

A pathway specific microarray analysis highlights the complex and coordinated transcriptional networks of the developing grain of field grown barley

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Supplementary Table S1. Specific primers used for real time RT-PCR.

Gene product	Forward primer (5' → 3')	Reverse primer (5' → 3')
C-hordein	ATAATTCCCCAGCAACCTCA	GATGGTGCACATCATTTATTCA
B-hordein	GCAAGGTATTCTCCAGCAGC	TAAGTTGTGGCATTTCGCACG
D-hordein	GACAGTCCACCGAGATGGCTA	CGATTACCGCCACAAAGAGG
γ -hordein	TCCCACCTAACTGCTCCACC	CGGAGACTACACCAACAAATGGT
Glutelin	ACCATGGTCGAAATGTGTCAAT	TTAATAGTTGCCCCGGGCTA
Rubisco large subunit	ATCGTGCTCGCGGTATCTTT	CACCTGGCATGGATACCCAG
SAM-S	CTGACATTGCCCAGGGTGT	CCTCTCTGGACGCTTGGTG

Supplementary Table S2. Significantly regulated genes from the developing grain specific microarray. The 501 genes ($p < 0.05$) are described with a specific library name from Clemson University (<http://www.genome.clemson.edu/projects/barley/>).

Cluster 1 (Early)

Clemson ID	Annotation
HVSMEi0001N05f	Ubiquitin fusion degradation protein 1 homolog (UB fusion protein 1)
HVSMEi0002C17f	Hypothetical protein C23C4.09c in chromosome I
HVSMEi0002J06f	Glutamate dehydrogenase 2 (EC 1.4.1.3) (GDH 2)
HVSMEi0003J24f	RAS-RELATED PROTEIN RAB1BV.
HVSMEi0004G06f	GTP-binding nuclear protein Ran/TC4
HVSMEi0004I01f	HypA protein
HVSMEi0005M20f	Cytosol aminopeptidase (EC 3.4.11.1) (Leucine aminopeptidase)
HVSMEi0005N08f	SACCHAROPINE DEHYDROGENASE [NADP+, L-GLUTAMATE FOR
HVSMEi0007F23f	Serine hydroxymethyltransferase, mitochondrial precursor (EC 2.1.2.1) (Serine methylase) (Glycine hydroxymethyltransferase)
HVSMEi0007H10f	Thioredoxin H-type (TRX-H) (Phloem sap 13 kDa protein-1)
HVSMEi0007N15f	Luminal binding protein 3 precursor (BiP3)
HVSMEi0007N22f	Glutamine synthetase root isozyme 4 (EC 6.3.1.2) (Glutamate--ammonia ligase) (GS107)
HVSMEi0008F01f	Glucose-1-phosphate adenyltransferase large subunit 1, chloroplast precursor (EC 2.7.7.27) (ADP-glucose synthase)
HVSMEi0008K08f	Alanine aminotransferase 2 (EC 2.6.1.2) (GPT) (Glutamic--pyruvic transaminase 2) (Glutamic--alanine transaminase 2) (ALAAAT)
HVSMEi0008K10f	Periplasmic beta-glucosidase precursor (EC 3.2.1.21) (Gentiobiase) (Cellobiase) (Beta-D-glucoside glucohydrolase)
HVSMEi0008L22f	Fructose-bisphosphate aldolase, chloroplast precursor (EC 4.1.2.13) (ALDP)
HVSMEi0008N09f	Glyceraldehyde-3-phosphate dehydrogenase, cytosolic (EC 1.2.1.12)
HVSMEi0008N13f	1,4-alpha-glucan branching enzyme IIB, chloroplast precursor (EC 2.4.1.18) (Starch branching enzyme IIB) (Q-enzyme)
HVSMEi0008N15f	ATP synthase gamma chain 1, chloroplast precursor (EC 3.6.3.14)
HVSMEi0009P11f	Hypothetical protein At5g27120
HVSMEi0011H14f	Auxin-binding protein ABP20 precursor
HVSMEi0011I18f	GAMMA-HORDEIN 1 PRECURSOR.
HVSMEi0011J24f	14-3-3-like protein A (14-3-3A)
HVSMEi0011M16f	Probable histone deacetylase (RPD3 homolog)
HVSMEi0012B13f	Actin-depolymerizing factor 1 (ADF 1)
HVSMEi0012J12f	Profilin-1
HVSMEi0013P18f	Hypothetical UPF0012 protein C26A3.11 in chromosome I (EC 3.5.-.-)
HVSMEi0014L05f	SON PROTEIN (SON3).
HVSMEi0014L24f	SON PROTEIN (SON3).
HVSMEi0016F15f	S-adenosylmethionine decarboxylase proenzyme (EC 4.1.1.50) (AdoMetDC) (SamDC) [Contains: S-adenosylmethionine decarboxylase]
HVSMEi0016J01f	HYPOTHETICAL 93.1 KDA PROTEIN YLL034C.
HVSMEi0016N11f	Guanine nucleotide-binding protein beta subunit-like protein (GPB-LR) (RWD)
HVSMEk0001E09f	Acyl carrier protein III, chloroplast precursor (ACP III)
HVSMEk0001K16f	DAG protein, chloroplast precursor
HVSMEk0001M16f	Mitochondrial uncoupling protein 2 (UCP 2)
HVSMEk0001M23f	Dihydroflavonol-4-reductase (EC 1.1.1.219) (DFR) (Dihydrokaempferol 4-reductase)
HVSMEk0001M24f	PUTATIVE LACTOYLGLUTATHIONE LYASE (EC 4.4.1.5) (ME)
HVSMEk0001O23f	Notchless homolog 1
HVSMEk0002A09f	PROLINE-RICH PROTEIN MP-2 PRECURSOR.
HVSMEk0002A11f	ACTIN 66 (FRAGMENT).
HVSMEk0002D13f	ASPARTATE AMINOTRANSFERASE, MITOCHONDRIAL PRECURSOR
HVSMEk0002G11f	CYTOCHROME C OXIDASE POLYPEPTIDE VC (EC 1.9.3.1).
HVSMEk0002G24f	Probable protease inhibitor P322 precursor
HVSMEk0002I15f	GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE SMALL SUBU
HVSMEk0002I18f	Acetyl-CoA acetyltransferase IA (EC 2.3.1.9) (Peroxisomal acetoacetyl-CoA thiolase) (Thiolase IA)

HVSMEk0002K10f Plasma membrane ATPase (EC 3.6.3.6) (Proton pump)

HVSMEk0002L09f Probable microsomal signal peptidase 25 kDa subunit (EC 3.4.-.-) (SPase 25 kDa subunit) (SPC25)

HVSMEk0002L24f Retrovirus-related Pol polyprotein from transposon TNT 1-94 [Contains: Protease (EC 3.4.23.-)]

HVSMEk0002N08f Probable cysteine proteinase A494 precursor (EC 3.4.22.-)

HVSMEk0002N12f Acyl carrier protein I, chloroplast precursor (ACP I)

HVSMEk0002P13f L-ascorbate peroxidase, cytosolic (EC 1.11.1.11) (AP)

HVSMEk0003A20f Phosphoenolpyruvate carboxylase 2 (EC 4.1.1.31) (PEPCase 2) (CP28)

HVSMEk0003A23f HISTIDINE-RICH GLYCOPROTEIN PRECURSOR.

HVSMEk0003B08f Transcription initiation factor TFIID subunit 10 (Transcription initiation factor TFIID 30 kDa subunit) (TAF(II)30) (TAFII-30) (mTAFII250)

HVSMEk0003C04f Enolase 2 (EC 4.2.1.11) (2-phosphoglycerate dehydratase 2) (2-phospho-D-glycerate hydro-lyase 2)

HVSMEk0003E04f 31.1 KDA PROTEIN IN DCM-SERU INTERGENIC REGION.

HVSMEk0003E19f Malate dehydrogenase, cytoplasmic (EC 1.1.1.37)

HVSMEk0003E21f Argininosuccinate synthase, chloroplast precursor (EC 6.3.4.5) (Citrulline--aspartate ligase)

HVSMEk0003E24f Putative glycosyl transferase ypfP (EC 2.-.-.-)

HVSMEk0003K13f AMINOGLYCOSIDE 3'-PHOSPHOTRANSFERASE (EC 2.7.1.95)

HVSMEk0003K15f AMP deaminase 2 (EC 3.5.4.6) (AMP deaminase isoform L)

HVSMEk0003K23f Triosephosphate isomerase, cytosolic (EC 5.3.1.1) (TIM) (Triose-phosphate isomerase)

HVSMEk0003L10f Alanyl-tRNA synthetase, mitochondrial precursor (EC 6.1.1.7) (Alanine--tRNA ligase) (AlaRS)

HVSMEk0003M03f HYPOTHETICAL 20.5 KDA PROTEIN IN CRCB-LIPA INTERGE

HVSMEk0003M05f Hypothetical 56.3 kDa protein in ARO3-KRS1 intergenic region

HVSMEk0003N02f Omega-6 fatty acid desaturase, endoplasmic reticulum isozyme 2 (EC 1.14.19.-)

HVSMEk0003N13f Ubiquinol-cytochrome c reductase complex ubiquinone-binding protein QP-C (EC 1.10.2.2) (Ubiquinol-cytochrome c reductase complex ubiquinone-binding protein)

HVSMEk0004A06f Probable 60 ribosomal protein L14 (Hydroxyproline-rich glycoprotein HRGP1)

HVSMEk0004C04f Ferredoxin VI, chloroplast precursor (Fd VI)

HVSMEk0004C16f Transcription factor HBP-1a (Histone-specific transcription factor HBP1)

HVSMEk0004D10f S-adenosylmethionine synthetase 1 (EC 2.5.1.6)

HVSMEk0004H12f Hypothetical 28.2 kDa protein in hemB 3'region

HVSMEk0004I01f SUPPRESSOR OF CONSTANS OVEREXPRESSION 1 protein (Agamous-like MADS box protein AGL20)

HVSMEk0004I09f Sucrose synthase 1 (EC 2.4.1.13) (Sucrose-UDP glucosyltransferase 1)

HVSMEk0004K01f Putative GTP-binding protein PTD004

HVSMEk0004K19f Hypothetical protein B0228.4 in chromosome II

HVSMEk0004M19f Nonspecific lipid-transfer protein 4.1 precursor (LTP 4.1) (CW21) (CW-21)

HVSMEk0004P20f Probable glutathione S-transferase GSTU6 (EC 2.5.1.18) (28 kDa cold-induced protein)

HVSMEk0004P24f Protein kinase G11A (EC 2.7.1.-) (Fragment)

HVSMEk0005A14f B1-hordein precursor

HVSMEk0005A15f Xanthine dehydrogenase/oxidase [Includes: Xanthine dehydrogenase (EC 1.17.1.4) (XD); Xanthine oxidase (EC 1.17.3.2) (XO)]

HVSMEk0005B11f Heat shock protein 101

HVSMEk0005E06f B2 protein

HVSMEk0005E23f Cytochrome P450 98A1 (EC 1.14.-.-)

HVSMEk0005F09f TRANSPARENT TESTA 12 protein

HVSMEk0005G24f Leucine-rich repeat receptor protein kinase EXS precursor (EC 2.7.1.37) (Extra sporogenous cells protein) (EXCESS MICROSPOROGENOUS CELLS PROTEIN)

HVSMEk0005H15f Glutamyl-tRNA(Gln) amidotransferase subunit A (EC 6.3.5.-) (Glu-ADT subunit A)

HVSMEk0005J19f Pyrophosphate-energized vacuolar membrane proton pump (EC 3.6.1.1) (Pyrophosphate-energized inorganic pyrophosphatase)

HVSMEk0005K04f Transcription factor HBP-1b(c38)

HVSMEk0005K16f Glucose-6-phosphate isomerase, cytosolic (EC 5.3.1.9) (GPI) (Phosphoglucose isomerase) (PGI) (Phosphohexose isomerase)

HVSMEk0005K23f Cell division protein ftsH homolog (EC 3.4.24.-)

HVSMEk0005N24f ALPHA-AMYLASE/SUBTILISIN INHIBITOR PRECURSOR (BASI)

HVSMEk0005O02f GLUTATHIONE S-TRANSFERASE I (EC 2.5.1.18) (GST-I)

HVSMEk0005P10f ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1.2.1.11)

HVSMEk0006A09f Phytpepsin precursor (EC 3.4.23.40) (Aspartic proteinase)

HVSMEk0006A13f Sulfite reductase (Ferredoxin) (EC 1.8.7.1)

HVSMEk0006B23f Alpha-amylase/trypsin inhibitor CMd precursor (Chloroform/methanol-soluble protein CMd)

HVSMEk0006E16f PROLIFERA protein
 HVSMEk0006E18f Soluble inorganic pyrophosphatase (EC 3.6.1.1) (Pyrophosphate phospho-hydrolase) (PPase)
 HVSMEk0006I09f B3-hordein (Fragment)
 HVSMEk0006J18f Naringenin,2-oxoglutarate 3-dioxygenase (EC 1.14.11.9)
 HVSMEk0006K20f Acyl-CoA-binding protein (ACBP)
 HVSMEk0006L09f Adenine phosphoribosyltransferase 2 (EC 2.4.2.7) (APRT)
 HVSMEk0006P03f Glutenin, low molecular weight subunit PTDUCD1 precursor
 HVSMEk0007B20f Hyoscyamine 6-dioxygenase (EC 1.14.11.11) (Hyoscyamine 6-beta-hydroxylase)
 HVSMEk0007C06f Microsomal signal peptidase 18 kDa subunit (EC 3.4.-.-) (SPase 18 kDa subunit) (SPC18) (Endopeptidase SP18) (SEC11-like)
 HVSMEk0007D09f Dihydroflavonol-4-reductase (EC 1.1.1.219) (DFR) (Dihydrokaempferol 4-reductase) (TRANSPARENT TESTA 3 protein)
 HVSMEk0007D24f LONG-CHAIN-FATTY-ACID--COA LIGASE 4 (EC 6.2.1.3)
 HVSMEk0007G04f Calcium-dependent protein kinase SK5 (EC 2.7.1.-) (CDPK)
 HVSMEk0007G17f Alanine aminotransferase 2 (EC 2.6.1.2) (GPT) (Glutamic--pyruvic transaminase 2) (Glutamic--alanine transaminase 2) (ALAA)
 HVSMEk0007I12f Uridine 5'-monophosphate synthase (UMP synthase)
 HVSMEk0007J13f Fibrillarin-1 (SKP1 interacting partner 7)
 HVSMEk0007J16f Transketolase, chloroplast precursor (EC 2.2.1.1) (TK)
 HVSMEk0007J22f SALIVARY PROLINE-RICH PROTEIN PO PRECURSOR
 HVSMEk0007K03f S-ADENOSYLMETHIONINE DECARBOXYLASE PROENZYME (EC 4
 HVSMEk0007L13f Nonsense-mediated mRNA decay protein 3
 HVSMEk0007M02f Myb-related protein B (B-Myb)
 HVSMEk0008G07f PUTATIVE SUCCINATE DEHYDROGENASE [UBIQUINONE] IRON
 HVSMEk0009B06f Putative DNA repair protein RAD23-4 (RAD23-like protein 4) (AtRAD23-4)
 HVSMEk0009J02f Cell division cycle 2-related protein kinase 7 (EC 2.7.1.37) (CDC2-related protein kinase 7) (CrkRS)
 HVSMEk0009J11f Tryptophanyl-tRNA synthetase (EC 6.1.1.2) (Tryptophan--tRNA ligase) (TrpRS)
 HVSMEk0009J22f Glutamine synthetase root isozyme 2 (EC 6.3.1.2) (Glutamate--ammonia ligase)
 HVSMEk0009N12f Hypothetical 24.5 kDa protein in SAP185-BCK1 intergenic region
 HVSMEk0010D20f PEPTIDE TRANSPORTER PTR2-B (HISTIDINE TRANSPORTING
 HVSMEk0010O18f HMG1/2-LIKE PROTEIN.
 HVSMEk0010P11f Succinate dehydrogenase [ubiquinone] flavoprotein subunit, mitochondrial (EC 1.3.5.1) (FP) (Flavoprotein subunit of complex II
 HVSMEk0011I08f Protein C9orf74
 HVSMEk0011I17f ATP-citrate synthase (EC 2.3.3.8) (ATP-citrate (pro-S-)-lyase) (Citrate cleavage enzyme)
 HVSMEk0011K05f ABSCISIC STRESS RIPENING PROTEIN 2.
 HVSMEk0011P16f CYLICIN II (MULTIPLE-BAND POLYPEPTIDE II).
 HVSMEk0012D09f gamma hordein1
 HVSMEk0012E08f Putative lactoylglutathione lyase (EC 4.4.1.5) (Methylglyoxalase) (Aldoketomutase) (Glyoxalase I) (Glx I) (Ketone-aldehyde mut
 HVSMEk0012E09f HYPOTHETICAL 99.0 KDA PROTEIN SPBC119.17.
 HVSMEk0012F17f ACTIN 3-SUB1.
 HVSMEk0012I08f Quinone oxidoreductase (EC 1.6.5.5) (NADPH:quinone reductase)
 HVSMEk0012J11f Glucose-1-phosphate adenyltransferase small subunit, chloroplast precursor (EC 2.7.7.27) (ADP-glucose synthase) (ADP-glu
 HVSMEk0012J14f GTP-binding protein SAR1A
 HVSMEk0012K01f Phosphoglycerate kinase, cytosolic (EC 2.7.2.3)
 HVSMEk0012M12f Eukaryotic translation initiation factor 5A-1 (eIF-5A-1)
 HVSMEk0013C18f RuBisCO subunit binding-protein beta subunit, chloroplast (60 kDa chaperonin beta subunit) (CPN-60 beta) (Fragment)
 HVSMEk0013E10f Auxin-responsive protein IAA27 (Indoleacetic acid-induced protein 27) (Auxin-induced protein 27) (Phytochrome-associated pro
 HVSMEk0013G14f Elongation factor 1-alpha (EF-1-alpha)
 HVSMEk0013G16f Probable nonspecific lipid-transfer protein precursor (LTP) (Aleurone-specific 10 kDa protein) (B-FABP)
 HVSMEk0013G19f CHLOROPLAST ENVELOPE MEMBRANE 70 KDA HEAT SHOCK-RE
 HVSMEk0013I10f Testis spermatocyte apoptosis-related gene 6 protein
 HVSMEk0013K24f XPA-binding protein 1 (HUSSY-23)
 HVSMEk0014A19f Succinyl-CoA ligase [GDP-forming] alpha-chain 2, mitochondrial precursor (EC 6.2.1.4) (Succinyl-CoA synthetase 2, alpha chain
 HVSMEk0014A22f Pyrophosphate--fructose 6-phosphate 1-phosphotransferase alpha subunit (EC 2.7.1.90) (PFP) (6-phosphofructokinase, pyroph
 HVSMEk0014D10f AMINOPEPTIDASE N (EC 3.4.11.2)

HVSMEk0014E02f Probable inosine-5'-monophosphate dehydrogenase (EC 1.1.1.205) (IMP dehydrogenase) (IMPDH) (IMPD)

HVSMEk0014F05f Regulatory protein viviparous-1

HVSMEk0014G04f Adenosine kinase 2 (EC 2.7.1.20) (AK 2) (Adenosine 5'-phosphotransferase 2)

HVSMEk0014H23f Beta-expansin 1a precursor (Pollen allergen Zea m 1) (Zea m l)

HVSMEk0014J23f 2-dehydro-3-deoxyphosphooctonate aldolase (EC 2.5.1.55) (Phospho-2-dehydro-3-deoxyoctonate aldolase) (3-deoxy-D-manno

HVSMEk0014N10f PROTEIN DISULFIDE ISOMERASE (PDI) (EC 5.3.4.1) (PR)

HVSMEk0014N11f Proteasome subunit beta type 6 precursor (EC 3.4.25.1) (Proteasome delta chain) (Tobacco cryptogein-induced protein 7) (tcl

HVSMEk0015A11f PYROPHOSPHATE-ENERGIZED VACUOLAR MEMBRANE PROTON P

HVSMEk0015B17f Carbonic anhydrase, chloroplast precursor (EC 4.2.1.1) (Carbonate dehydratase)

HVSMEk0015E05f UTP--glucose-1-phosphate uridylyltransferase (EC 2.7.7.9) (UDP-glucose pyrophosphorylase) (UDPGP) (UGPase)

HVSMEk0015E06f 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--HOMOCYSTEIN

HVSMEk0015E07f Ketol-acid reductoisomerase, chloroplast precursor (EC 1.1.1.86) (Acetohydroxy-acid reductoisomerase) (Alpha-keto-beta-hydr

HVSMEk0015E11f HMG1/2-like protein

HVSMEk0015H01f MUCIN 2 PRECURSOR (INTESTINAL MUCIN 2).

HVSMEk0015N16f Elongation factor G, mitochondrial precursor (mEF-G)

HVSMEk0016C02f RNA-binding region containing protein 2 (Hepatocellular carcinoma protein 1) (Splicing factor HCC1)

HVSMEk0016D03f Peptidyl-prolyl cis-trans isomerase (EC 5.2.1.8) (PPIase) (Rotamase) (Cyclophilin) (Cyclosporin A-binding protein)

HVSMEk0016F01f Eukaryotic translation initiation factor 1A (EIF-1A) (EIF-4C)

HVSMEk0016H04f Copper transporter 1

HVSMEk0016H10f Floral homeotic protein AGAMOUS

HVSMEk0016H23f Protein disulfide-isomerase precursor (EC 5.3.4.1) (PDI) (Endosperm protein E-1)

HVSMEk0016J24f 26S protease regulatory subunit 6A homolog (TAT-binding protein homolog 1) (TBP-1)

HVSMEk0016K10f Beta-hexosaminidase beta chain precursor (EC 3.2.1.52) (N-acetyl-beta-glucosaminidase) (Beta-N-acetylhexosaminidase) (He

HVSMEk0016L09f Pyruvate, phosphate dikinase, chloroplast precursor (EC 2.7.9.1) (Pyruvate, orthophosphate dikinase)

HVSMEk0016L21f Tubulin alpha chain

HVSMEk0017C11f Sucrose transport protein (Sucrose permease) (Sucrose-proton symporter)

HVSMEk0017C21f Hypothetical 21.5 kDa protein in SEC15-SAP4 intergenic region

HVSMEk0017F24f Formate dehydrogenase, mitochondrial precursor (EC 1.2.1.2) (NAD-dependent formate dehydrogenase) (FDH)

HVSMEk0017G03f Phosphoserine phosphatase, chloroplast precursor (EC 3.1.3.3) (PSP) (O-phosphoserine phosphohydrolase) (PSPase)

HVSMEk0017G05f Major latex protein 146 (MLP 146)

HVSMEk0017G16f Proliferating cell nuclear antigen (PCNA) (Cyclin)

HVSMEk0017I03f Acyl carrier protein, mitochondrial precursor (ACP) (NADH-ubiquinone oxidoreductase 9.6 kDa subunit) (MtACP-1)

HVSMEk0017J05f Mucin-5B precursor (Mucin 5 subtype B, tracheobronchial) (High molecular weight salivary mucin MG1) (Sublingual gland mucin

HVSMEk0017J12f Probable pyridoxin biosynthesis protein PDX1 (pvPDX1)

HVSMEk0017L08f Isocitrate dehydrogenase [NADP], chloroplast precursor (EC 1.1.1.42) (Oxalosuccinate decarboxylase)

HVSMEk0017N23f Deubiquitination-protection protein dph1

HVSMEk0017P19f RAC-like GTP binding protein ARAC1 (GTPase protein ROP3)

HVSMEk0018A17f Beta-fructofuranosidase 1 precursor (EC 3.2.1.26) (Sucrose 1) (Invertase 1)

HVSMEk0018C15f Tubulin alpha-2 chain

HVSMEk0018G02f NUCLEAR TRANSPORT FACTOR 2 (NTF-2) (NUCLEAR TRANSP

HVSMEk0018H23f DYNEIN HEAVY CHAIN (DYHC) (FRAGMENT).

HVSMEk0018M10f CYCLIN A/CDK2-ASSOCIATED PROTEIN P19 (RNA POLYMER

HVSMEk0018M19f Histone H2A

HVSMEk0018O15f METALLOTHIONEIN-LIKE PROTEIN 1.

HVSMEk0018P18f PHENYLALANINE AMMONIA-LYASE (EC 4.3.1.5).

HVSMEk0018P20f IMPORTIN BETA-1 SUBUNIT (KARYOPHERIN BETA-1 SUBUNI

HVSMEk0019F01f Aspartate aminotransferase, cytoplasmic (EC 2.6.1.1) (Transaminase A)

HVSMEk0019G18f 26S protease regulatory subunit 4 homolog (TAT-binding protein homolog 2)

HVSMEk0019J11f ADP-ribosylation factor-like protein 5

HVSMEk0019O18f Heat shock protein sti1 homolog

HVSMEk0020H02f 14-3-3-LIKE PROTEIN B (14-3-3B).

HVSMEk0020H08f CHLOROPLAST STROMA 70 KDA HEAT SHOCK-RELATED PROTE

HVSMEk0020N06f FK506-binding protein 2-1 precursor (EC 5.2.1.8) (Peptidyl-prolyl cis-trans isomerase) (PPIase) (Rotamase) (15 kDa FKBP) (FKBP)

HVSMEk0021B09f Anter-specific proline-rich protein APG (Protein CEX) (Fragment)

HVSMEk0021C12f TRANSLOCON-ASSOCIATED PROTEIN, ALPHA SUBUNIT PRECU

HVSMEk0021C21f SPLICEOSOME ASSOCIATED PROTEIN 62 (SAP 62) (SF3A66)

HVSMEk0021D14f 3-ketoacyl-CoA thiolase A, peroxisomal precursor (EC 2.3.1.16)

HVSMEk0021I02f PHOSPHOGLUCOMUTASE (EC 5.4.2.2)

HVSMEk0021J12f Glucose-6-phosphate 1-dehydrogenase, cytoplasmic isoform (EC 1.1.1.49) (G6PD)

HVSMEk0021J20f Dolichyl-diphosphooligosaccharide--protein glycosyltransferase 67 kDa subunit precursor (EC 2.4.1.119) (Ribophorin I) (RPN-I)

HVSMEk0021K08f SPLICING FACTOR U2AF 50 KDA SUBUNIT (U2 AUXILIARY

HVSMEk0021K21f Prohibitin 2

HVSMEk0021N05f Phytochrome A type 3 (AP3)

HVSMEk0021O15f Mannosyl-oligosaccharide glucosidase (EC 3.2.1.106) (Glycoprotein processing glucosidase I)

HVSMEk0022A03f 2-cys peroxiredoxin BAS1, chloroplast precursor (EC 1.11.1.15) (Thiol-specific antioxidant protein) (Fragment)

HVSMEk0022B07f HMG1/2-like protein

HVSMEk0022C18f 28 kDa heat- and acid-stable phosphoprotein (PDGF-associated protein)

HVSMEk0022C23f DNA damage binding protein 1a (UV-damaged DNA-binding protein 1a) (DDB1a)

HVSMEk0022D04f 14 kDa zinc-binding protein (Protein kinase C inhibitor) (PKCI)

HVSMEk0022D06f Naringenin,2-oxoglutarate 3-dioxygenase (EC 1.14.11.9) (Flavonone-3-hydroxylase) (F3H) (FHT)

HVSMEk0022E18f NADPH--cytochrome P450 reductase (EC 1.6.2.4) (CPR) (P450R)

HVSMEk0022I15f Transformation/transcription domain-associated protein (350/400 kDa PCAF-associated factor) (PAF350/400) (STAF40) (Tra1)

HVSMEk0022J16f Retinol dehydrogenase 14 (EC 1.1.1.-) (Alcohol dehydrogenase PAN2)

HVSMEk0022K15f PROTEASE II (EC 3.4.21.83) (OLIGOPEPTIDASE B).

HVSMEk0022K19f DNA-directed RNA polymerase III subunit 22.9 kDa polypeptide (EC 2.7.7.6) (RPC8)

HVSMEk0022L03f CATHEPSIN B PRECURSOR (EC 3.4.22.1) (CATHEPSIN B1)

HVSMEk0022L06f Hypothetical protein C1F7.01c in chromosome I

HVSMEk0022L07f Elongation factor 1-beta' (EF-1-beta')

HVSMEk0022L19f Superoxide dismutase [Cu-Zn] 4A (EC 1.15.1.1)

HVSMEk0022M02f Putative peroxiredoxin At1g60740 (EC 1.11.1.15) (Thioredoxin reductase)

HVSMEk0022M07f 6-phosphogluconate dehydrogenase, decarboxylating (EC 1.1.1.44)

HVSMEk0022M14f Puromycin-sensitive aminopeptidase (EC 3.4.11.-) (PSA)

HVSMEk0022N14f Translationally controlled tumor protein homolog (TCTP) (HTP)

HVSMEk0022O04f SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6.2.1.5) (

HVSMEk0022P09f Probable aquaporin PIP1.5 (Plasma membrane intrinsic protein 1d) (PIP1d)

HVSMEk0022P19f 60S ribosomal protein L24

HVSMEk0022P20f Peptidyl-prolyl cis-trans isomerase TLP20, chloroplast precursor (EC 5.2.1.8) (PPIase) (Rotamase) (Thylakoid lumen PPIase of

HVSMEk0022P24f Putative glutamine-dependent NAD(+) synthetase (EC 6.3.5.1) (NAD(+) synthase [glutamine-hydrolyzing])

HVSMEk0023B10f Surfactin synthetase subunit 3

HVSMEk0023B14f Glucose-1-phosphate adenyllyltransferase small subunit, chloroplast precursor (EC 2.7.7.27) (ADP-glucose synthase) (ADP-glu

HVSMEk0023B18f GLUTAREDOXIN.

HVSMEk0023B24f Histone H3

HVSMEk0023D12f Beta-fructofuranosidase 1 precursor (EC 3.2.1.26) (Sucrose 1) (Invertase 1)

HVSMEk0023E04f 3-oxoacyl-[acyl-carrier-protein] synthase I, chloroplast precursor (EC 2.3.1.41) (Beta-ketoacyl-ACP synthase I) (KAS I)

HVSMEk0023G06f Endoglucanase 1 precursor (EC 3.2.1.4) (Endo-1,4-beta-glucanase) (Abscission cellulase 1)

HVSMEk0023H12f (RS)-norcochlorine 6-O-methyltransferase (EC 2.1.1.128) (S-adenosyl-L-methionine:norcochlorine 6-O-methyltransferase) (6-O

HVSMEk0023I12f Aspartate aminotransferase, chloroplast precursor (EC 2.6.1.1) (Transaminase A)

HVSMEk0023J06f NHP2-like protein 1 (High mobility group-like nuclear protein 2 homolog 1) ([U4/U6.U5] tri-snRNP 15.5 kDa protein) (OTK27)

HVSMEk0024A19f Multidrug resistance-associated protein 5 (Multi-specific organic anion transporter-C) (MOAT-C) (pABC11) (SMRP)

HVSMEk0024E09f 3-isopropylmalate dehydrogenase 3, chloroplast precursor (EC 1.1.1.85) (Beta-IPM dehydrogenase 3) (IMDH 3) (3-IPM-DH 3)

HVSMEk0024I11f 70 kDa peptidylprolyl isomerase (EC 5.2.1.8) (Peptidyl-prolyl cis-trans isomerase) (PPIase) (Rotamase)

HVSMEk0024I17f Agamous-like MADS box protein AGL9 homolog (OM1)

HVSMEk0024M03f ATP synthase beta chain, mitochondrial precursor (EC 3.6.3.14)

HVSMEk0024M13f Formate--tetrahydrofolate ligase (EC 6.3.4.3) (Formyltetrahydrofolate synthetase) (10-formyletetrahydrofolate synthetase) (FHS)

HVSMEk0024P21f Malonyl CoA-acyl carrier protein transacylase (EC 2.3.1.39) (MCT)

Cluster 2 (Mid)

Clemson ID	Annotation
HVSMEi0002O02f	Profilin-1 (Fragment)
HVSMEi0003H15f	Casein kinase II, alpha chain (CK II) (EC 2.7.1.37) (CK2-alpha)
HVSMEi0004C03f	Hsc70-interacting protein (Hip) (Putative tumor suppressor ST13) (Progesterone receptor-associated p48 protein)
HVSMEi0004D02f	Heat shock cognate protein 80
HVSMEi0004I12f	Glutenin, high molecular weight subunit 12 precursor
HVSMEi0005I02f	SSM4 protein
HVSMEi0007N24f	Calcium-dependent protein kinase, isoform 11 (EC 2.7.1.-) (CDPK 11)
HVSMEi0008B14f	Homoaconitase, mitochondrial precursor (EC 4.2.1.36) (Homoaconitate hydratase)
HVSMEi0008D20f	1,4-alpha-glucan branching enzyme, chloroplast precursor (EC 2.4.1.18) (Starch branching enzyme) (Q-enzyme)
HVSMEi0008P04f	Ribulose biphosphate carboxylase large chain precursor (EC 4.1.1.39) (RuBisCO large subunit)
HVSMEi0009B23f	RHSB PROTEIN PRECURSOR.
HVSMEi0009H17f	Alpha-amylase/subtilisin inhibitor precursor (BASI)
HVSMEi0009N06f	MITOCHONDRIAL LON PROTEASE HOMOLOG 1 PRECURSOR (EC
HVSMEi000P5CRf	P5CR
HVSMEi0010G19f	1,4-ALPHA-GLUCAN BRANCHING ENZYME (EC 2.4.1.18) (S
HVSMEi0011I01f	Gamma-hordein 1 precursor
HVSMEi0011J02f	Antifreeze glycopeptide polyprotein precursor (AFGP polyprotein) [Contains: AFGP7 (AFGP 7); AFGP8 (AFGP 8)] (Fragment)
HVSMEi0011M10f	Protochlorophyllide reductase A, chloroplast precursor (EC 1.3.1.33)
HVSMEi0011M13f	GAMMA-HORDEIN 3.
HVSMEi0011M17f	PROBABLE DIHYDROPYRIMIDINE DEHYDROGENASE [NADP+]
HVSMEi0011M23f	Probable leaf thionin precursor
HVSMEi0012D18f	Wilms' tumor 1-associating protein (WT1-associated protein) (Putative pre-mRNA splicing regulator female-lethal(2D) ho
HVSMEi0012E10f	Gamma-interferon inducible lysosomal thiol reductase precursor (Gamma-interferon-inducible protein IP-30)
HVSMEi0012F03f	Flavonol synthase/flavanone 3-hydroxylase (EC 1.14.11.23) (EC 1.14.11.9) (FLS)
HVSMEi0012L02f	Bowman-Birk type trypsin inhibitor
HVSMEi0012L14f	PROBABLE RNA 3'-TERMINAL PHOSPHATE CYCLASE
HVSMEi0012P11f	ABA-INDUCIBLE PROTEIN PHV A1.
HVSMEi0013D04f	Putative serine/threonine-protein kinase receptor precursor (EC 2.7.1.37) (S-receptor kinase) (SRK)
HVSMEi0014B20f	Oxysterol binding protein-related protein 3 (OSBP-related protein 3) (ORP-3)
HVSMEi0014G06f	HYPOTHETICAL 50.6 KDA PROTEIN
HVSMEi0014H21f	GLYCINE-RICH CELL WALL STRUCTURAL PROTEIN 1 PRECUR
HVSMEi0015A19f	Viviparous protein homolog
HVSMEi0016H20f	ALPHA/BETA-GLIADIN A-V PRECURSOR (PROLAMIN).
HVSMEi0016H22f	ZINC FINGER PROTEIN 207.
HVSMEi0016K22f	16.9 KDA CLASS I HEAT SHOCK PROTEIN (LOW MOLECULAR Protein)
HVSMEi0017B10f	SEED ALLERGENIC PROTEIN RA17 PRECURSOR.
HVSMEi0017G01f	SON PROTEIN (SON3).
HVSMEi0017N20f	Nucleotide-binding protein 1 (NBP 1)
HVSMEi0024J11f	ISOCHORISMATASE (EC 3.3.2.1) (2,3 DIHYDRO-2,3 DIHY
HVSMEk0001I14f	PUTATIVE 3,4-DIHYDROXY-2-BUTANONE KINASE (EC 2.7.1
HVSMEk0002F18f	Ribosome-binding protein 1 (180 kDa ribosome receptor) (RRp)
HVSMEk0002L10f	Flap endonuclease-1a (EC 3.-.-.-) (OsFEN-1a)
HVSMEk0002L16f	Glutathione reductase, cytosolic (EC 1.8.1.7) (GR) (GRase)
HVSMEk0002O24f	Trypsin/factor XIA inhibitor precursor (Hageman factor inhibitor) (CHF1)
HVSMEk0002P24f	EXTENSIN PRECURSOR (CELL WALL HYDROXYPROLINE-RICH

HVSMEk0003E08f HYPOTHETICAL 55.1 KDA PROTEIN IN OGT-DBPA INTERGEN

HVSMEk0003F02f Probable small nuclear ribonucleoprotein G (snRNP-G) (Sm protein G) (Sm-G) (SmG)

HVSMEk0003J14f Solute carrier family 23, member 2 (Sodium-dependent vitamin C transporter 2) (hSVCT2) (Na(+)/L-ascorbic acid transporter 2)

HVSMEk0003K09f CUTINASE PRECURSOR (EC 3.1.1.-).

HVSMEk0003K21f BRASSINOSTEROID INSENSITIVE 1-associated receptor kinase 1 precursor (EC 2.7.1.37) (BRI1-associated receptor kinase)

HVSMEk0003M06f HYPOTHETICAL 83.1 KDA PROTEIN IN ALPA-GABD INTERGE

HVSMEk0003M24f Minor allergen Alt a 7 (Alt a VII)

HVSMEk0003O05f Branched-chain-amino-acid aminotransferase-like protein 1 (Atbcat-like)

HVSMEk0004B20f Coatomer delta subunit (Delta-coat protein) (Delta-COP) (Archain)

HVSMEk0004E01f Protein kinase AFC1 (EC 2.7.1.-)

HVSMEk0004J08f PUROINDOLINE-A PRECURSOR.

HVSMEk0004K02f Pyruvate, phosphate dikinase, chloroplast precursor (EC 2.7.9.1) (Pyruvate, orthophosphate dikinase)

HVSMEk0005B15f Glutamine synthetase (EC 6.3.1.2) (Glutamate--ammonia ligase) (GS)

HVSMEk0005J10f LIGHT-MEDIATED DEVELOPMENT PROTEIN DET1.

HVSMEk0005K12f Chaperone protein dnaJ 15 (Protein ALTERED RESPONSE TO GRAVITY) (AtARG1) (AtJ15) (AtDjB15)

HVSMEk0005N03f Kelch-like protein 1

HVSMEk0005P03f Hypothetical 35.8 kDa protein in ARA1-RIB7 intergenic region

HVSMEk0006N01f Glutathione S-transferase III (EC 2.5.1.18) (GST-III) (GST class-phi)

HVSMEk0007F09f ATP synthase a chain (EC 3.6.3.14) (ATPase protein 6)

HVSMEk0007L15f Pectinesterase-2 precursor (EC 3.1.1.11) (Pectin methylesterase 2) (PE 2)

HVSMEk0007M10f Putative casein kinase II beta-4 subunit (CK II beta-4)

HVSMEk0007M15f Oleosin 16 kDa

HVSMEk0009J23f Importin alpha-1b subunit

HVSMEk0009L22f DNA-directed RNA polymerase II 23 kDa polypeptide (EC 2.7.7.6)

HVSMEk0011C06f RAS-RELATED PROTEIN RIC1.

HVSMEk0011K05f ABSCISIC STRESS RIPENING PROTEIN 2.

HVSMEk0012A15f L-asparaginase (EC 3.5.1.1) (L-asparagine amidohydrolase) (Fragment)

HVSMEk0012H15f GLUTENIN, LOW MOLECULAR WEIGHT SUBUNIT 1D1 PRECURS

HVSMEk0012M24f Peroxidase 12 precursor (EC 1.11.1.7) (Atperox P12) (PRXR6) (ATP4a)

HVSMEk0013I06f MSP1 protein (TAT-binding homolog 4)

HVSMEk0014L07f GMP synthase [glutamine-hydrolyzing] (EC 6.3.5.2) (Glutamine amidotransferase) (GMP synthetase)

HVSMEk0014P23f Retinol dehydrogenase 12 (EC 1.1.1.-)

HVSMEk0015G02f ATP SYNTHASE A CHAIN (EC 3.6.1.34) (PROTEIN 6).

HVSMEk0016A08f OCTAPEPTIDE-REPEAT PROTEIN T2.

HVSMEk0016B21f Putative low molecular weight protein-tyrosine-phosphatase slr0328 (EC 3.1.3.48)

HVSMEk0017D03f Glutathione-dependent formaldehyde dehydrogenase (EC 1.2.1.1) (FDH) (FALDH) (Alcohol dehydrogenase SFA) (EC 1.1.1.1)

HVSMEk0017F15f AUXIN-REPRESSED 12.5 KDA PROTEIN.

HVSMEk0017H01f Peptidylprolyl isomerase 1 (EC 5.2.1.8) (Peptidylprolyl cis-trans isomerase 1) (PPIase 1) (Cyclophilin) (BmCYP-1)

HVSMEk0017I16f Endoglucanase A precursor (EC 3.2.1.4) (Endo-1,4-beta-glucanase A)

HVSMEk0017J10f Polyadenylate-binding protein 2 (Poly(A)-binding protein 2) (PolyA binding protein II) (PABII) (Polyadenylate-binding nuclear pro

HVSMEk0017J23f Dihydrolipoyllysine-residue acetyltransferase component of pyruvate dehydrogenase complex, mitochondrial precursor (EC 2.3.1.18) (PDCE2)

HVSMEk0017P01f Hemolysin E, chromosomal (Hemolysis-inducing protein) (Silent hemolysin sheA) (Cytotoxin clyA) (Latent pore-forming 34 kDa)

HVSMEk0018C06f Mitogen-activated protein kinase homolog 2 (EC 2.7.1.37) (MAP kinase 2) (AtMPK2)

HVSMEk0018C21f MOTHER of FT and TF1 protein

HVSMEk0018E19f Alpha-amylase inhibitor BDAl-I precursor

HVSMEk0018H09f CHROMOSOME REGION MAINTENANCE PROTEIN 1.

HVSMEk0018I18f PECTINESTERASE 2.1 PRECURSOR (EC 3.1.1.11)

HVSMEk0019B24f Chalcone--flavonone isomerase (EC 5.5.1.6) (Chalcone isomerase)

HVSMEk0019L03f MOTHER of FT and TF1 protein

HVSMEk0019N08f PROBABLE S-ADENOSYLMETHIONINE SYNTHETASE T13A10.11

HVSMEk0020C22f Trypsin inhibitor CMe precursor (Chloroform/methanol-soluble protein CMe)

HVSMEk0020G12f DNA-DIRECTED RNA POLYMERASE II LARGEST SUBUNIT

HVSMEk0020H14f	PUTATIVE ALANINE AMINOTRANSFERASE, MITOCHONDRIAL P
HVSMEk0020O19f	HYPOTHETICAL 82.0 KDA PROTEIN IN SULA-HELD INTERGE
HVSMEk0020P14f	GAMMA-GLIADIN B-I PRECURSOR.
HVSMEk0021F18f	Sucrose-phosphate synthase 1 (EC 2.4.1.14)
HVSMEk0021I06f	Transmembrane protein Tmp21 precursor (21 kDa transmembrane trafficking protein)
HVSMEk0021K16f	SERINE CARBOXYPEPTIDASE I PRECURSOR (EC 3.4.16.5)
HVSMEk0022C07f	ENV polyprotein precursor (Coat polyprotein) [Contains: Surface protein; Transmembrane protein]
HVSMEk0022C17f	Puroindoline-B precursor
HVSMEk0022K09f	26S protease regulatory subunit S10B (Proteasome subunit p42) (CADp44)

Cluster 3 (Late)

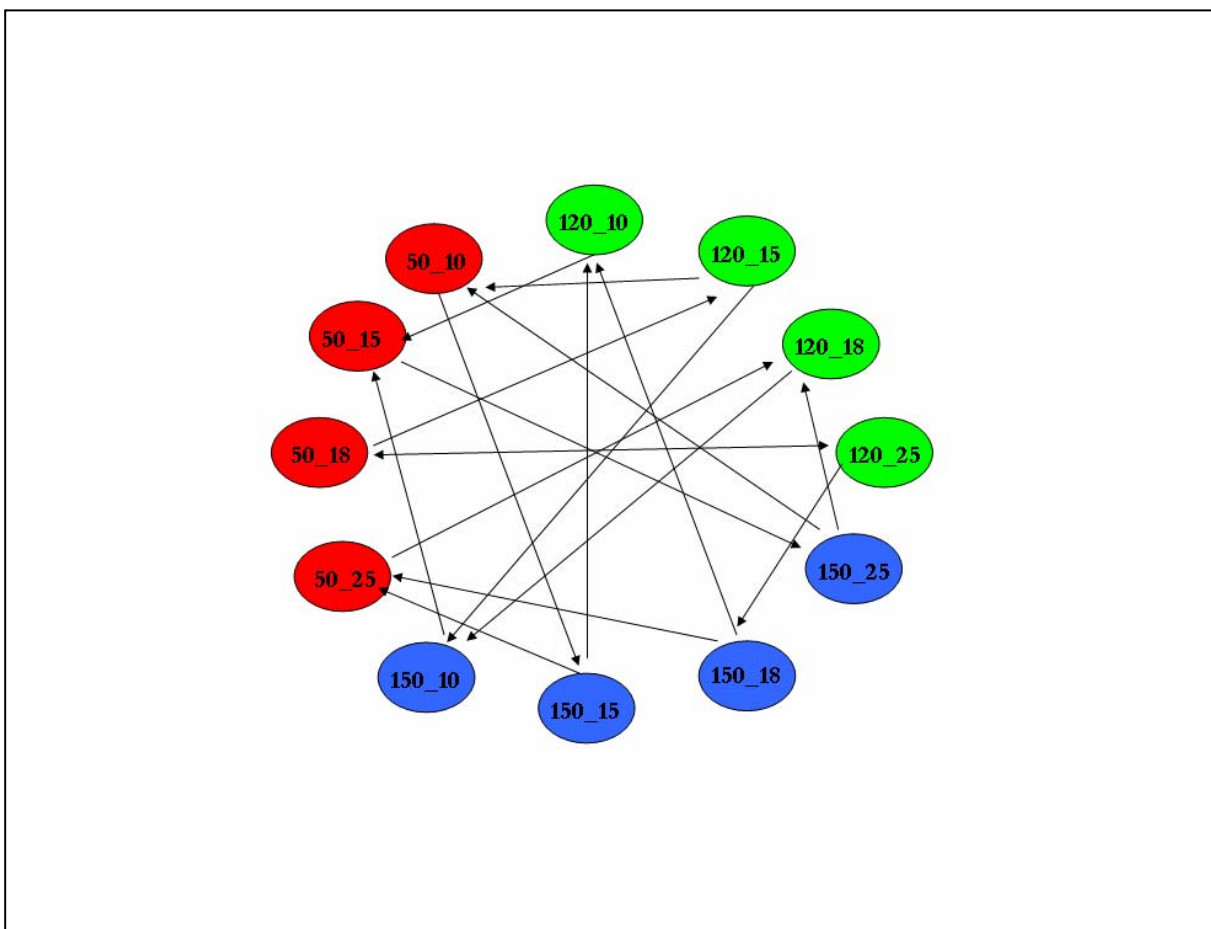
Clemson ID	Annotation
HVSMEi0001K04f	O-succinylbenzoate--CoA ligase (EC 6.2.1.26) (OSB-CoA synthetase)
HVSMEi0002A02f	Polygalacturonase precursor (EC 3.2.1.15) (PG) (Pectinase)
HVSMEi0002B08f	Protein translation factor SUI1 homolog (GOS2 protein)
HVSMEi0002E13f	Photosystem I reaction center subunit psaK, chloroplast precursor (Photosystem I subunit X)
HVSMEi0002F01f	EXTENSIN PRECURSOR (CELL WALL HYDROXYPROLINE-RICH Protein)
HVSMEi0002G22f	HEAT SHOCK PROTEIN HTPG (HIGH TEMPERATURE PROTEIN)
HVSMEi0002H01f	ALPHA-2-PUROTHIONIN PRECURSOR.
HVSMEi0002H17f	Phospholipase D alpha 1 precursor (EC 3.1.4.4) (PLD alpha 1) (Choline phosphatase 1)
HVSMEi0002I14f	L-ascorbate oxidase (EC 1.10.3.3) (Ascorbase) (ASO)
HVSMEi0002K12f	Cell division control protein 2 homolog 2 (EC 2.7.1.37)
HVSMEi0002L08f	Lactase-phlorizin hydrolase precursor (Lactase-glycosylceramidase) [Includes: Lactase (EC 3.2.1.108)
HVSMEi0002L12f	Glutathione-dependent formaldehyde dehydrogenase (EC 1.2.1.1) (FDH) (FALDH) (FLD)
HVSMEi0002M06f	Probable cation-transporting ATPase C1672.11c (EC 3.6.3.-)
HVSMEi0002O10f	UBIQUITIN CARBOXYL-TERMINAL HYDROLASE 12
HVSMEi0002P07f	GLUTENIN, HIGH MOLECULAR WEIGHT SUBUNIT PC256 (FRA
HVSMEi0003C02f	Gamma hordein1
HVSMEi0003K24f	Proliferation-associated protein 2G4 (Proliferation-associated protein 1) (Protein p38-2G4)
HVSMEi0003L16f	Poly [ADP-ribose] polymerase-2 (EC 2.4.2.30) (PARP-2) (NAD(+) ADP-ribosyltransferase-2)
HVSMEi0003O11f	Peroxidase 2 precursor (EC 1.11.1.7)
HVSMEi0004C08f	TUBULIN BETA-1 CHAIN (FRAGMENT).
HVSMEi0004C19f	GOS9 PROTEIN.
HVSMEi0004E12f	Dehydrin DHN4 (B18)
HVSMEi0004F20f	2,3-bisphosphoglycerate-independent phosphoglycerate mutase (EC 5.4.2.1) (Phosphoglyceromutase)
HVSMEi0004I04f	60S ribosomal protein L24
HVSMEi0004J22f	Beta-glucosidase A (EC 3.2.1.21) (Gentiobiase) (Beta-D-glucoside glucohydrolase)
HVSMEi0004K02f	Late embryogenesis abundant protein B19.1A (B19.1)
HVSMEi0004N20f	EC PROTEIN III (ZINC-METALLOTHIONEIN CLASS II).
HVSMEi0004O24f	Probable dimethyladenosine transferase (EC 2.1.1.-) (S-adenosylmethionine-6-N)
HVSMEi0005B03f	Em protein H2
HVSMEi0005D02f	CYPROSIN PRECURSOR (EC 3.4.23.-)
HVSMEi0005E15f	Pathogenesis-related homeodomain protein (PRHA)
HVSMEi0005H12f	12S SEED STORAGE GLOBULIN PRECURSOR.
HVSMEi0006A15f	B3-hordein (Fragment)
HVSMEi0006C02f	ADENOSYLHOMOCYSTEINASE (EC 3.3.1.1) (S-ADENOSYL-L-
HVSMEi0006E12f	ALPHA-AMYLASE A PRECURSOR (EC 3.2.1.1)
HVSMEi0006G05f	Oleosin 16 kDa
HVSMEi0006N22f	Hypothetical 40.4 kDa protein in PES4-HIS2 intergenic region
HVSMEi0006O15f	Globulin-1 S allele precursor (GLB1-S) (7S-like)
HVSMEi0008C08f	Protein synthesis inhibitor I (EC 3.2.2.22) (Ribosome-inactivating protein I)

HVSMEi0008D09f NADP-dependent malic enzyme (EC 1.1.1.40) (NADP-ME)
 HVSMEi0008F13f ABA-inducible protein PHV A1
 HVSMEi0009N11f PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTS
 HVSMEi0009P14f HYPOTHETICAL 141.5 KDA PROTEIN IN YPT53-RHO2 INTER
 HVSMEi0010G15f G-BOX BINDING FACTOR (GBF).
 HVSMEi0010I13f Late embryogenesis abundant protein B19.3 (LEA B19.3)
 HVSMEi0010L03f Aldose reductase (EC 1.1.1.21) (AR) (Aldehyde reductase)
 HVSMEi0010L19f SEX-DETERMINING REGION Y PROTEIN (TESTIS-DETERMINI
 HVSMEi0011D05f Hypothetical 41.5 kDa protein in YCF6-CHLB intergenic region (ORF349)
 HVSMEi0011D08f Gamma hordeothionin
 HVSMEi0011D09f Chloride channel protein CLC-c (AtCLC-c)
 HVSMEi0011E22f Leaf-specific thionin DB4 precursor
 HVSMEi0011F03f Low-temperature induced protein It101.1 (Blt101) (Blt101.1)
 HVSMEi0011I06f ACYL-[ACYL-CARRIER PROTEIN] DESATURASE PRECURSOR
 HVSMEi0012A04f Nucleotide-binding protein 1 (NBP 1)
 HVSMEi0012B01f NifU-like N-terminal domain containing protein, mitochondrial precursor (NifU-like protein) (Iron-sulfur cluster assembly enzyme)
 HVSMEi0012C18f DnaJ protein homolog 2
 HVSMEi0012C23f Carbon catabolite derepressing protein kinase (EC 2.7.1.-)
 HVSMEi0012D20f PHOSPHATIDYLINOSITOL 3-KINASE TOR2 (EC 2.7.1.137)
 HVSMEi0012G23f RIBULOSE-PHOSPHATE 3-EPIMERASE PRECURSOR (EC 5.1.3
 HVSMEi0012I04f Cyanogenic beta-glucosidase precursor (EC 3.2.1.21) (Linamarase) (Fragment)
 HVSMEi0012I13f Sucrose operon repressor (Scr operon regulatory protein)
 HVSMEi0012M03f Probable coatomer epsilon subunit (Epsilon-coat protein) (Epsilon-COP)
 HVSMEi0012N02f Small protein inhibitor of insect alpha-amylases 1 (SI alpha-1)
 HVSMEi0013D14f Allene oxide synthase, chloroplast precursor (EC 4.2.1.92) (Hydroperoxide dehydrase) (Cytochrome P450 74A)
 HVSMEi0013E22f Putative steroid binding protein 2 (AtMP2)
 HVSMEi0013K17f Glycogenin-2 (EC 2.4.1.186) (GN-2) (GN2)
 HVSMEi0014J21f Octapeptide
 HVSMEi0015E09f HANSENULA MRAKII KILLER TOXIN-RESISTANT PROTEIN 1
 HVSMEi0015K09f Delta 1-pyrroline-5-carboxylate synthetase (P5CS) [Includes: Glutamate 5-kinase (EC 2.7.2.11) (Gamma-glutamyl kinase)
 HVSMEi0016H16f C-HORDEIN (CLONE PC HOR1-3)
 HVSMEi0018G14f Protein arginine N-methyltransferase 4 (EC 2.1.1.-) (Heterogeneous nuclear ribonucleoprotein methyltransferase-like protein 4)
 HVSMEi0018I07f Subtilisin-chymotrypsin inhibitor-2A (CI-2A)
 HVSMEk0001G20f DNA-directed RNA polymerases I, II, and III 7.3 kDa polypeptide (EC 2.7.7.6) (ABC10-alpha)
 HVSMEk0002C02f Meiosis protein mei2
 HVSMEk0002C14f Putative transcription elongation factor S-II (TFIIS)
 HVSMEk0002D07f URIDYLATE KINASE (EC 2.7.4.-) (UK) (URIDINE MONOPH
 HVSMEk0002F05f Probable aquaporin TIP3.2 (Tonoplast intrinsic protein 3.2) (Beta-tonoplast intrinsic protein) (Beta-TIP)
 HVSMEk0002H20f Hypothetical oxidoreductase yhxC (EC 1.-.-) (ORFX)
 HVSMEk0003D11f Glutelin type-B 1 precursor
 HVSMEk0003E13f IAA-AMINO ACID HYDROLASE HOMOLOG 2 PRECURSOR.
 HVSMEk0003F08f Hypothetical WD-repeat protein alr3466
 HVSMEk0003I13f HYPOTHETICAL 50.8 KDA PROTEIN IN PHOH-CSGG INTERGE
 HVSMEk0003L16f 5-oxoprolinase (EC 3.5.2.9) (5-oxo-L-prolinase) (Pyroglutamase) (5-OPase)
 HVSMEk0003M21f Cell division control protein 1
 HVSMEk0003P19f Peroxisomal 2,4-dienoyl-CoA reductase (EC 1.3.1.34)
 HVSMEk0004J22f OUTER MITOCHONDRIAL MEMBRANE PROTEIN PORIN (VOLTAG
 HVSMEk0004N18f Oleosin 16 kDa
 HVSMEk0005A03f Protein transport protein SEC61 gamma subunit
 HVSMEk0005D22f RIBONUCLEASE 1 PRECURSOR (EC 3.1.27.1).
 HVSMEk0006B21f Chorismate mutase, chloroplast precursor (EC 5.4.99.5) (CM-1)
 HVSMEk0006H09f Vacuolar ATP synthase subunit B isoform 2 (EC 3.6.3.14) (V-ATPase B subunit 2) (Vacuolar proton pump B subunit 2)

HVSMEk0006N03f Actin 7 (Actin 2)
 HVSMEk0007I23f Glucose-1-phosphate adenyltransferase large subunit 1, chloroplast precursor (EC 2.7.7.27) (ADP-glucose synthase) (ADP-g
 HVSMEk0007J15f 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE 2 (EC
 HVSMEk0007K21f Actin 1
 HVSMEk0007M10f Putative casein kinase II beta-4 subunit (CK II beta-4)
 HVSMEk0007M21f Probable prephenate dehydratase (EC 4.2.1.51) (PDT)
 HVSMEk0008P11f D-3-PHOSPHOGLYCERATE DEHYDROGENASE PRECURSOR (EC 1
 HVSMEk0009B04f Corticosteroid 11-beta-dehydrogenase, isozyme 2 (EC 1.1.1.-)
 HVSMEk0009F11f Vacuolar processing enzyme precursor (EC 3.4.22.-) (VPE)
 HVSMEk0009F15f 26 kDa endochitinase 1 precursor (EC 3.2.1.14)
 HVSMEk0009J23f Importin alpha-1b subunit
 HVSMEk0009N12f Hypothetical 24.5 kDa protein in SAP185-BCK1 intergenic region
 HVSMEk0009P12f Vacuolar ATP synthase catalytic subunit A (EC 3.6.3.14) (V-ATPase A subunit) (Vacuolar proton pump alpha subunit) (V-ATPase
 HVSMEk000LUC0f Luciferase
 HVSMEk0011G05f Glutenin, high molecular weight subunit DY10 precursor
 HVSMEk0011L06f ACTIN 85C (FRAGMENT).
 HVSMEk0012B23f EXOSTOSIN-2 (PUTATIVE TUMOR SUPPRESSOR PROTEIN EXT
 HVSMEk0012G03f Putative cell division control protein 48 homolog D (AtCDC48d) (Transitional endoplasmic reticulum ATPase D)
 HVSMEk0012J09f Ras-related protein Rab-2-B
 HVSMEk0013A08f Prohibitin 2
 HVSMEk0014L02f Hypothetical 51.6 kDa protein in RPL24B-RSR1 intergenic region
 HVSMEk0014L14f Protein translation factor SUI1 homolog (GOS2 protein)
 HVSMEk0015E21f Asparagine synthetase [glutamine-hydrolyzing] (EC 6.3.5.4) (Glutamine-dependent asparagine synthetase)
 HVSMEk0015F23f Glutelin type-B 1 precursor
 HVSMEk0015N24f Probable peroxiredoxin (EC 1.11.1.15) (Thioredoxin peroxidase) (Rehydrin homolog) (B15C)
 HVSMEk0016J05f Ribosome-binding protein 1 (180 kDa ribosome receptor) (RRp)
 HVSMEk0016L03f Tartrate-resistant acid phosphatase type 5 precursor (EC 3.1.3.2) (TR-AP) (Tartrate-resistant acid ATPase) (TrATPase) (Acid p
 HVSMEk0017D10f Glutelin type-B 1 precursor
 HVSMEk0017E13f Preprotein translocase secY subunit
 HVSMEk0017M13f Ribonucleoside-diphosphate reductase large subunit (EC 1.17.4.1) (Ribonucleoside-diphosphate reductase R1 subunit) (AtRNP
 HVSMEk0017M20f Putative low-molecular-weight cysteine-rich protein LCR68 precursor
 HVSMEk0017N17f Probable phospholipid hydroperoxide glutathione peroxidase, mitochondrial precursor (EC 1.11.1.12) (PHGPx) (AtGPX1)
 HVSMEk0018I21f Nonspecific lipid-transfer protein 4 precursor (LTP 4) (Fragment)
 HVSMEk0019C20f Globulin-1 S allele precursor (GLB1-S) (7S-like)
 HVSMEk0019E19f Vicilin GC72-A precursor (Alpha-globulin A)
 HVSMEk0019M23f Transcription initiation factor IIA gamma chain (TFIIA-gamma)
 HVSMEk0020B17f HYPOTHETICAL 39.4 KDA PROTEIN IN MET1-SIS2 INTERGE
 HVSMEk0020H10f TRANSMEMBRANE PROTEIN PFT27.
 HVSMEk0022H13f Beta-glucosidase A (EC 3.2.1.21) (Gentiobiase) (Cellobiase) (Beta-D-glucoside glucohydrolase)
 HVSMEk0022K16f Pyruvate kinase A - chloroplastic
 HVSMEk0022L08f TGF beta-inducible nuclear protein 1 (L-name related LNR42)
 HVSMEk0022M13f ACETYL-COA ACETYLTRANSFERASE (EC 2.3.1.9) (ACETOAC
 HVSMEk0022N22f Diaminopimelate decarboxylase (EC 4.1.1.20) (DAP decarboxylase)
 HVSMEk0022O15f Globulin-1 S allele precursor (GLB1-S) (7S-like)
 HVSMEk0022P18f 2,3-bisphosphoglycerate-independent phosphoglycerate mutase (EC 5.4.2.1) (Phosphoglyceromutase) (BPG-independent PGA
 HVSMEk0023I16f Acyl-protein thioesterase 2 (EC 3.1.2.-) (Lysophospholipase II) (LPL-I)
 HVSMEk0024C24f 12S seed storage globulin precursor
 HVSMEk0024E17f Pre-mRNA processing splicing factor 8 (Splicing factor Prp8)
 HVSMEk0024K22f GLUTAMIC ACID-RICH PROTEIN PRECURSOR.
 HVSMEk0024P19f EBNA-1 NUCLEAR PROTEIN.

Supplementary Figure S1. An interwoven loop experimental design was used to assess the impact of applied nitrogen regimes on gene expression, during barley grain development, (Altman and Hua, 2006).

Annotation; The coloured circles represent the nitrogen regime (kg N/ha) Red=50 kg N/ha, Green=120 50 kg N/ha, Blue=150 50 kg N/ha. The first number in the circle corresponds to the nitrogen treatment and the second to the days after pollination (DAP). The RNA was prepared from three independent biological samples in total 36 independent RNA samples were hybridised. Within the interwoven loop figure the arrows indicate the specific pairwise combinations used for each hybridisation. The RNA sample at the head of the arrow was labelled with Cy5, while the RNA sample at the tail of the arrow was labelled with Cy3.



Supplementary Figure 2. Cluster analysis. The expression profile of the 1200 most significantly regulated probes (501 genes) representing an early-, mid- and late phase of the field-grown barley grain. The relative expression is depicted by the Z-score (obtained for each measurement by subtracting from it the mean intensity for the given probe and dividing the result with the corresponding standard deviation) separated by the sampling time points. The red line indicated the average gene expression during development.

