Cereal Genomics Workshop
9/12/05 – 9/19/05
Cold Spring Harbor Lab

Answers for Gramene Exercise 1 – Ontologies
9/15/05

1. Imagine you are a plant breeder interested in working with drought tolerance. What term will you search for?

1. Be careful not to limit your terminology too early in your research, so start out doing a general search on “drought.”

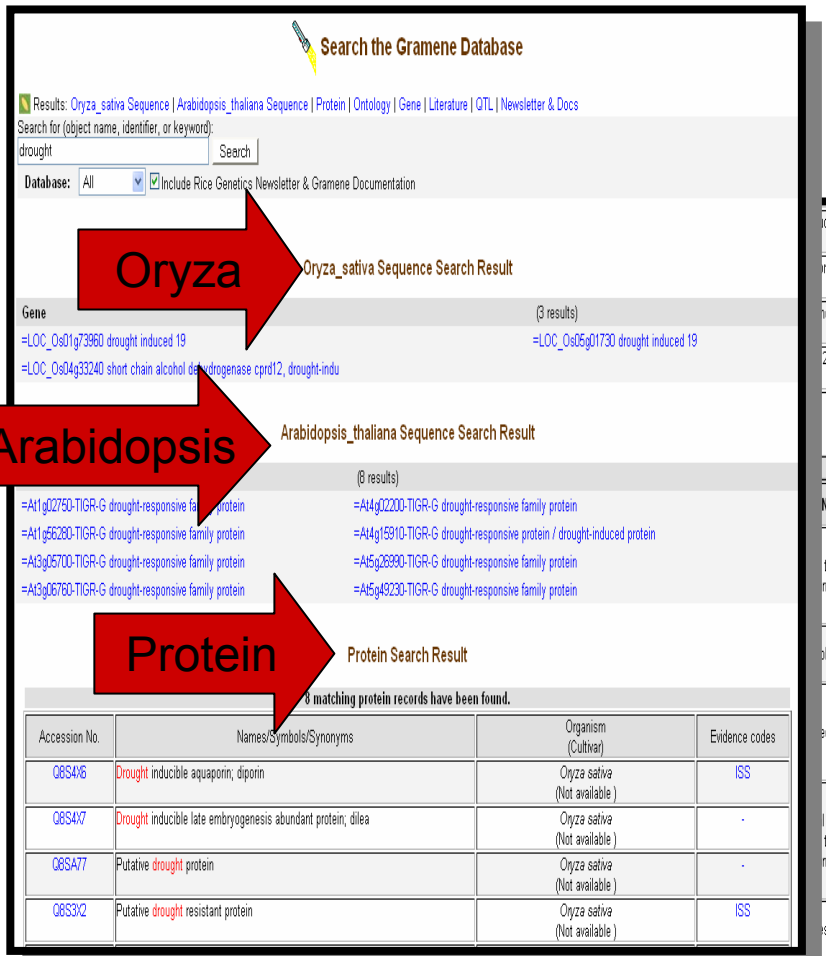
General Gramene:
Do a general search for “drought” from the top of the Gramene home page.

2a- What types of information in Gramene are associated with “drought”?

2b – Why is this general search important?

2a - Answer: Genome info from Oryza and Arabidopsis, Protein info, Ontology info, Gene info, Literature info, QTL info and Information from Rice Genetics Newsletter.

2b – It gives a good general background on drought information, and reviewing the literature and RGN are good places to get educated on drought traits to search for, and provides internal information and outside resources



QTL Search Result

25 of 45. Page 1 of 2.

[Download Data]

Species Name	Trait Name	Trait Synonyms	Linkage Group	Trait Category	Trait Symbol	Published Symbol
Maize	Drought sensitivity index	DSI	6	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	10	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	2	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	6	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	4	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	10	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	7	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	3	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	4	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	1	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	7	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	7	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	4	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	9	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	2	Abiotic stress	DRSN	NA
Maize	Drought sensitivity index	DSI	2	Abiotic stress	DRSN	NA
Rice	Drought susceptibility index	NA	4	Abiotic stress	DRSD	qDRS4-1
Rice	Drought susceptibility index	NA	4	Abiotic stress	DRSD	qDRS4-1
Rice	Drought susceptibility index	NA	12	Abiotic stress	DRSD	qDRS12-1
Rice	Drought susceptibility index	NA	12	Abiotic stress	DRSD	qDRS12-1
Pearl millet	Drought tolerance	Drought resistance	2	Abiotic stress	DRTL	Drought resistance
Pearl millet	Drought tolerance	Drought resistance	2	Abiotic stress	DRTL	Drought resistance
Rice	Drought tolerance	Drought resistance	3	Abiotic stress	DRTL	NA

Rice Genetics Newsletter & Documentation Sea

66 matches in Rice Genetic Newsletter & Documents

Score Document

1000
28. Genetics of leaf rolling under vegetative stage drought stress

Genetics of leaf rolling under vegetative stage drought stress...Leaf rolling is one of the drought avoidance mecha... drought... G. C. Loresto, 1986. Screening techniques for drought...breeding for drought resistance. Phil. Jour. Sc... reaction...OToole, J. C., 1982. Adaptation of rice to drought prone environments. p...

849
Report of the Committee on Genetic Engineering

Salt stress and drought stress are the two most important...

810
trait definition

term: drought recovery...

7	TO:0000155	Trait	drought susceptibility index	drought sensitivity index, DRSD, DRSSID, DSI.	The index is calculated as, DSI = (1-Yds/Yns), where Yds and Yns are mean yields of a given genotype in drought susceptible (DS) and non-susceptible (NS) environments respectively.
8	TO:0000198	Trait	drought sensitivity	drought susceptibility, DRS, DRSN.	Drought sensitivity is highly interactive with crop phenology, plant growth prior to stress, and timing, duration, and intensity of drought stress. For many soils, it takes at least 2 rainless weeks to cause marked differences in drought sensitivity during the vegetative stage and at least 7 rainless days during the reproductive stage to cause severe drought injury. Leaf rolling precedes leaf drying during drought. Repeated ratings are recommended through progress of the drought.
9	TO:0000276	Trait	drought tolerance	drought resistance, DRTL.	Becoming tolerant to drought like conditions of minimal or no water content in environment or high salt stress due to flash flooding in coastal areas
10	TO:0000394	Trait	drought related trait	dessication related trait.	No Definition Available
11	TO:0000458	Trait	drought recovery	DRR.	Scores are taken after 10 days following soaking rain or watering- Indicate the degree of stress before recovery.
12	TO:0000503	Trait	leaf rolling time	LFRLTM.	Measure time taken by the leaf to roll completely under drought or water stress.
13	GRO:0007022	Growth Stage	5.02-silking	maize growth stage-5.2, R1, silk emergence.	Silks (styles) emerge from the husks at the ear tip. Normally the first silks appear slightly after anthesis begins, but this interval can be delayed by drought or other stresses. Silks of spikelets at the base of the ear emerge prior to those from more ... spikelets

Gene Search Result for drought

Candidate Rice Gene (1 term found)

Gene Name	Gene symbol	Synonym	Phenotypic Description	Gramene ID
leaf unrolling under drought stress	lr		under curation	GR:0060512

Literature Search Result

Items 1-20 of 96 Page 1 of 5 1 2 3 4 5

1. Lee-S-C, Lee-M-Y, Kim-S-J, Jun-S-H, An-G, Kim-S-R
Characterization of an Abiotic Stress-inducible Dehydrin Gene, OsDhn1, in Rice (Oryza sativa L.) (More info)
Molecules and cells, 2005, vol.19, pp212-218

2. Li-Z, Mu-P, Li-C, Zhang-H, Gao-Y, Wang-X
QTL mapping of root traits in a doubled haploid population from a cross between upland and lowland japonica rice in three environments (More info)
Theor Appl Genet, 2005, vol.110, pp1244-1252

3. Quarrie-S-A, Steed-A, Calestani-C, Semikhodskii-A, Lebreton-C, Chinoy-C, Steele-N, Pljevljakusic-D, Waterman-E, Weyen-J, Schondelmaier-J, Habash-D-Z, Farmer-P, Saker-L, Clarkson-D-T, Abugalieva-A, Yessimbekova-M, Turuspekov-Y, Abugalieva-S, Tuberosa-R, Sanguineti-M-C, Hollington-P-A, Aragues-R, Royo-A, Dodig-D
A high-density genetic map of hexaploid wheat (Triticum aestivum L.) from the cross Chinese Spring x SQ1 and its use to compare QTLs for grain yield across a range of environments (More info)
Theor Appl Genet, 2005, vol.110, pp865-880

4. Wang-Y-S, Zhu-J, Mansueto-L, Bruskiewich-R
Identification of candidate genes for drought stress tolerance in rice by the integration of a genetic (QTL) map with the rice genome physical map (More info)
J Zhejiang Univ Sci B, 2005, vol.6, pp382-388

5. Abbasi-F-M, Komatsu-S
A proteomic approach to analyze salt-responsive proteins in rice leaf sheath (More info)
Proteomics, 2004, vol.4, pp2072-2081

3a - How many standard vocabulary (ontology) terms are associated with “drought” in the database?
3b - What ontologies are they associated with?
3c - How many contain drought in the term name?
3d - Why did some terms show up but did not contain drought in the term name, and what does this mean for you?

3a - There are 13 results for “drought” in the ontology search.
3b – These are associated with Gene Ontology (GO), Trait Ontology (TO) and Cereal Plant Growth Stages Ontology (GRO)
3c –7 term names contain the word “drought”
3d - Terms other than those with “drought” in the name are associated with drought, and it’s important to explor other terms possibly associated with drought, such as leaf rolling.

3c

3a

Summary for *drought*

Items 1 to 13 of 13

#	Term Accession	t	Term Name	Synonym	Definition
1	GO:0009414	Biological Process	response to water deprivation	response to dehydration, response to drought, response to thirst.	A change in state or activity of an organism (in terms of movement, secretion, gene expression, enzyme production, etc.) as a result of prolonged deprivation of water.
2	GO:0009633	Biological Process	drought tolerance	None	OBSOLETE (was not defined before being made obsolete).
3	GO:0009819	Biological Process	drought recovery	None	A change in state or activity of an organism (in terms of movement, secretion, gene expression, enzyme production, etc.) as a result of prolonged deprivation of water that restores that organism to a normal (non-stressed) condition.
4	GO:0042630	Biological Process	behavioral response to water deprivation	havioral response to drought, behavioral response to thirst, behavioural response to water deprivation.	A change in the behavior of an organism as a result of a deprivation of water.
5	GO:0042631	Biological ess	cellular response to water deprivation	r response to drought.	A change in the state or activity of a cell (in terms of enzyme production, gene expression, etc.) as a result of a prolonged deprivation of water.
6	TO:0000185	Trait	leaf rolling	LFRL	Leaf rolling is a feature observed in response to drought or water stress. It precedes leaf drying stage.
7	TO:0000155	Trait	drought susceptibility index	drought sensitivity index, DRSID, DRSSID, DSI.	The index is calculated as, DSI = (1-Yds/Yns), where Yds and Yns are mean yields of a given genotype in drought susceptible (DS) and non-susceptible (NS) environments respectively.
8	TO:0000188	Trait	drought sensitivity	drought susceptibility, DRS, DRSN.	Drought sensitivity is highly interactive with crop phenology, plant growth prior to stress, and timing, duration, and intensity of drought stress. For many soils, it takes at least 2 rainless weeks to cause marked differences in drought sensitivity during the vegetative stage and at least 7 rainless days during the reproductive stage to cause severe drought injury. Leaf rolling precedes leaf drying during drought. Repeated ratings are recommended through progress of the drought.
9	TO:0000276	Trait	drought tolerance	drought resistance, DRTL.	Becoming tolerant to drought like conditions of minimal or no water content in environment or high salt stress due to flash flooding in coastal areas
10	TO:0000394	Trait	drought related trait	dessication related trait.	No Definition Available
11	TO:0000458	Trait	drought recovery	DRR	Scores are taken after 10 days following soaking rain or watering- Indicate the degree of stress before recovery,
12	TO:0000	rait	leaf rolling time	LFRLTM	Measure time taken by the leaf to roll completely under drought or water stress.
13	GRO:0007022	Growth Stage	5.02-silking	maize growth stage-5.2, R1, silk emergence.	Silks (styles) emerge from the husks at the ear tip. Normally the first silks appear slightly after anthesis begins, but this interval can be delayed by drought or other stresses. Silks of spikelets at the base of the ear emerge prior to those from more apical spikelets

3b

3d

4a - How many ontology terms are there for “drought tolerance”?
4b - Why is there more than one?
4c - What are some synonyms for “drought tolerance”?

4a - There are two terms for drought tolerance
4b – They are in different ontologies - One is in GO, one is in TO
4c - Synonyms are drought resistance and DRTL.

#	Term Accession	Aspect	Term Name	Synonym	
1	GO:0009414	Biological Process	response to water deprivation	response to dehydration, response to drought, response to thirst.	A et
2	GO:0009633	Biological Process	drought tolerance	None	O
3	GO:0009819	Biological Process	drought recovery	None	A et
4	GO:0042630	Biological Process	behavioral response to water deprivation	behavioral response to drought, behavioral response to thirst, behavioural response to water deprivation.	A
5	GO:0042631	Biological Process	cellular response to water deprivation	cellular response to drought.	A pr
6	TO:0000085	Trait	leaf rolling	LFRL.	Le
7	TO:0000155	Trait	drought susceptibility index	drought sensitivity index, DRSID, DRSSID, DSI.	Th su
8	TO:0000188	Trait	drought sensitivity	drought susceptibility, DRS, DRSN.	D in se dr th
9	TO:0000276		drought tolerance	drought resistance, DRTL.	B fla
10	TO:0000394	Trait	drought related trait	dessication related trait.	N

Either

1) review previous results for ‘drought tolerance’ (there were two)

or

2) search for “drought tolerance” directly in ontologies

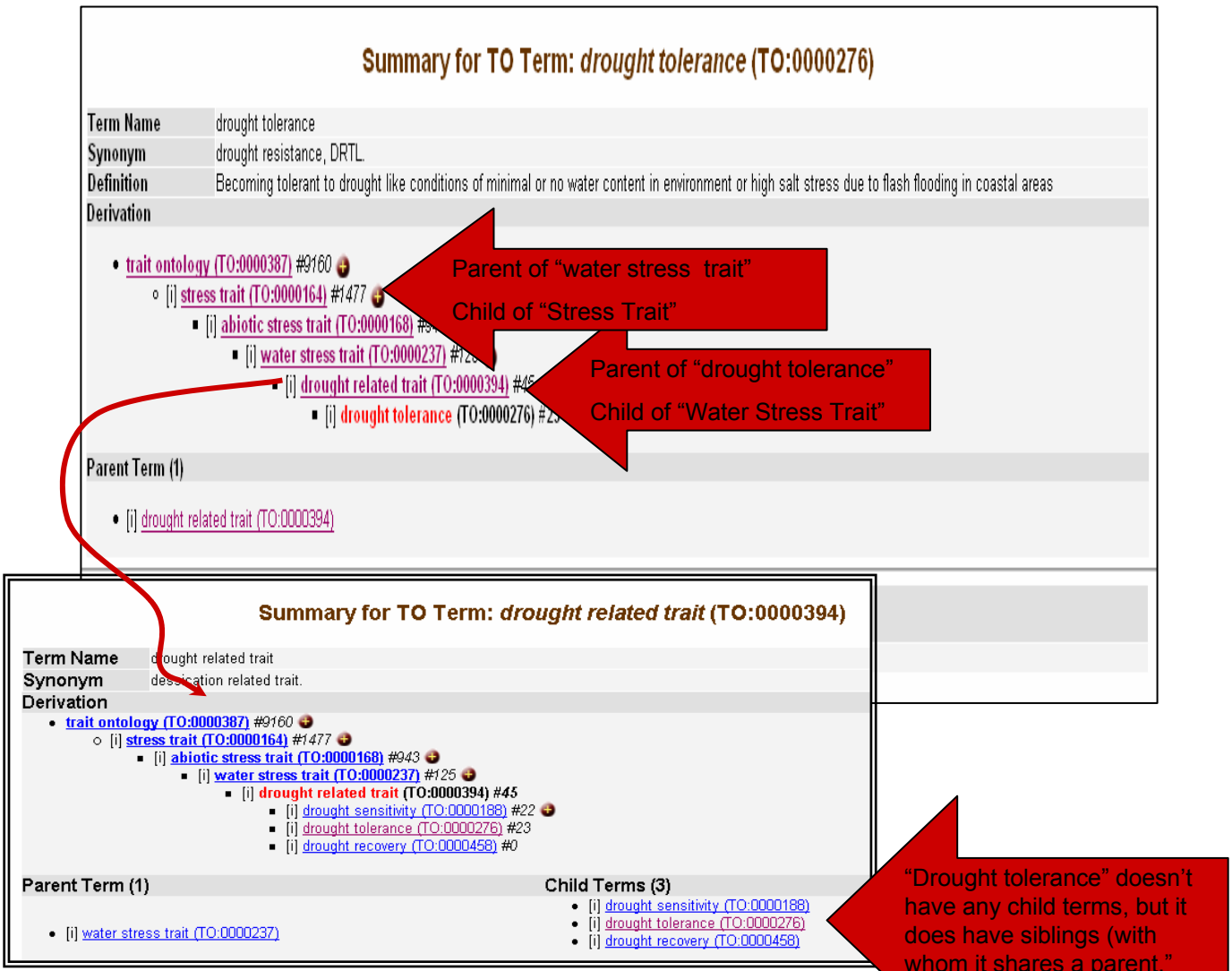
Summary for *drought tolerance*

Items 1 to 2 of 2

#	Term Accession	Aspect	Term Name	Synonym	Definition
1	GO:0009633	Biological Process	drought tolerance	None	OBSOLETE (was not defined before being made obsolete).
2	TO:0000276	Trait	drought tolerance	drought resistance, DRTL.	Becoming tolerant to drought like conditions of minimal or no water content in environment or high salt stress due to flash flooding in coastal areas

Click on the TO Accession ID's for drought tolerance.
5a - What do you find?
5b - What is a parent term?
5c - What is a child term?
5d - What are sibling terms?
5e - Why do you think we point this out to you?

5a – you find the ontology tree
5b Parent terms are the root term, located hierarchically above a term. Stress trait is the parent of abiotic stress trait.
5c A child term is derived from a parent term, and is located hierarchically below it. Drought tolerance is a child of drought related trait.
5d – Siblings of drought tolerance are drought sensitivity and drought recovery.
5e - This options provide suggestions for other search terms for your research queries.

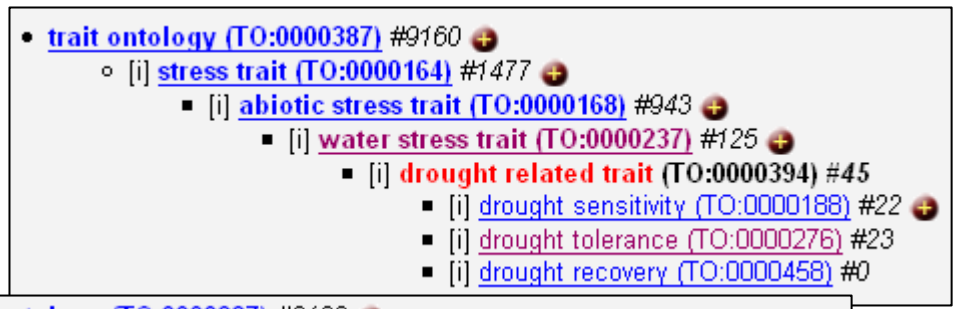


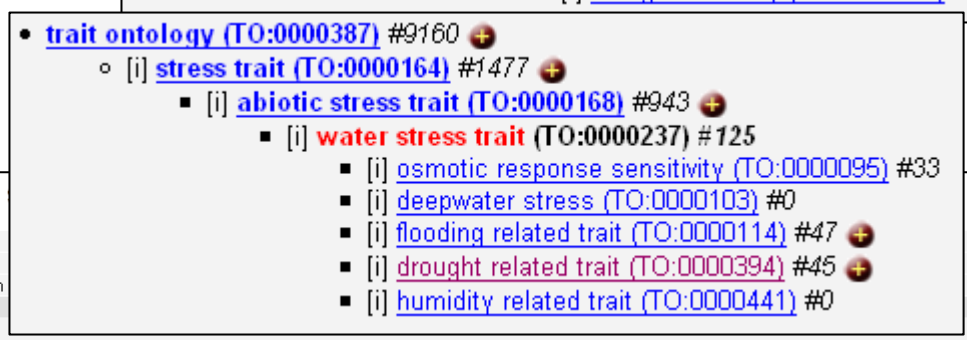
6. What sibling or parent terms for **drought tolerance** may also give information on drought?

6. Siblings of ‘drought tolerance” are “drought sensitivity” and “drought recovery.” Will these be pertinent to your area of interest?

The parent of “drought tolerance” is “water stress trait”, which has other child terms that may or may not be related to your interest.

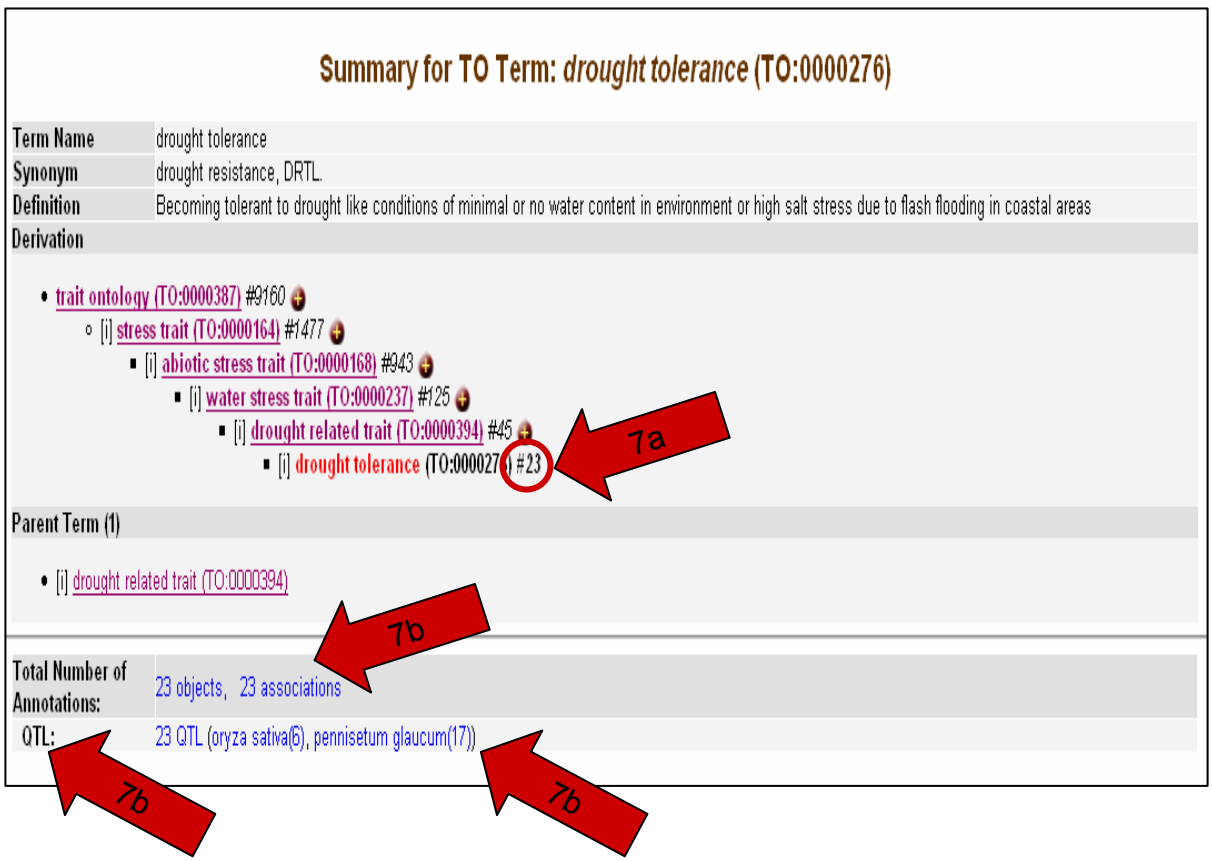
In the case of Trait Ontology, you would probably want to go as far back as “abiotic stress trait.” Other terms may be related to drought, such as root penetration, leaf rolling, etc. Drought affects many traits, and the term “drought” may not be in all of their definitions. Therefore, it is important to not limit yourself too early in your research unless you have already researched “drought” in the general literature and have several known traits to research. Ontologies are used for classification purposes, but browsing the ontologies for pertinent related information will likely yield stronger results than a single search for a single term. As ontologies become more commonly used, these terms will be more familiar to researchers.





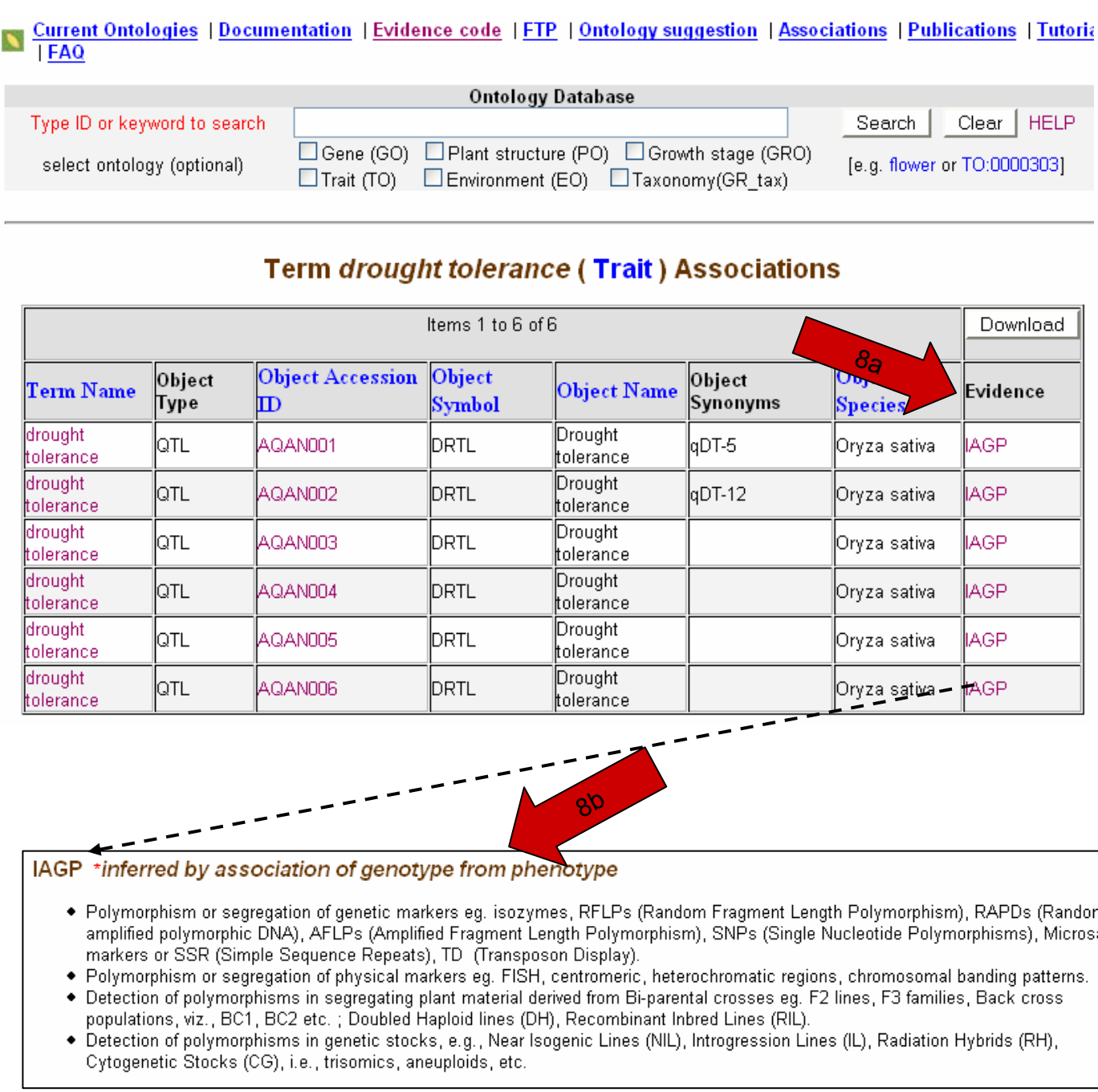
7a - How many associations are there for the term accession for “drought tolerance” in trait ontology (TO)?
7b - If any, what type are they and what species are they associated with.

7a – There are 23 association for this term.
7b – They are QTL associations, 6 of which are associated with oryza sativa, and 17 associated with pennisetum glaucum



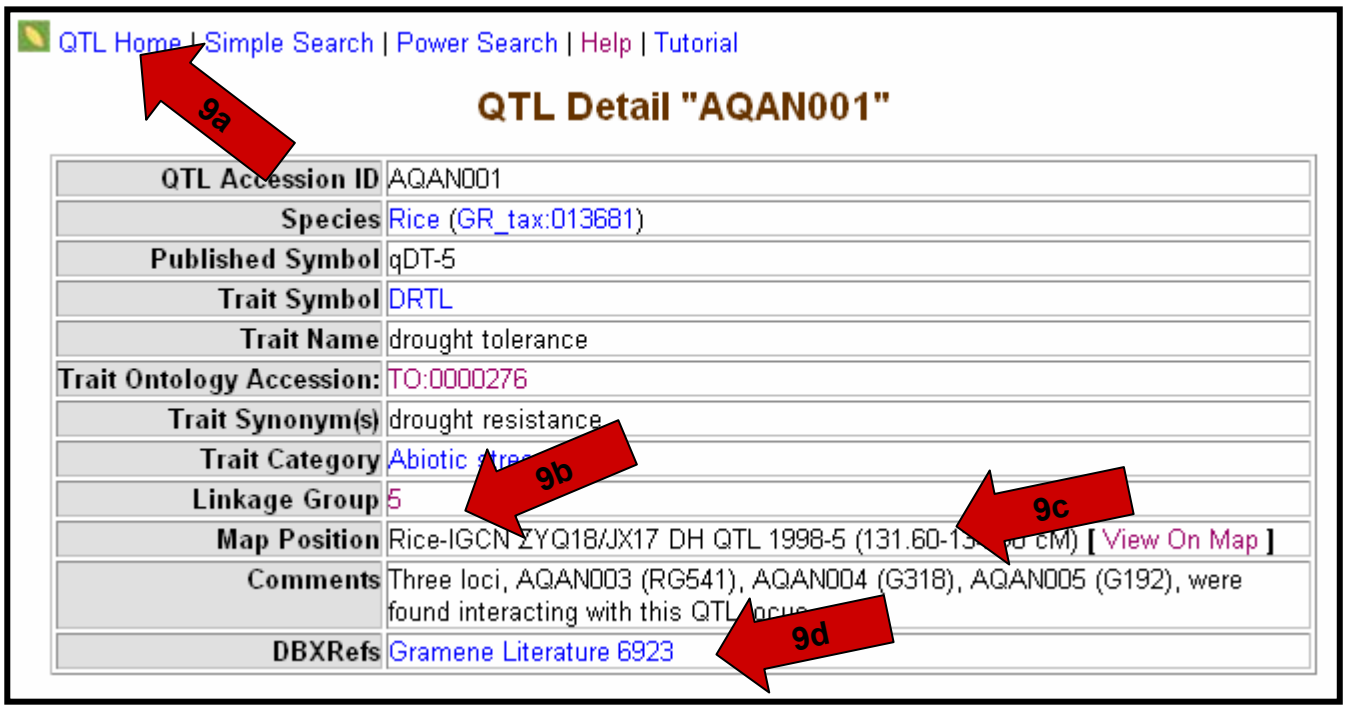
8a – What are the Accession ID's for the QTL associated with Oryza Sativa?
8b - What is the evidence code associated with them?
8c - What does the evidence code mean?

8a – AQAN001, AQAN002, AQAN003, AQAN004, AQAN005, AQAN006
8b –IAGP
8c – Click on IAGP to find "inferred by association of genotype from phenotype"



9a - If you click on a rice QTL Accession ID from this page, what module do you go to?
9b - Can you identify the chromosome and map position where each QTL resides.
9c - How many studies are associated with these QTL?

9a – The QTL Module
9b - AQAN001 (131.60-134.90 cM) (chromosome 5);
AQAN002 (69.10-93.60 cM) (chromosome 12);
AQAN003 (97.30-97.30 cM) (chromosome 1);
AQAN004 (162.60-162.60 cM) (chromosome 4);
AQAN005 (96.50-96.50 cM) (chromosome 8);
AQAN006 (11.30-11.30 cM) (chromosome 3)
9c – All 6 QTL were taken from one article, on one study, Gramene Literature 6923.



10 - If you had already done all your background research, and were simply interested in finding the QTL for drought tolerance in rice, where would you begin?

Search directly in the QTL module, or

Browse abiotic stress in QTL