**Supplementary table 1. Primers used for gene expression analysis.**

|  |  |  |
| --- | --- | --- |
| **Gene** | **Accession no.** | **Sequence (5'-3')** |
| LpNYC1-QRTF  | KX686491 | GATCGTCTCCCAGAAGTGCT |
| LpNYC1-QRTR | KX686491 | GCCAGTCTCCTGCTTGAAC |
| LpNOL-QRTF | KX686493 | GCTGGCAAAGAAGTTTCTCA |
| LpNOL-QRTR | KX686493 | ATGCTGCTCTCCAAATTCCT |
| LpPPH-QRTF | KT345726 | ACCCAGGTGATTCAGGAAAG |
| LpPPH-QRTR  | KT345726 | CCTGACCTCACCAACCTTCT |
| LpSGR-QRTF | KX791203 | GAGGAGGCGAACTCGAAG |
| LpSGR-QRTR  | KX791203 | GGTTGTACCACCCTTGCAG |
| LpelF4A-QRTF | GO924770 | AACTCAACTTGAAGTGTTGGAGTG |
| LpelF4A-QRTR | GO924770 | AGATCTGGTCCTGGAAAGAATATG |

**Supplementary table 2. Eigenvectors and percentage of accumulated contribution ratios of each principal component.**

|  |  |
| --- | --- |
| principal | Initial Eigenvalues |
| component | Eigenvalue | Contribution ratio (%) | Cumulative contribution ratio (%) |
| PC1 | 3.80 | 54.34 | 54.34 |
| PC2 | 1.63 | 23.25 | 77.59 |
| PC3 | 0.61 | 8.69 | 86.28 |
| PC4 | 0.30 | 4.25 | 90.53 |
| PC5 | 0.27 | 3.84 | 94.36 |
| PC6 | 0.26 | 3.76 | 98.12 |
| PC7 | 0.13 | 1.88 | 100.00 |

**Supplementary table 3.** **Principle component analysis of eight physiological traits across 98 perennial ryegrass accessions using heat stress index (HSI) after 24 days of treatment.**

|  |  |  |  |
| --- | --- | --- | --- |
| Traits | PC1 | PC2 | PC3 |
| TQ | 0.915 | -0.186 | 0.096 |
| Fv/Fm | 0.791 | -0.298 | 0.366 |
| Chl | 0.858 | 0.003 | -0.255 |
| Pn | 0.369 | 0.813 | 0.312 |
| WUE | 0.243 | 0.900 | -0.079 |
| RWC | 0.887 | -0.172 | 0.173 |
| RA | 0.789 | 0.049 | -0.517 |
| CR | 53.34 | 23.25 | 8.69 |

PC1, the first principle component; PC2, the second principle component; PC3, the third principle component; CR, Contribution ratio.