

Gramene's Ontologies Tutorial

This database is a collective resource of structured controlled vocabularies (Ontologies) for knowledge domains and their associations.

Knowledge Domains:

Plant Ontology (PO)

Plant Structure (morphology, organs, tissue and cell types) and Development*

Growth stages (plant growth and developmental stages) (From Gramene)

Trait Ontology (TO)

Plant traits and phenotypes

Gene Ontology (GO)

Molecular function

Biological process

Cellular component

Environment Ontology (EO)

Gramene's taxonomy ontology (GR_tax)

Associations:

Use this database to quickly find Ensembl rice genes (from TIGR's rice genome assembly), proteins from SWISSPROT-TrEMBL representing Poaceae (grass) family, rice genes, QTL and map sets.

**Note: Remember that different ontologies are for different purposes and do not overlap with each other.
For more information on each ontology type please visit the current ontologies section at Gramene**

Tutorial Tips



If you are viewing this tutorial with Adobe Acrobat Reader, click the "bookmarks" on the left hand side of the Reader for easier navigation.

Note! Although we continually work to make Gramene compatible with all browsers, there are problems with some browser versions. If you're having difficulty viewing Gramene, try using a different browser. Please report any problems with browsers through Gramene Feedback.

Gramene Home Page

The screenshot shows the Gramene Home Page, a resource for comparative grass genomics. The page has a green header with the Gramene logo and navigation links. A left sidebar contains a 'Quick Search' box and a list of database categories. The main content area features a 'Quick Start' section with links to various genomic resources. A right sidebar lists 'Featured News' and upcoming events. An orange callout box with the text 'Click here to open ontology search' points to the 'Ontologies' link in the left sidebar.

GRAMENE *A Resource for Comparative Grass Genomics* V24 (March 2007)

Search Genomes Species Download Resources About Help Feedback

Quick Search

Search

Search a single module or all available modules plus online documentation.
Diversity, Pathways, BLAST and Mart not available in this search.

Have Questions...?

- Gramene now has [tutorials](#) for every module, also recommended for experienced users.
- Ask questions through [Feedback](#) or [Email](#).
- See [FAQ](#) for questions and answers.

Gramene Tip:

Map details can be [downloaded](#) in a tab-delimited format so that users can work

Quick Start

enced genomes for [Rice](#), [Maize](#) & [Arabidopsis](#); Look for [rice/maize](#) with [GrameneMart](#); Search for sequence alignment with [BLAST](#); [Map](#) or [ProSite](#) or Browse by Gene Ontology using [GO Slim](#).

physical maps for [Rice](#), [Wild Rice](#), [Maize](#), [Wheat](#), [Barley](#), [Oats](#), [Sorghum](#), or use the Comparative Map Viewer ([CMap](#)) to compare maps of [S. pombe](#).

[Genes](#) (c.), DNA Probes (Primers, Overgos, sequences (GSSs, ESTs, etc.); Use the [Search](#) by species, including [Rice](#)

Click here to open ontology search

TRAITS: Search the [Genes](#) or [QTL](#) database for important phenotype-related loci such as [Rice Genes](#), [Rice QTL](#), [Maize QTL](#). Don't forget to explore traits in [Ontologies](#).

GENETIC DIVERSITY: Search for SNP and SSR allelic variation on loci of [rice](#), [maize](#), and [wheat](#) germplasms.

BIOCHEMICAL PATHWAYS: Search for ALL the rice pathways on [starch biosynthesis](#) or get an overview of the [metabolic network](#). Compare [rice](#) and [Arabidopsis](#) pathway datasets.

LITERATURE: Search the literature for your friends and topics of interest

Featured News

- [NEW](#) March 2007, V 24 [release notes](#).
- [NEW](#) [Gramene Jan/Feb Newsletter](#)
- [Rice News Worldwide](#) from IRRI

Visit with us at

- March 15-18, 2007. [CSHL Plant Genome meeting](#)
- March 22-25, 2007. [Maize Genetics Meeting](#)
- April 16-20, 2007. [ITMI](#)
- May 8-12, 2007. [Biology of Genomes](#)
- July 7-11, 2007. [ASPB](#)

[View Previous Gramene Presentations Calendar](#)

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Ontology Home Page

The screenshot shows the top navigation bar with links: [Current Ontologies](#), [Documentation](#), [Evidence code](#), [FTP](#), [Ontology suggestion](#), [Associations](#), [Publications](#), [Tutorial](#), [FAQ](#), and [HELP](#). Below this is the 'Ontology Database' section. It features a search input field with the placeholder text 'Type ID or keyword to search' and a 'Search' button. To the left of the search field is a box labeled 'or' and a list of ontology types with checkboxes: ☐ Plant structure (PO), ☐ Growth stage (GRO), ☐ Environment (ENV), and ☐ Taxonomy (GR_tax). Below the search field is a text box with the example '[e.g. flower or TO:00003]'. A callout points to the 'Current Ontologies' link, and another points to the 'Search' button. A third callout points to the 'FAQ' link.

1. Click on “Current Ontologies” to browse terms

2. Type term name and click search. (option- to limit a search, click box of desired ontology type)

Click here if you need more help on Ontology

Searches can be limited by checking any one or more of the ontologies listed below the text search box.

For more information on each ontology type please visit the [current ontologies](#) section. You may like to [browse the tutorial](#) to learn more about the ontologies and how to use the database or may like to seek the [help document](#).

The ontology database aims to provide a collective resource for structured controlled vocabularies (Ontologies) for the following knowledge domains and their associations to various objects such as QTL, phenotype gene, proteins and Ensembl rice genes.

- Plant Ontology (PO)
 - ◊ Plant Structure (morphology, organs, tissue and cell types)*
 - ◊ Growth stages (plant growth and developmental stages)
- Trait Ontology (TO)
 - ◊ Plant traits and phenotypes
- Gene Ontology (GO)**
 - ◊ Molecular function
 - ◊ Biological process
 - ◊ Cellular component

Click on the links of the ontologies to learn more about their use and key concepts.

Browsing the Ontology Database



[Current Ontologies](#) |
 [Documentation](#) |
 [Evidence code](#) |
 [FTP](#) |
 [Ontology suggestion](#) |
 [Associations](#) |
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Current Ontologies	Browse	Download (in OBO format)
Trait Ontology™ (TO) It is a controlled vocabulary to describe each trait as a distinguishable feature, characteristic, quality or phenotypic feature of a developing or mature individual. Examples are glutinous endosperm, disease resistance, plant height, photosensitivity, male sterility, etc.	BROWSE	Ontology + Definitions
Gene Ontology™ (GO) Developed by the Gene Ontology Consortium to help annotate information on gene products (not the genes) using the following three organizing principles of molecular function, biological process and cellular component. Copyright © Gene Ontology Consortium.		All ontologies + Definitions
Molecular Function: The tasks performed by individual gene products; example is Rubisco	BROWSE	--
Biological Process: Broad biological goals, such as photosynthesis or ripening, that are accomplished by ordered assemblies of molecular functions.	BROWSE	--
Cellular Component: Subcellular structures, locations, and macromolecular complexes; examples include chloroplast, telomere, vacuole, nucleus, etc.	BROWSE	--
Plant Ontology™ (PO) Gramene is collaborating with The Plant Ontology Consortium (POC) to develop and grow plant ontologies.		
Plant Structure (PO): The controlled vocabulary of plant structures representing stamen, gynoecium, petal, parenchyma, guard cell, etc.	BROWSE	Ontology + Definitions
Cereal Plant Growth Stages (GRO): The controlled vocabulary of growth stages. Examples are germination, seedling, booting, flowering, etc. Available on POC .	BROWSE	Ontology + Definitions
Environment Ontology (EO) It represents a controlled vocabulary to describe different types of supplemental environmental conditions and profiles of gene expression and phenotype (mutant and QTL) studies on cereal plants.	BROWSE	Ontology + Definitions
Taxonomy Ontology (GR_tax) It is a representation of the taxonomy tree in the ontology format. Each term in this ontology can represent subspecies, species, genus, order, class or any rank in the classification. Primarily derived from NCBI Taxonomy, the revisions were made as and when/where required in the rankings. The rank of genome types was added by this project. This taxonomy ontology focuses on the Poaceae (Gramineae) family of plant taxonomy only.	BROWSE	Ontology + Definitions

3. Click on "BROWSE" to navigate through the desired ontology type.

Searching the Ontology Database

Type your query
e.g. Example is a search for function alpha-amylase

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

Ontology Database

Type ID or keyword to search
select ontology (optional)

alpha-amylase

☒ Gene (GO) ☐ Plant structure (PO) ☐ Growth stage (GRO)
☐ Trait (TO) ☐ Environment (EO) ☐ Taxonomy (GR_tax)

Search Clear

[e.g. flower or TO:0000303]

Select “Gene Ontology” to search the GO database (or select one or more others appropriate to your term.)
(*Molecular Function is part of Gene Ontology*)

Click search

Gene Ontology (GO) search results

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

Exact ontology term

Definition of the ontology term

Summary for *alpha-amylase*
 Items 1 to 4 of 4

#	Term Accession	Aspect	Term Name	Synonym	Definition
1	GO:0004556	Molecular Function	alpha-amylase activity	None	Catalysis of the endohydrolysis of 1,4-alpha-D-glucosidic linkages in polysaccharides containing three or more 1,4-alpha-linked D-glucose units.
2	GO:004574	Molecular Function	oligo-1,6-glucosidase activity	sucrase, isomaltase	Catalysis of the hydrolysis of 1,6-alpha-D-glucosidic linkages in some oligosaccharides produced from starch and glycogen by alpha-amylase , and in isomaltose.
3	GO:0066	Molecular Function	alpha-amylase inhibitor activity	None	Stops, prevents or reduces the activity of alpha-amylase .
4	GO:0008534	Biological Process	pancreatic juice secretion	None	The regulated release of pancreatic juice by the exocrine pancreas into the upper part of the intestine. Pancreatic juice is slightly alkaline and contains numerous enzymes and inactive enzyme precursors including alpha-amylase , chymotrypsinogen, lipase, procarboxypeptidase, proelastase, phospholipase A2, ribonuclease, and trypsinogen. Secretion of bicarbonate ions helps to neutralize the acid from the duodenum.

Ontology Accession for the ontology term. Select to view detailed information. (see next slide)

Synonyms (if any)

Ontology Term Accession Detail

Exact ontology term

Definition of the term








External references used for defining or associated to synonyms


Summary for GO Term: *alpha-amylase activity* (GO:0004556)

Term Name	alpha-amylase activity
Aspect	Molecular Function
Definition	Catalysis of the endohydrolysis of 1,4-alpha-D-glucosidic linkages in polysaccharides containing alpha-D-glucopyranosyl units
External References	EC:3.2.1.1 EC:3.2.1.1 MetaCyc:3.2.1.1-RXN
Source Ontology Database Link	The GO browser of Gene Ontology Database

The lineage of alpha-amylase activity as a molecular function

Derivation

- [all \(all\)](#) #512041 
 - [\[i\] molecular function \(GO:0003674\)](#) #133742 
 - [\[i\] hydrolase activity \(GO:0003824\)](#) #53953 
 - [\[i\] hydrolase activity \(GO:0016787\)](#) #16713 
 - [\[i\] hydrolase activity, acting on glycosyl bonds \(GO:0016798\)](#) #1941 
 - [\[i\] hydrolase activity, hydrolyzing O-glycosyl compounds \(GO:0004553\)](#) #1817 
 - [\[i\] amylase activity \(GO:0016160\)](#) #193 
 - [\[i\] alpha-amylase activity \(GO:0004556\)](#) #116

 Expandable tree. Click on term to expand.

Term-term relationship
[i]: IS A (type of)

Total Number of Annotations:	116 objects, 116 associations
Gene:	Gene(10) Ensembl rice gene(17) Ensembl maize gene(1) Ensembl arabidopsis gene(8) Protein(6)
Ensembl rice gene:	Oryza sativa(10)
Ensembl maize gene:	Zea mays(1)
Ensembl arabidopsis gene:	Arabidopsis thaliana(8)
Protein:	Aegilops tauschii(3) Avena fatua(2) Oryza sativa(3) Oryza sativa (japonica cultivar-group)(1) Triticum aestivum(18) Zea mays(10)

Number of database objects associated in the database with this term.

Links to source that originally developed this ontology.

Click on link to get a complete list of set of genes/proteins/QTL/maps etc. that may be associated with the given ontology term (see next slide.)

Clicking on the active column headers will sort by that column

Ontology Associations

Click to download a zip file with tab delimited list of associations

Term [alpha-amylase activity \(GO:0004556\)](#) Associations

Items 1 to 25 of 146. Page 1 of 5. | [Next](#) [Download](#)

Term Name	Object Type	Object Accession ID	Object Symbol	Object Name	Object Synonyms	Object Species	Evidence
alpha-amylase activity	Protein	O81699	alpha-Amy2A	Alpha amylase precursor		Avena fatua	IEA
alpha-amylase activity	Protein	P17900	alpha-Amy2D	Alpha-amylase precursor		Avena fatua	IEA
alpha-amylase activity	Protein					Hordeum vulgare	IEA
alpha-amylase activity	Protein					Hordeum vulgare	
alpha-amylase activity	Gene				RAmy1A/C Amy1A Alpha-amylase-1A Amy1A/C*	Oryza sativa	CA
alpha-amylase activity	Protein				1,4-alpha-D- glucan glucanohydrolase AMY1 Low pl alpha-amylase	Hordeum vulgare	CA
alpha-amylase activity	Protein			precursor	1,4-alpha-D-glucan glucanohydrolase	Triticum aestivum	CA
alpha-amylase activity	Protein	P17654	AMY1.1	Alpha-amylase precursor	1,4-alpha-D-glucan glucanohydrolase AMY1A Isozyme 1B	Oryza sativa (japonica cultivar-group)	CA
alpha-amylase activity	Protein	P04063	AMY1.2	Alpha-amylase type B isozyme precursor	1,4-alpha-D- glucan glucanohydrolase AMY2-2 High pl alpha-amylase	Hordeum vulgare	CA
alpha-amylase activity	Protein	P27932			can glucanohy		CA
alpha-amylase activity	Protein	P04747			can glucanohy		
alpha-amylase activity	Protein	P27933			can glucanohy		
alpha-amylase activity	Protein	P04748			can glucanohydrolase Clone 103	Hordeum vulgare	IEA
alpha-amylase activity	Protein	P27934	AMY1.4	Alpha-amylase isozyme 3E precursor	1,4-alpha-D-glucan glucanohydrolase AMY3E	Oryza sativa (japonica cultivar-group)	IEP;ISS;RCA
alpha-amylase activity	Protein	P04749	AMY1.5	Alpha-amylase type B isozyme	1,4-alpha-D-glucan glucanohydrolase Clone 168	Hordeum vulgare	IEA

Click to view the term and its children (indirectly associated to parent term if any) for which the object type was annotated (returns to previous page)

Links to the original entry in Gramene database. Click for TIGR gene report in Gramene.

Method used to ascertain this association. Click on code for description.

Searching other ontologies

Previous slides presented the gene ontology (GO) example. The same procedure must be followed if you would like to search other ontologies.

The following table suggests the type of objects that are associated with different types of ontologies:

Ontology	Associated object types
Gene Ontology	Ensembl rice genes (from rice genome assembly) Proteins from SWISSPROT-TrEMBL
Plant Ontology Plant structure or anatomy (PO) Cereal plant growth stages (GRO)	phenotype genes phenotype genes
Trait Ontology	Phenotype genes QTL
Environment Ontology	Coming soon
Gramene Taxonomy Ontology	Proteins from SWISSPROT-TrEMBL QTL Map sets

Other Options From Ontologies

Click to browse the frequently asked questions or access tutorial or help files.

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

Learn more about
Gramene ontologies

Documentation	More information on ontology, their structure, concepts and help on how to search [VIEW] Release Notes
Evidence codes	Defines the evidence codes and explains how they are used for PO annotation of genes/gene products/phenotypes
FTP archive	Anonymous user access to Plant Ontology archive is at ftp://ftp.gramene.org The ontology files are organized by ontology type(s).
Ontology submission	Any suggestions for the addition, replacement or modification of the controlled vocabulary can be made via a web-based SUBMISSION FORM or by using a PDF of the form. If you have problems look for Submission help document.
Associations	Gene ontology associations based on Gramene curation and Interpro assignments. Results available at: <ul style="list-style-type: none"> Gramene [view] Gene Ontology Consortium [view] - [download] Help Gene Ontology associations [view]
Publications	Gramene development and integration of trait and gene ontologies for rice Comparative and Functional Genomics, Vol 3(2), April, 2002 [see it] or [search for full text (search for "91016047")]. The Plant Ontology™ Consortium and Plant Ontologies Comparative and Functional Genomics, 2002, Vol 3(2), April, 2002 [search for full text (search for "91016119")] Plant Ontology resource: design and implementation. Genetics, 2001, Vol 11(8), 1425-1433 [Abstract] [Full Text] Gene Ontology: tool for the unification of biology. Nature Genetics , 2000, 25: 25-29 [Abstract] [Full Text]

Click to access download
instructions

Click to download the
associations

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Tutorial

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Ontologies Tutorial

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Different options available for all browsers

Navigate to other tutorials

Download free software for viewing tutorials

FAQ's

Submit a question to
Gramene

The screenshot shows the Gramene website interface. At the top, there is a green header with the 'GRAMENE' logo and navigation links: Search, Genomes, Download, Resources, About, Help. Below this is a secondary navigation bar with links: Current Ontologies, Documentation, Evidence code, FTP, Ontology suggestion, Associations, Publications, Tutorial, FAQ, and HELP. The 'FAQ' link is highlighted with a red starburst. A yellow callout bubble points to the 'FAQ' link with the text 'Submit a question to Gramene'. Below the header, the 'GRAMENE Cache' section is visible. The 'Gramene FAQ' link is circled in red. A yellow callout bubble points to the 'Gramene FAQ' link with the text 'Select a module to view it's FAQs'. The 'Gramene FAQ' section lists subcategories: Maps and CMap, BLAST, Proteins, Ontologies, Genomes, Markers, QTL, Genes, Literature, Data Curation, Gramene Program, Diversity, GrameneMart, and Pathways. Below the list, it says 'Answers in this category:' followed by a link 'New Item'. A date stamp '2006-Aug-15 9:45am' is visible. At the bottom, there is a 'Search FAQ' callout bubble pointing to a search bar. The footer includes logos for USDA, das, and other institutions, along with links for Home, Site Map, About, and Cite Gramene. The text 'Last modified: Tue Aug 15 09:45:35 2006' is also present.

GRAMENE Documentation

Search Genomes Download Resources About Help

Current Ontologies Documentation Evidence code FTP Ontology suggestion Associations Publications Tutorial FAQ HELP

GRAMENE Cache

Find anything Search

Feedback

Gramene FAQ

- Moderator: cer17@cornell.edu
- Gramene FAQ's may be browsed by category (based on datasets) or may be searched by keyword. (see search on bottom left of page)
- Subcategories:
 - Maps and CMap
 - BLAST
 - Proteins
 - Ontologies
 - Genomes
 - Markers
 - QTL
 - Genes
 - Literature
 - Data Curation
 - Gramene Program
 - Diversity
 - GrameneMart
 - Pathways

Answers in this category:

New Item

2006-Aug-15 9:45am

This document is: <http://dev.gramene.org/cgi-bin/fom?file=1>
[Search] [Appearance] [Show This Entire Category] [Show Expert Edit Commands] This is a [Faq-O-Matic 2.721](#).

Search FAQ

SPECIES

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Last modified: Tue Aug 15 09:45:35 2006

Help

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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)

[e.g. [flower](#) or [TO:0000303](#)]

Find help on ontology [Search](#) | [Browse](#) | [Query results](#) | [Term details](#) | [Associations](#) | [Term to term relationships](#) | [More information](#)

Ontology (Controlled Vocabulary) Help

Search:

You can search the ontology database by using either of the following methods:

- Term: e.g. stem length, alpha-amylase, Zea mays, etc.
- Term accession (e.g. 303 or TO:0000303)
- Synonym: culm length)
- Or a keyword you think can fetch an appropriate query result

Use Help file for assistance on developing a search, understanding the results, or in understanding ontologies.

Ontologies Help Menu

Query results:

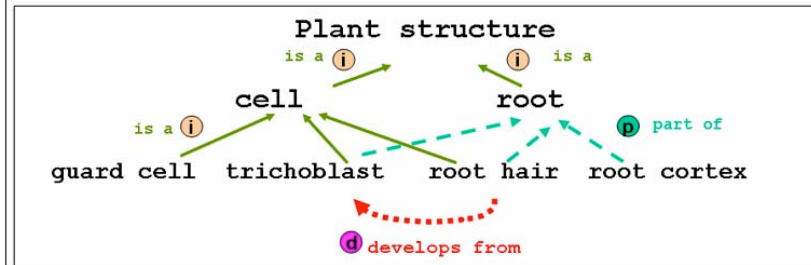
The query results table will give you a list of terms that matched your search. This table

- Term accession: A stable ontology term id
- Aspect: suggesting a given term belongs to which type of ontology
- Term name: Name of the ontology term, by which it is called.
- Synonym: alternate names or aliases.
- Definition: A standardized definition of the term.

See an example search for [culm](#) by selecting the ontology type "plant structure(PO)"

Browse:

If you are not familiar with the ontology types, their usage, term names, and the term [current ontologies](#) section to find an appropriate term and the datasets associated with objects as listed in the table below. To view all the associations please consult the [a](#)



Statement looks like

- Trichome, root hair, root cortex are part of root
- Trichoblast, root hair and guard cell are instances of cell
- Root hair develops from trichoblast
- Cell and root are instances of plant structure

Plant Structure

- cell
 - guard cell
 - root hair
 - trichoblast
 - root hair
- root
 - root cortex
 - trichoblast
 - root hair

Please note that terms in the ontology may have more than one parent (e.g. trichoblast, has two parents, cell and root. Same as root hair).

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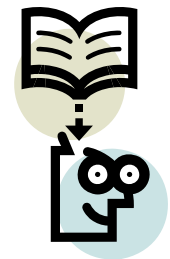
Action Steps: Things you can do

1) Make Suggestions

- Send us your review of the terms, definitions and relationships to ensure accuracy.
- Suggest new terms, definitions, or improvements to current structures.
- If you find incorrect associations, let us know.

2) Use Ontologies

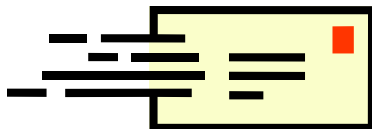
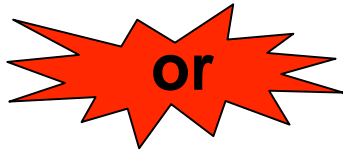
- Use current ontology terms in describing your data in publications and databases.
- If your project on cereal plants (especially rice [Oryza]) is generating data sets that may require these kinds of annotations and associations, we will be happy to help guide you through the annotation process and in setting up an Ontology database.



Contact Gramene



Use the feedback button, located at the top of every page, to provide feedback or to ask questions about Gramene.



Email Gramene at gramene@gramene.org