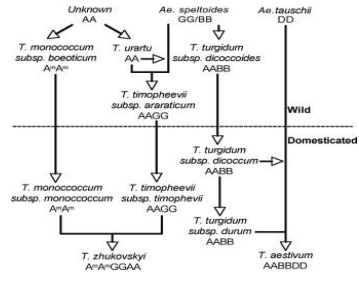


High-Resolution Study of Wheat Transcriptsomes in Response to Drought and Salinity & Ontologies

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 IWGSC Standards and Protocols Workshop
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About wheat genomes

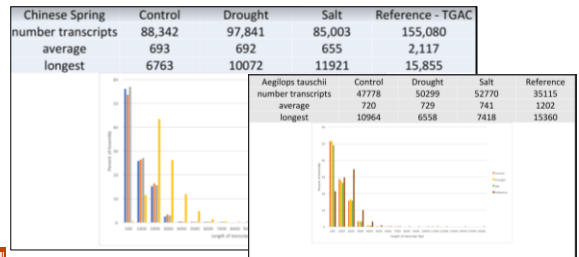


Wheat lines being analyzed for their transcriptome sequencing, performance and genetic variation

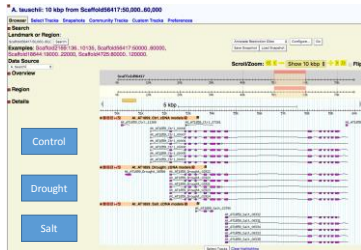
Plant ID	Species	Genome_type	Control (unpaired-Replicate)			Salt 11200M NaCl for 28hrs treated -Replicate			Drought 15-day treatment -Replicate			
			01	02	03	01	02	03	01	02	03	
P12622V	Aegilops speltoides	BB	0	1	1	1	1	1	1	0	1	1
P12622V			1	1	1	1	1	1	1	0	1	1
P12649B			1	1	0	1	0	1	0	0	0	0
P12649B			0	1	1	1	1	1	1	0	0	0
P12607A			1	1	1	1	1	1	1	0	0	0
P12637B	Aegilops tauschii	DD	0	1	1	1	0	1	0	1	0	
P12637B			0	1	1	1	1	1	0	0	0	
P12284T			1	1	1	1	1	1	1	0	0	0
P12284T			0	1	1	1	1	1	1	0	0	0
P12284T			0	1	1	1	1	1	1	0	0	0
P12649Z	Triticum monococcum	AA	0	1	1	0	1	0	1	0	1	0
P12649Z			1	1	1	1	1	1	1	1	1	1
P12649Z			1	1	0	0	1	0	1	0	1	0
P12649Z			1	1	1	1	1	1	1	1	1	1
P12649Z			1	1	1	1	1	1	1	1	1	1
P12631B	Triticum aestivum	AABBDD	1	1	1	1	1	1	1	1	1	1
P12631B			1	1	1	1	1	1	1	1	1	1
P12631B			1	1	1	1	1	1	1	1	1	1
P12631B			1	1	1	1	1	1	1	1	1	1
P12631B			1	1	1	1	1	1	1	1	1	1

The mRNA from 89-samples (colored cells) from 11 wheat lines marked with *, were processed for 150bp paired-end RNA-Seq sequencing on illumina Hi-Seq 3000. Wheat plants were grown in the OSU green houses under normal 12h-day/12h-night photoperiod cycle at 28C temperature. When the plants reached booting stage, the treatments were given and only the topmost leaf was harvested for isolating the mRNA. The plants continued to complete their lifecycle under normal conditions after the treatment and were observed for yield traits like average grain number and weight, after undergoing stress shock during their reproductive phase. Ideally stress during reproductive phase would negatively impact the yield.

Treatment-Specific De-novo Transcript Assemblies



An Example of Differentially Spliced Transcript Isoforms Under Different Treatments

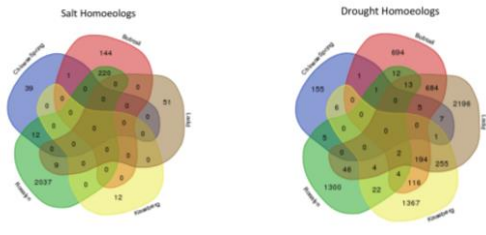


Number of Homeologous Genes Expressed Under Salt and Drought Conditions

	Drought	Salt
Chinese Spring	181	52
Bobtail	1726	365
Ladd	3407	60
Kaseberg	1971	12
Rosalyn	1410	2278

Total number of homeologs in Gramene Database: 86,523

Common & Treatment-Specific Homeologues in Hexaploid Accessions



SNP Identification and Their Consequences

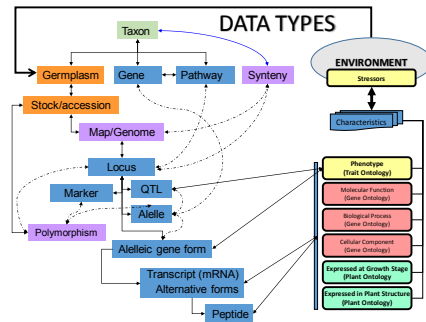
consequence type	ChineseSpring	Bobtail	Ladd	Kaseberg	Rosalyn
3_prime_UTR_variant	4728	39291	45503	40772	47157
5_prime_UTR_variant	2601	10161	12178	11304	12168
coding_sequence_variant	418	308	295	304	432
downstream_gene_variant	15781	66091	76527	69227	83927
frameshift_variant	112	367	588	566	546
inframe_deletion	48	277	356	351	398
inframe_insertion	2	103	110	111	114
intergenic_variant	6215	27405	33849	30448	32990
intron_variant	16615	57402	71401	67901	79908
missense_variant	7695	44072	52417	47804	53757
protein_altering_variant	0	15	15	19	12
splice_acceptor_variant	3093	2705	2935	3057	3230
splice_donor_variant	5729	5024	4784	5088	5349
start_lost	15	31	47	46	43
stop_gained	99	431	508	472	526
stop_lost	43	163	167	174	189
stop_retained_variant	11	66	75	76	96
synonymous_variant	9883	54876	64175	59899	66426
upstream_gene_variant	10059	43881	51773	46248	53802



Planteome

www.planteome.org

Ontologies for Wheat



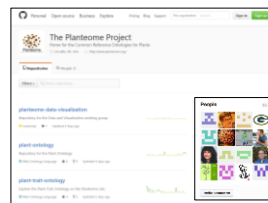
Planteome: Reference Ontologies for Plants

Environment Ontology (ENVO)					
Plant Environmental Conditions (EO)					
GRANULARITY	Plant Taxonomy	NCBI Taxonomy	Plant Stress Ontology (PSO)	Phenotypic Quality (PATO)	Biological Process (GO)
	Anatomy	Plant Anatomical Entity Plant Ontology (PO)		Plant Trait Ontology (TO)	Plant Structure Development Stage (PO)
	Cell	Plant Cell (PO) Cell (CL)			
	Cellular Component	Cellular Component (GO)		Molecular Function (GO)	Molecular Process (GO)
	Molecule	Molecular Entity (ChEBI, PR)			

Key:
 Yellow: Ongoing Planteome development; Blue: Collaborator ontologies with plant enrichment
 Pink: New ontology to be developed



Planteome Ontologies Maintained on the GitHub

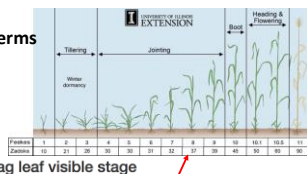


Ontologies are maintained at GitHub for sharing and tracking revisions

Community feedback- make comments, request terms, and suggest changes

<https://github.com/Planteome>

Integration of Species-Specific Terms (e.g. Wheat Growth Stages)

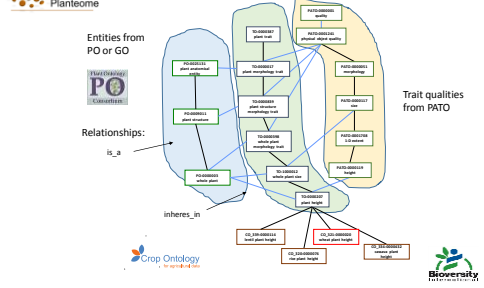


SE.97 flag leaf visible stage

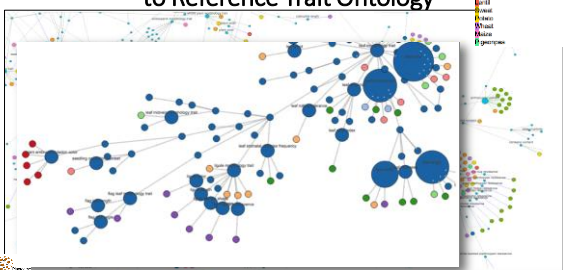
Term Information

Accession: PO:001090
 Name: SE.97 flag leaf visible stage
 Ontology: plant_anatomy,development,stage
 Synonym: 04 flag leaf visible in anthesis, 4.08 flag leaf just visible in barley, 4.08 flag leaf just visible in oat, 4.08 flag leaf just visible in wheat, Zadoks scale 37, Feekes scale 8
 Alternative IDs: None
 Definition: The stage at which the flag leaf is visible. Source: [GRAnurath, Pajer](#)
 Comment: A measure of vegetative growth, but leaf production is to be preferred.
 Related: [is_a](#) to all annotated objects annotated to SE.97 flag leaf visible stage.
[is_a](#) to all direct and indirect annotations to SE.97 flag leaf visible stage.
[is_a](#) to all direct and indirect annotations download (linked to W11 10.000) for SE.97 flag leaf visible stage.
 Feedback: Contact the [Plantome](#) listserve if you find mistakes or have concerns about the data you find here.
 Comments, changes to terms, or requests for new ontology terms can be made at [PO](#) issue tracker on [GitHub](#).

Integration of Species-Specific Terms (e.g. Trait)



Mapping of Species-specific Traits to Reference Trait Ontology



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Plantome Partners

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<p>Lawrence Berkeley National Lab Christopher Mungall, Seth Carbon</p>	<p>Collaborator Labs & Projects Users and resource databases who have adopted the Plantome Ontologies and contributed data: CVGenes, Gene Ontology Consortium, Protégé, ORO, FounDri, Gramene, Ensembl Plants, USDA-GRIN, Rice Diversity Project, SolGenomics N, MaizeGDB, Rex Nelson, SoyBase, TARS, Steve Cannon, LegumeGDB And many others!</p>
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<p>University of Birmingham, UK Georgios Giannoutsos</p>	
<p>Aberystwyth University, UK John Doonan,</p>	
<p>UC Santa Barbara BS Manjareth (Binaque), Dmitry Fedorov, Vladimir Kozlovskiy</p>	

Wheat Transcriptome Work

OSU
 Matthew Geniza
 Terry Nipp
 John Talbott
 Chris Daly