

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

Search the Gramene Database

Results: *Oryza sativa* Sequence | *Arabidopsis thaliana* Sequence | Protein | Ontology | Gene | Literature | QTL | Newsletter & Docs

Search for (object name, identifier, or keyword):
drought

Database: All Include Rice Genetics Newsletter & Gramene Documentation

Oryza → **Oryza sativa Sequence Search Result**

Gene (3 results)
 =LOC_Os01g73960 drought induced 19 =LOC_Os05g01730 drought induced 19
 =LOC_Os04g33240 short chain alcohol dehydrogenase cprd12, drought-indu

Arabidopsis → **Arabidopsis thaliana Sequence Search Result**

(6 results)
 =At1g02750-TIGR-G drought-responsive family protein =A44g22200-TIGR-G drought-responsive family protein
 =At1g56280-TIGR-G drought-responsive family protein =A44g15910-TIGR-G drought-responsive protein / drought-induced protein
 =At3g05700-TIGR-G drought-responsive family protein =A45g26990-TIGR-G drought-responsive family protein
 =At3g06780-TIGR-G drought-responsive family protein =A45g49230-TIGR-G drought-responsive family protein

Protein → **Protein Search Result**

8 matching protein records have been found.

Accession No.	Names/Symbols/Synonyms	Organism (Cultivar)	Evidence codes
G8S4X6	Drought inducible aquaporin, dipoin	<i>Oryza sativa</i> (Not available)	ISS
G8S4X7	Drought inducible late embryogenesis abundant protein, dilea	<i>Oryza sativa</i> (Not available)	-
G8SA77	Putative drought protein	<i>Oryza sativa</i> (Not available)	-
G8S3X2	Putative drought resistant protein	<i>Oryza sativa</i> (Not available)	ISS

uced protein, R1G1A	<i>Oryza sativa</i> (<i>indica</i> cultivar-group) (R 62266-42-62)	-
protein DIP2, DIG2	<i>Oryza sativa</i> (<i>indica</i> cultivar-group) (Not available)	-
duced protein, LT6B	<i>Oryza sativa</i> (<i>japonica</i> cultivar-group) (Not available)	IEA ISS
22 kD protein, SoDip22	<i>Saccharomyces cerevisiae</i> (Not available)	IEA

Ontology Search Result for drought

Candidate Term (13 terms found)

Name	Synonym	Definition
to water in	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.
tolerance	None	OBSOLETE (was not defined before being made obsolete).
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.
l to water in	behavioral 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.
response	cellular 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:0000066	Trait leaf rolling LFRL Leaf rolling is a feature observed in response to drought or water stress. It precedes leaf drying stage.

QTL Search Result



Species Name	Trait Name	Trait Synonyms	Linkage Group	Trait Category	Trait Symbol	Published Symbol
Maize	Drought sensitivity index	DSI	6	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	10	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	2	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	6	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	4	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	10	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	7	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	3	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	4	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	1	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	7	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	7	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	4	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	9	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	2	Abiotic stress	DRSN	IIA
Maize	Drought sensitivity index	DSI	2	Abiotic stress	DRSN	IIA
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	IIA

RGN

Rice Genetics Newsletter & Documentation Search

66 matches in Rice Genetic Newsletter & Documentation

Score 1000
 Document
 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 mechanisms... G. C. Loresta, 1986. Screening techniques for drought... breeding for drought resistance. Phil. Jour. Sci. reaction... O'Toole, 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, DRSSD, 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	desiccation 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 distal spikelets

Gene Search Result for drought

Genes

Candidate Rice Gene (1 term found)				
Gene Name	Gene symbol	Synonym	Phenotypic Description	Gramene ID
leaf unrolling under drought stress	lr		under curvature	GR.0060512

Literature Search Result

Literature

Items 1-28 of 96 Page 1 of 5

- 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
- Li-Z, Ma-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
- Quarrie-S-A, Steed-A, Caletani-C, Semikhodskii-A, Lebrun-C, Chiny-C, Steele-N, Pijevjakovic-D, Waterman-E, Weyen-J, Schondelmaier-J, Habash-D-Z, Farmer-P, Saker-L, Clarkson-D-T, Abugaleva-A, Yessimbekova-M, Turuspekova-Y, Abugaleva-S, Tuberosa-R, Sanguneti-M-C, Hollington-P-A, Araqueo-R, Rojo-A, Dodg-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
- Wang-X-S, Zhu-J, Mansueti-L, Bruskiwich-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
- 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 explore other terms possibly associated with drought, such as leaf rolling.

3c

Summary for drought
Items 1 to 13 of 13

#	Term Accession	Ontology	Term Name	Synonym	Definition
1	GO:0009474	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	behavioral 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 Process	cellular response to water deprivation	cellular 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:0001085	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	desiccation 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:0000585	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 apical spikelets

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	Trait	drought tolerance	drought resistance, DRTL.	Bi fla
10	TO:0000394	Trait	drought related trait	desiccation 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.

Summary for TO Term: *drought tolerance* (TO:0000276)

Term Name	drought tolerance
Synonym	drought resistance, DRTL
Definition	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
Derivation	<ul style="list-style-type: none">• trait ontology (TO:0000387) #9160<ul style="list-style-type: none">◦ [i] stress trait (TO:0000164) #1477<ul style="list-style-type: none">▪ [i] abiotic stress trait (TO:0000168) #943<ul style="list-style-type: none">▪ [i] water stress trait (TO:0000237) #125<ul style="list-style-type: none">▪ [i] drought related trait (TO:0000394) #45<ul style="list-style-type: none">▪ [i] drought tolerance (TO:0000276) #23
Parent Term (1)	<ul style="list-style-type: none">• [i] drought related trait (TO:0000394)

Parent of "water stress trait"
Child of "Stress Trait"

Parent of "drought tolerance"
Child of "Water Stress Trait"

Summary for TO Term: *drought related trait* (TO:0000394)

Term Name	drought related trait
Synonym	desiccation related trait.
Derivation	<ul style="list-style-type: none">• trait ontology (TO:0000387) #9160<ul style="list-style-type: none">◦ [i] stress trait (TO:0000164) #1477<ul style="list-style-type: none">▪ [i] abiotic stress trait (TO:0000168) #943<ul style="list-style-type: none">▪ [i] water stress trait (TO:0000237) #125<ul style="list-style-type: none">▪ [i] drought related trait (TO:0000394) #45<ul style="list-style-type: none">▪ [i] drought sensitivity (TO:0000188) #22▪ [i] drought tolerance (TO:0000276) #23▪ [i] drought recovery (TO:0000458) #0
Parent Term (1)	<ul style="list-style-type: none">• [i] water stress trait (TO:0000237)
Child Terms (3)	<ul style="list-style-type: none">• [i] drought sensitivity (TO:0000188)• [i] drought tolerance (TO:0000276)• [i] drought recovery (TO:0000458)

"Drought tolerance" doesn't have any child terms, but it does have siblings (with whom it shares a parent."

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.

- [trait ontology \(TO:0000387\)](#) #9160 +
 - [i] [stress trait \(TO:0000164\)](#) #1477 +
 - [i] [abiotic stress trait \(TO:0000168\)](#) #943 +
 - [i] [water stress trait \(TO:0000237\)](#) #125 +
 - [i] [drought related trait \(TO:0000394\)](#) #45
 - [i] [drought sensitivity \(TO:0000188\)](#) #22 +
 - [i] [drought tolerance \(TO:0000276\)](#) #23
 - [i] [drought recovery \(TO:0000458\)](#) #0

- [trait ontology \(TO:0000387\)](#) #9160 +
 - [i] [stress trait \(TO:0000164\)](#) #1477 +
 - [i] [abiotic stress trait \(TO:0000168\)](#) #943 +
 - [i] [water stress trait \(TO:0000237\)](#) #125
 - [i] [osmotic response sensitivity \(TO:0000095\)](#) #33
 - [i] [deepwater stress \(TO:0000103\)](#) #0
 - [i] [flooding related trait \(TO:0000114\)](#) #47 +
 - [i] [drought related trait \(TO:0000394\)](#) #45 +
 - [i] [humidity related trait \(TO:0000441\)](#) #0

Term Name	abiotic stress trait
Synonym	abiotic stress tolerance.
Definition	Response by the plant in
Derivation	

- [trait ontology \(TO:0000387\)](#) #9160 +
 - [i] [stress trait \(TO:0000164\)](#) #1477 +
 - [i] [abiotic stress trait \(TO:0000168\)](#) #943
 - [i] [stem strength \(TO:0000051\)](#) #41 +
 - [i] [lodging incidence \(TO:0000068\)](#) #8
 - [i] [root number \(TO:0000084\)](#) #100 +
 - [i] [leaf rolling \(TO:0000085\)](#) #42 +
 - [i] [root pulling force \(TO:0000093\)](#) #12
 - [i] [root mass density \(TO:0000115\)](#) #0 +
 - [i] [leaf water potential \(TO:0000131\)](#) #32 +
 - [i] [canopy temperature \(TO:0000157\)](#) #0
 - [i] [radiation sensitivity \(TO:0000161\)](#) #24 +
 - [i] [root volume \(TO:0000233\)](#) #13
 - [i] [water stress trait \(TO:0000237\)](#) #125 +
 - [i] [root branching \(TO:0000257\)](#) #1
 - [i] [root weight \(TO:0000279\)](#) #103 +
 - [i] [temperature response trait \(TO:0000432\)](#) #51 +
 - [i] [leaf drying \(TO:0000446\)](#) #25
 - [i] [root penetration index \(TO:0000471\)](#) #18
 - [i] [chemical stress sensitivity \(TO:0000482\)](#) #166 +
 - [i] [leaf composition trait \(TO:0000493\)](#) #20 +
 - [i] [leaf temperature \(TO:0000504\)](#) #9
 - [i] [leaf weight \(TO:0000505\)](#) #0
 - [i] [penetrated to total root ratio \(TO:0000510\)](#) #14
 - [i] [relative growth rate \(TO:0000515\)](#) #11
 - [i] [rooting depth \(TO:0000519\)](#) #17
 - [i] [stomatal frequency \(TO:0000566\)](#) #4 +
 - [i] [stem length \(TO:0000576\)](#) #140 +

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*

Summary for TO Term: <i>drought tolerance</i> (TO:0000276)	
Term Name	drought tolerance
Synonym	drought resistance, DRTL
Definition	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
Derivation	<ul style="list-style-type: none">• trait ontology (TO:0000387) #9160<ul style="list-style-type: none">◦ [i] stress trait (TO:0000164) #1477<ul style="list-style-type: none">▪ [i] abiotic stress trait (TO:0000168) #943<ul style="list-style-type: none">▪ [i] water stress trait (TO:0000237) #125<ul style="list-style-type: none">▪ [i] drought related trait (TO:0000394) #45<ul style="list-style-type: none">▪ [i] drought tolerance (TO:0000276) #23
Parent Term (1)	<ul style="list-style-type: none">• [i] drought related trait (TO:0000394)
Total Number of Annotations:	23 objects, 23 associations
QTL:	23 QTL (<i>oryza sativa</i> (6), <i>pennisetum glaucum</i> (17))

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”

[Current Ontologies](#) | [Documentation](#) | [Evidence code](#) | [FTP](#) | [Ontology suggestion](#) | [Associations](#) | [Publications](#) | [Tutorials](#) | [FAQ](#)

Ontology Database

Type ID or keyword to search

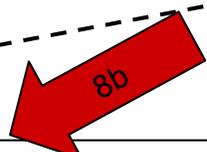
select ontology (optional) Gene (GO) Plant structure (PO) Growth stage (GRO) Trait (TO) Environment (EO) Taxonomy (GR_tax)

Search Clear HELP
[e.g. flower or TO:0000303]

Term drought tolerance (Trait) Associations

Items 1 to 6 of 6

Term Name	Object Type	Object Accession ID	Object Symbol	Object Name	Object Synonyms	Object Species	Evidence
drought tolerance	QTL	AQAN001	DRTL	Drought tolerance	qDT-5	Oryza sativa	IAGP
drought tolerance	QTL	AQAN002	DRTL	Drought tolerance	qDT-12	Oryza sativa	IAGP
drought tolerance	QTL	AQAN003	DRTL	Drought tolerance		Oryza sativa	IAGP
drought tolerance	QTL	AQAN004	DRTL	Drought tolerance		Oryza sativa	IAGP
drought tolerance	QTL	AQAN005	DRTL	Drought tolerance		Oryza sativa	IAGP
drought tolerance	QTL	AQAN006	DRTL	Drought tolerance		Oryza sativa	IAGP



IAGP *inferred by association of genotype from phenotype

- Polymorphism or segregation of genetic markers eg. isozymes, RFLPs (Random Fragment Length Polymorphism), RAPDs (Random amplified polymorphic DNA), AFLPs (Amplified Fragment Length Polymorphism), SNPs (Single Nucleotide Polymorphisms), Microsatellite markers or SSR (Simple Sequence Repeats), TD (Transposon Display).
- Polymorphism or segregation of physical markers eg. FISH, centromeric, heterochromatic regions, chromosomal banding patterns.
- Detection of polymorphisms in segregating plant material derived from Bi-parental crosses eg. F2 lines, F3 families, Back cross populations, viz., BC1, BC2 etc. ; Doubled Haploid lines (DH), Recombinant Inbred Lines (RIL).
- Detection of polymorphisms in genetic stocks, e.g., Near Isogenic Lines (NIL), Introgression Lines (IL), Radiation Hybrids (RH), Cytogenetic Stocks (CG), i.e., trisomics, aneuploids, etc.

- 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.

[QTL Home](#) | [Simple Search](#) | [Power Search](#) | [Help](#) | [Tutorial](#)

QTL Detail "AQAN001"

QTL Accession ID	AQAN001
Species	Rice (GR_tax:013681)
Published Symbol	qDT-5
Trait Symbol	DRTL
Trait Name	drought tolerance
Trait Ontology Accession:	TO:0000276
Trait Synonym(s)	drought resistance
Trait Category	Abiotic Stress
Linkage Group	5
Map Position	Rice-IGCN ZYQ18/JX17 DH QTL 1998-5 (131.60-134.90 cM) [View On Map]
Comments	Three loci, AQAN003 (RG541), AQAN004 (G318), AQAN005 (G192), were found interacting with this QTL locus.
DBXRefs	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

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QTL Search			
Search by Trait Category:			
Abiotic stress Anatomy Biochemical Biotic stress Development Quality Sterility or fertility Vigor Yield			
OR			
Search for *:	Search in:	Species:	
<input type="text"/>	<input type="text" value="-All Fields-"/>	<input type="text" value="-All Species-"/>	<input type="button" value="Submit"/> <input type="button" value="Reset"/>
* eg, development , vegetative* , VGTM , QTL* , CQA11 . Or view help .			