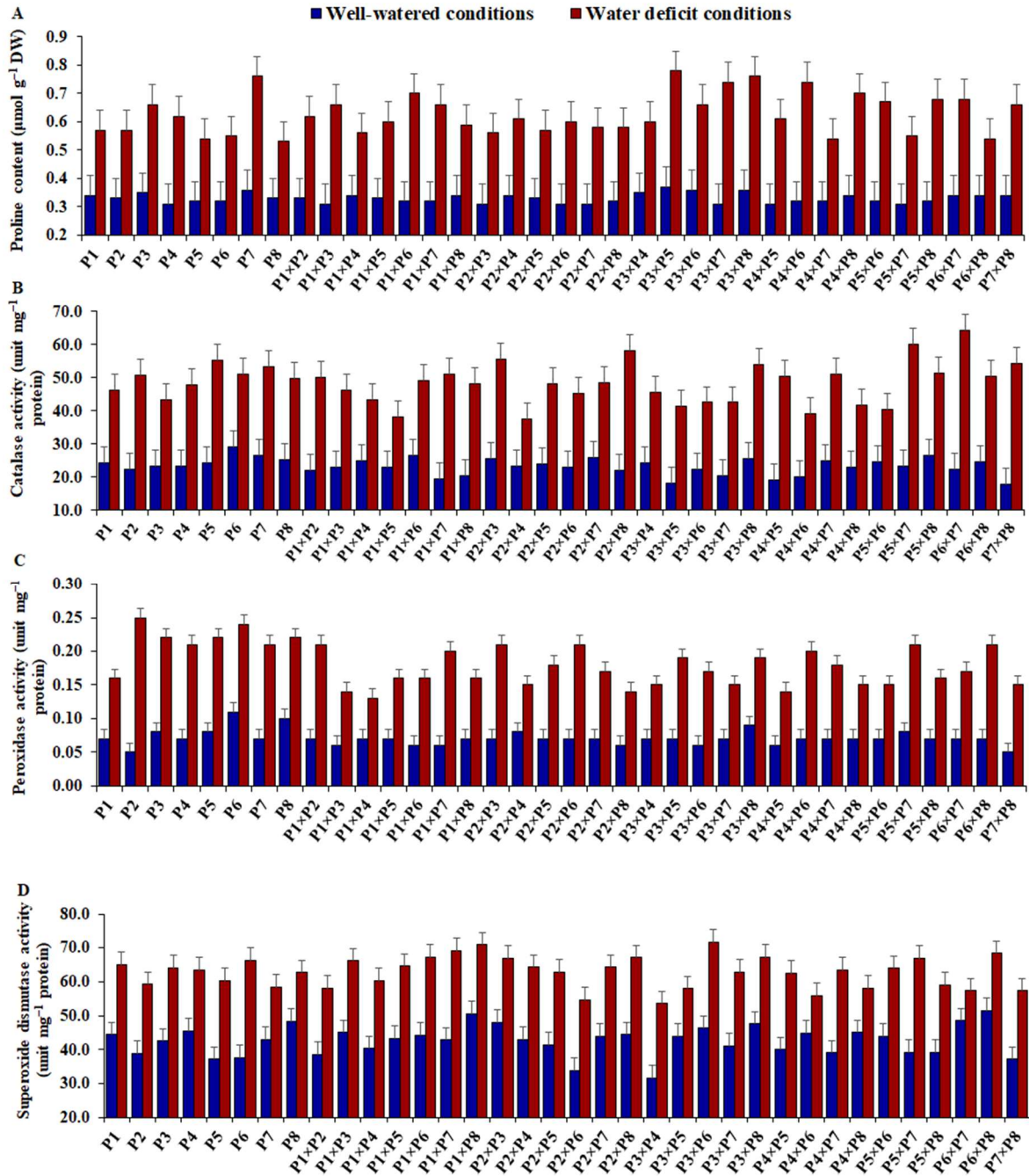


Figure S2. Mean performance of the thirty-six wheat genotypes for proline content (A), catalase activity (B), peroxidase activity (C), and superoxide dismutase activity (D). The bars on the columns represent LSD ($p < 0.05$).

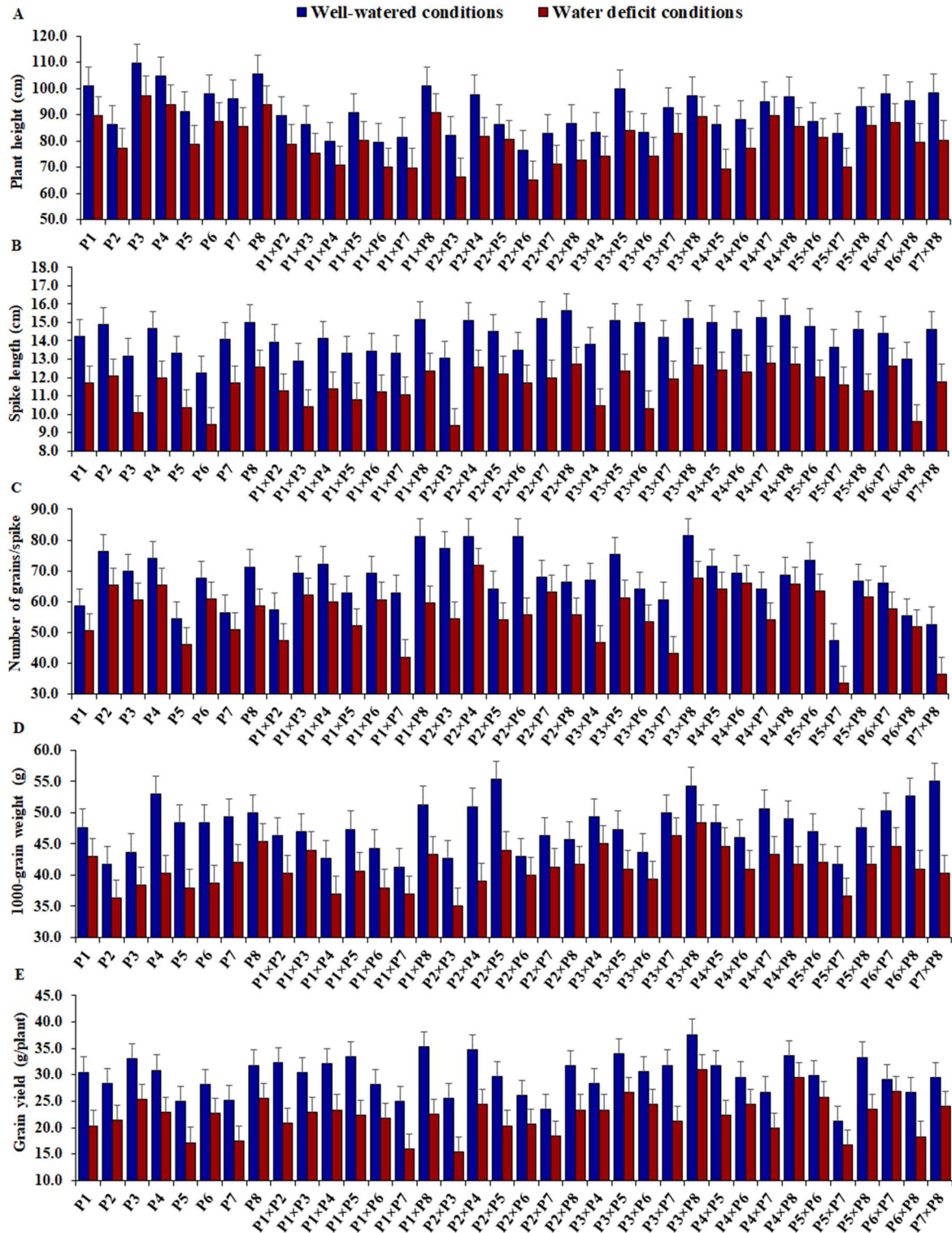


Figure S3. Mean performance of the thirty-six wheat genotypes for plant height (A), spike length (B), number of grains per spike (C), 1000-grain weight (D), and grain yield per plant (E). The bars on the columns represent LSD ($p < 0.05$).

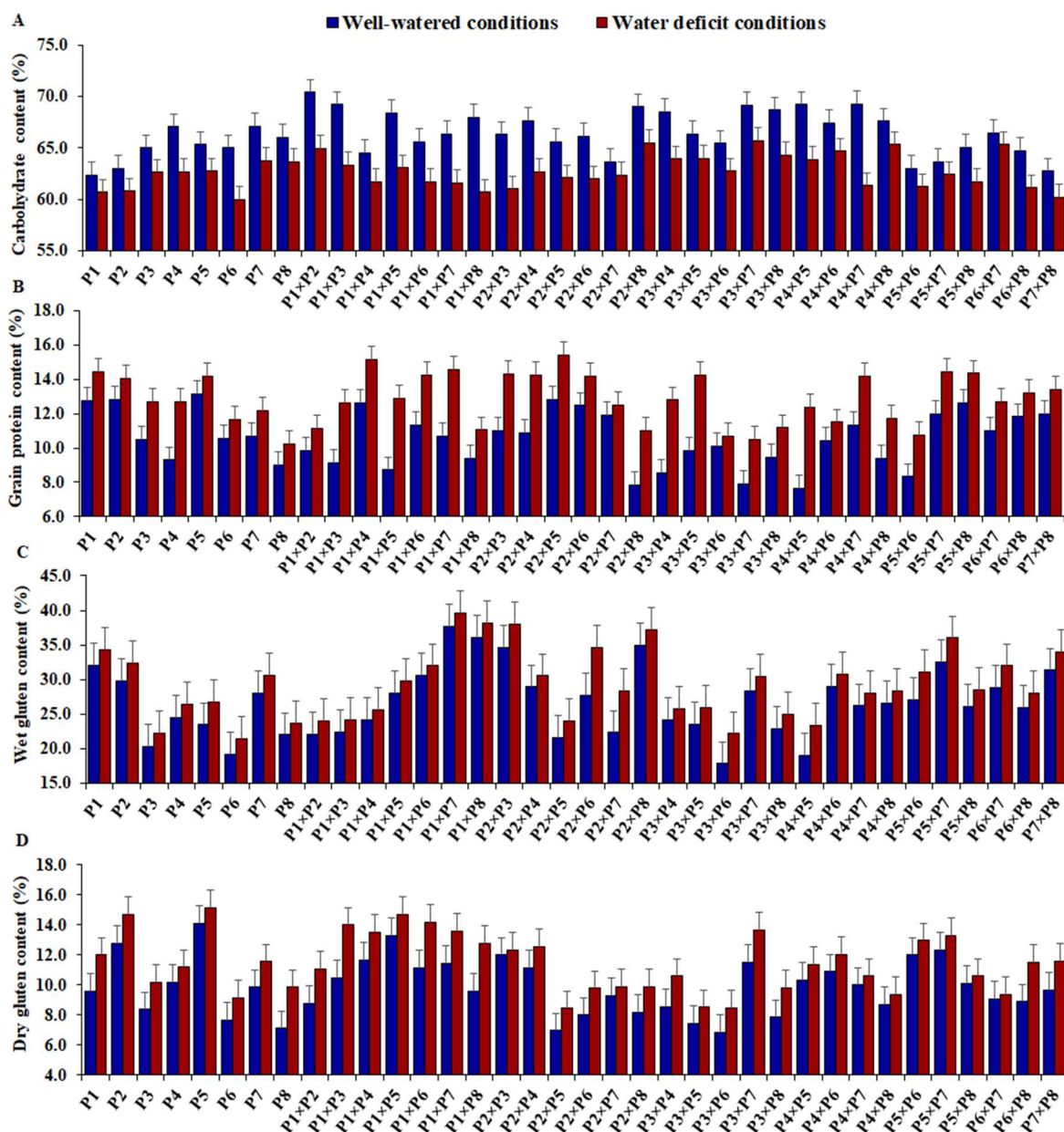


Figure S4. Mean performance of the thirty-six wheat genotypes for carbohydrate content (A), protein content (B), wet gluten content (C), and dry gluten content (D). The bars on the columns represent LSD ($p < 0.05$).

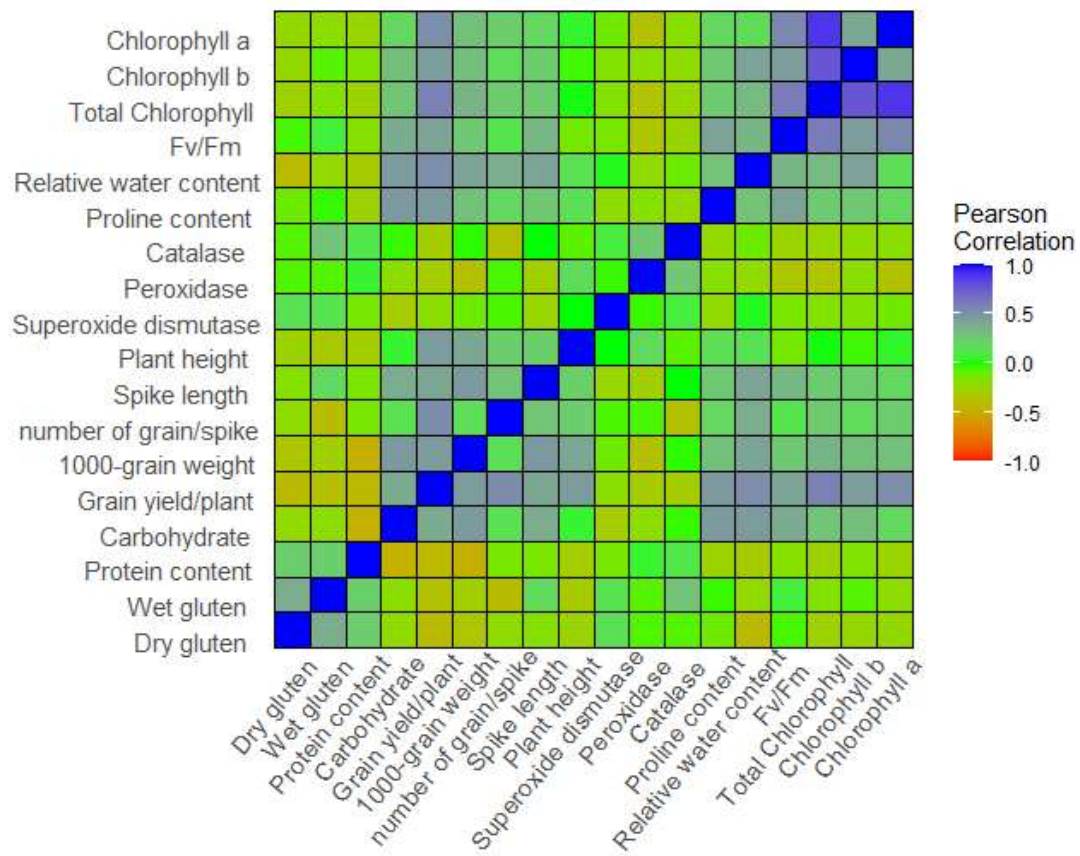


Figure 5. Correlation heatmap of the studied physiological, agronomic, and quality traits.