Supplementary Information

qPCR primer lists for reference and target genes for gene expression analysis in the crops winter wheat and grain maize.

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Table S1: Primer list for gene expression analysis in the crop winter wheat.

Gene ***Code***	**Annotation**	**Accession Reference**	**Forward and Reverse Primers (5'-3')**
Ubiquitin *TaUBIQ*	Reference gene	Cruz et al. 2015	CCTTCACTTGGTTCTCCGTCT AACGACCAGGACGACAGACACA
Elongation factor 1α *TaEF1α*	Reference gene	Cruz et al. 2015	ATGATTCCCACCAAGCCCAT ACACCAACAGCCACAGTTTGC
β-1,3-glucanase *TaPR1*	Stress-related	HQ848391	CAATAACCTCGGCGTCTTCATCAC TTATTTACTCGCTCGGTCCCTCTG
Lipoxygenase *TaLOX*	Stress-related	Cruz et al. 2015	CGACCCGCAGCTGTTGA CCCTTGTGATCGGAGGTGTT
Allene Oxide Synthase *TaAOS*	Stress-related	Wang et al. 2017	ACCGTGTTCAACAGCTACGG AGCGCCTCTATCGTCACCTT
Superoxide Dismutase *TaSOD*	Stress-related	JQ613154.1	CATTGTCGATAGCCAGATTCCTTT AGTCTTCCACCAGCATTTCCAGTA
Catalase *TaCAT*	Stress-related	GU984379.1	TTTGATGGGAGTCTTGTGCTTGTG ACGGTGAGGGAGTTGTCGTTGTT
Peroxidase *TaPer*	Stress-related	X53675.1	CAGCCCTGTAGCCAACATAAA GCACTTCCACGACTGCTTTG
Glutathione-S-Transferase 4 *TaGSTU4*	Stress-related	Behr et al. 2024	TTCAAGCATCCAACCTCTCC GCTGTCACATCCATCCAAAA
Glutathione-S-Transferase *TaGSTZ*	Stress-related	Behr et al. 2024	CCAAGCCCATTTGTTACCAG GTGGATGAGCACGGGTATCT
MYB transcription factor *TaPIMP2*	Stress-related	Wei et al. 2017b	GCATTGTACGGCCAGTTCG CGAGGAGGCTCTGTTCTTGG
MYB transcription factor 80 *TaMYB80*	Stress-related	Zhao et al. 2017	CAGATGCTCCTCCCTTGG GTGATCCTGGTGTAGTTGC
MYB transcription factor *TaODORANT1*	Stress-related	Wei et al. 2017a	CCGAAGCCCATGTACCTCC CGGATCTATGATCGGTCTATGTG
WRKY transcription factor 49 *TaWRKY49*	Stress-related	Wang et al. 2017	CTTCCCTGCCGCATTCT ACGCTCTCGCCCTAGTG
WRKY transcription factor 62 *TaWRKY62*	Stress-related	Wang et al. 2017	TCGTTGACCACCACCAG AGCCGTCCCCAAATCCA
Nitrate Reductase *TaNR1*	N metabolism	Buchner and Hawkesford 2014	GGCCAATTCYTTCATCTCCTTCTG TACRTSCACAGATTGATGCGTCSA
Nitrite Reductase *TaNIR*	N metabolism	Buchner and Hawkesford 2014	ACGAGGAGTAGGCCGGCTASGAG ATCAGCCGCAGCCCATCTCTRC
Nitrate/Peptide Transporter Family 7.1 *TaNPF7.1*	N metabolism	Buchner and Hawkesford 2014	CTACAAGACCTGCGCCATCTTC GATGAGGTATAGCCGCGAGGAG
Glutamate dehydrogenase 2 *TaGDH2*	N metabolism	Buchner and Hawkesford 2014	AGGATGGGAGCATTCACCTTGG GGATATAAGAACTKTCATCCACCACG
Iron transporter *TaVIT2*	Fe uptake	Connorton et al. 2017	CTCCCCCTACATGTTCGT CCCTTGACGTAGCCGAA
Mitogen-activated Protein Kinase 3 *TaMPK3*	Stress-related	Goyal et al. 2018	GGAGATCAAGCTCCTCAGGC ACTGGCAGTGTTCTTCCGAG
Mitogen-activated PK4 *TaMPK4*	Stress-related	Goyal et al. 2018	TCGAGCCTGGGATTTCTTCG GTCAACAGTGATGCGTCTGC
Mitogen-activated PK6 *TaMPK6*	Stress-related	Goyal et al. 2018	CAGCTTATCTCCGAGGAAAACG TTGTGCCGCACTAGTTGGA
Mitogen-activated Protein Kinase Kinase 6 *TaMKK6*	Stress-related	Goyal et al. 2018	CAGCTTATCTCCGAGGAAAACG TTGTGCCGCACTAGTTGGA
Mitogen-activated Protein Kinase Kinase 10 *TaMKK10-1/3a*	Stress-related	Goyal et al. 2018	CTCAAGGTCCAGCACTACGG CCACCAGCTCGAGGAGTAGA
Mitogen-activated Protein Kinase Kinase 10 *TaMKK10-1/3b*	Stress-related	Goyal et al. 2018	CCAGGGCCCTATGATCCGTA TTGCCGAAGAAGATAGCGCA

Table S2: Primer list for gene expression analysis in the crop grain maize.

Gene ***Code***	**Annotation**	**Accession Reference**	**Forward and Reverse Primers (5'-3')**
Ubiquitin-conjugating enzyme *ZmUbi*	Reference gene	NM_001154750.1	CAGGTGGGGTATTCTTGGTG ATGTTCGGGTGGAAAACCTT
Actin *ZmACT*	Reference gene	NM_001165684.1	GGAGCTCGAGAATGCCAAGAGCAG GACCTCAGGGCATCTGAACCTCTC
Cytosolic ascorbate peroxidase *ZmAPX1*	Stress-related	GRMZM2G316256	GCTCTGTCTTGCATGGCACTCC GATGGGCTCTAGCAACCTGACG
Mitogen-activated protein kinase *ZmMPK3*	Stress-related	GRMZM2G017792	ACAGCGACATGATGACGGAGTA CCAATCACCTCGGTTATGAG
Nicotianamine synthase *ZmNAS3*	Fe/Zn uptake	XM_008666956.4	GGCTCACCAGAAGATGGAGGAG TCACGCATGTGGTGTAGACACG
Nicotianamine synthase *ZmNAS4*	Fe/Zn uptake	Zhou et al. 2013	CACGGCACACACCACAAGCAACAAG ATCCATGCGGTGTGGGCACATAGAC
Ammonium Transporter *ZmAMT1*	N uptake	Gu et al. 2013	CCAGCAGCCAGGTGTAAAA CGACTCCCAAGTAGCCAAG
Zinc transporter *ZmIRTa*	Fe/Zn uptake	NM_001158638.2	CTGCAGAGCAGCGTCAGG AGTACTGTGTCATGTCGTCTC
Oligopeptide transporter *ZmOPT8a*	Fe/Zn uptake	GRMZM2G086258	GCTACATGAGCATGTCGCAGGCT TGCCAGCCACAATGGTACCAACAAACTGA
Oligopeptide transporter *ZmOPT8b*	Fe/Zn uptake	Kobae et al. 2014	GGCTACATGAGCATGGCACAGG CCAGCCACAATGGTACCGACAAACTGG
Oxo-phytodienoate reductase *ZmOPR8*	Stress-related	Yan et al. 2012	AAGAGCAGACTGATGCATGG ATATTGGAGCAGAACCACCC
Nitrite reductase *ZmNIR*	N metabolism	GRMZM2G079381	AGGTGGCGGACATCGGCTTC ACGGCACGGACTTCCTGTAGAC
Nitrate reductase 1 *ZmNR1*	N metabolism	GRMZM2G076723	TGCTTCTGGTCCGTCGAGGTGG ACACGTTCACCTTCACCTTGAA
Nitrate reductase 2 *ZmNR2*	N metabolism	Bowsher et al. 1991	ACTGGTGCTGGTGCTTCTGGTCC ATGCCGATCTCGCCCTTGTGC
High affinity nitrate transporter *ZmNAR2.2*	N metabolism	GRMZM2G163494	GCTGGAGGTGACCCTCTGCTACG TGCCGGGCGATCCTGAACTGG
Phosphate transporter 1;1 *ZmPht1*	P uptake	GRMZM2G326707	CGTAGTACGTGTGTGATAGTCTGG TATTATCACACGTGGACCTCTACC
Phosphate transporter 1;3 *ZmPht3*	P uptake	GRMZM2G112377	GCCTTCCGTTACGTCATTGT AGCACGTCTCTGATCCCATC
Phosphate transporter 1;4 *ZmPht4*	P uptake	GRMZM2G170208	ACCGGCTACCCTCACCTACT CTACCTTCTTGGCGTCCTTG
Phosphate transporter 1;8 *ZmPht8*	P uptake	GRMZM2G045473	CCTGGAGGAGATGTTCAGGA AAGACGGTGAACCAGTAGCC
Phosphate transporter 1;9 *ZmPht9*	P uptake	Xu et al. 2021	CATTGTCACGCTCGTCATCT GGTGGAGTTGAAGTGGTCGT
Glutathione Reductase *ZmGSR1*	Stress-related	Xu et al. 2022	CCAATAGGGTCAACCTGACACCAG TCCATACTCTTCAATTGCCTGCTC
Glutamin Synthetase *ZmGS2*	N metabolism	Li et al. 2021	TATAAACCGGTCCGCGACA CGATGAATCAAAGACAGCCGT
β-1,3-glucanase *ZmPR1*	Stress-related	Cao et al. 2023	AACCTTCTTGGCACCACCCT GTTGGTGTCGTGGTCGTAGT
Endochitinase PR4 *ZmPR4*	Stress-related	NM_001157282.1	TGATGGATAGATGGCGATTGC AGAATTGACACCGCCAAACC
Lipoxygenase 1 *ZmLOX1*	Stress-related	Ogunola et al. 2015	CACTCGAGCTCGTCAAGGAT TCCAACCTGTCTTGTCCTCTTT
Superoxide dismutase 2 *ZmSOD2*	Stress-related	Gautam et al. 2023	CACCAACGGCTGCATGTC ATGCTCCTTGCCAACAGGAT
Superoxide dismutase 4 *ZmSOD4*	Stress-related	XM_008653632.4	CACCAACGGCTGCATGTC ATGCTCCTTGCCAACAGGAT
1-Aminocyclopropane-1-carboxylate synthase *ZmACS6*	Stress-related	NM_001143622.2	GTGCTCATCACCAACCCTTC ACGAAGTCCACCAGCATCTC
Defensin-like protein 1 *ZmDef1*	Stress-related	NM_001329491.1	TGCTGCTCCTCATCGTCGTTGC TTGCCGCCGCCGTAGCCTTC

Defensin-like protein 2 *ZmDef2*	Stress-related	NM_001153491.2	AGTCCAGGGCGACCGTGTG CGAGTGGTGCTGGCTCTTGC
WRKY transcription factor *ZmWRKY106*	Stress-related	GRMZM2G013391	GCTCGTCACCTACACCTTCG AGCTTTCGTCCTCCTCTGC
WRKY transcription factor *ZmWRKY17*	Stress-related	GRMZM2G102583	TTTTTCTTCTTCCGCTGTTCTACTC TCAGATCGAGGGTCGTCATCT
WRKY transcription factor *ZmWRKY33*	Stress-related	GRMZM2G148087	GTGGTCCAGACGATGAGCGACAT GCTGCTCAGCATCTCCAGGGTGT
WRKY transcription factor *ZmWRKY40*	Stress-related	Hu et al. 2021	CTACTTCCGCTGCTCCTTCG TGCTGCTGCTGGTGCTGCT
WRKY transcription factor *ZmWRKY58*	Stress-related	GRMZM2G147880	AGGAAGTGGAGGAGGCGAACA GGATGGCTTGCGCTTGC
Ethylene-responsive factor-like protein *ZmERF1*	Stress-related	NM_001111800.2	ACTTCCCCAGCGACACCTC TGACCTCGTCGGACACCTGA
Ethylene-responsive transcription factor *ZmEREB58*	Stress-related	NM_001176924.1	GACGGCGACAAGAAGCGA CGGTGCCAGGACGACG
MYB transcription factor *ZmMYB30*	Stress-related	GRMZM2G087955	CTCCTTGTCGTTGTCCCTCT CTTGCTTGTGCTTGAGGTGT
MYB transcription factor *ZmMYB36*	Stress-related	GRMZM2G139284	GGTGTTCGAGTACGAGACGA ACAGGACGGTGGAAGTGG
MYB transcription factor *ZmMYB95*	Stress-related	GRMZM2G139284	CTCGTCTTCTCTCCGCTACC TAGTCGACGACAACGAGTGG