

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)*

Growth stages (plant growth and developmental stages)

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 Help



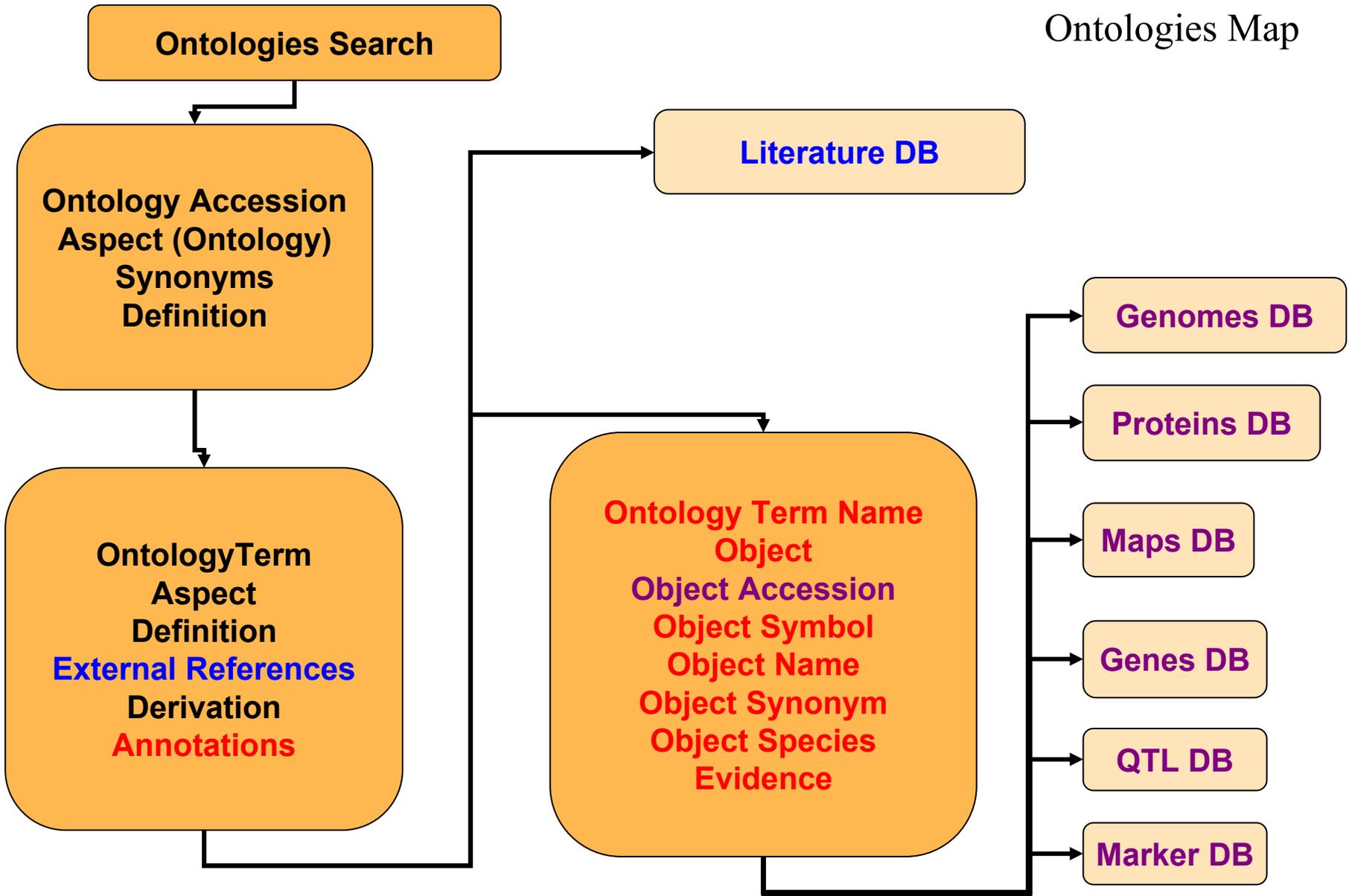
The hand icon indicates a link that allows you to go to the same page in your web browser.



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

Action Options are noted in this type of font.

Notes or comments use this style font.





Gramene Home Page

GRAMENE

A Resource for Comparative Grass Genomics

v20 (March 2006)

Search Genomes Download Resources About Help

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Quick Search

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Have Questions?

- Gramene navigation for every module.
- Ask questions through [Feedback](#) or [Email](#)

Gramene Tips:

The SSR Marker Search is listed under the Marker database.

[All Tips](#)

Genomes-Ensembl
 Maps-CMap
 Markers
 QTL
 Genes
 Proteins
Ontologies
 Literature
 Sequences-BLAST
 All-GrameneMart

Quick Start

Accessed genomes for [Rice](#), [Maize](#) & [Arabidopsis](#); Look for [rice/maize](#) search with [GrameneMart](#); Search for sequence alignment with [ontology](#).

Search [Protein](#) or [ProSite](#) or Browse by Gene Ontology using [GO Slim](#).

Physical maps for [Rice](#), [Maize](#), [Wheat](#), [Barley](#), [Oats](#), [Sorghum](#), and [Map](#) to compare maps of different

Click here to open ontology search

- **MOLECULAR**: Search by [SSR](#) (Simple Sequence Repeat) at Identification Tool ([SSRIT](#)); or [Sorghum](#) and [Others](#).
- **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](#).
- **LITERATURE**: Search the literature for your friends and topics of interest.
- **SUBMISSION**: Submit a [Rice Gene](#) or [Ontology Term](#) to Gramene.

Featured News

- Gramene Release 20 for March 2006. See the [release notes](#).
- [Gramene News Archive](#)
- RTWG [Gramene workshop materials](#) are available.
- [Rice News Worldwide](#) from IRRI

Visit with us at

- [48th Maize Genetics Conference](#), March 9-12, 2006, Asilomar, Pacific Grove, CA

[Gramene Calendar](#)



Ontology Home Page

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Ontology Database

Type ID or keyword to search



- Plant structure (PO)
- Growth stage (GRO)
- Environment (ENV)
- Taxonomy (GR_tax)

Search Clear

[e.g. flower or TO:0000303]

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 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](#) | [Publications](#) | [Tutorial](#) | [FAQ](#) | [HELP](#)

Current Ontologies	Browse	Download
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. Molecular Function: The tasks performed by individual gene products; example is Rubisco Biological Process: Broad biological goals, such as photosynthesis or ripening, that are accomplished by ordered assemblies of molecular functions. Cellular Component: Subcellular structures, locations, and macromolecular complexes; examples include chloroplast, etc.	BROWSE	Definitions (combined) Ontology Ontology Ontology
Plant Ontology™ (PO) Gramene is collaborating with The Plant Ontology Consortium (POC) to develop a controlled vocabulary for plant structure and growth stages. Plant Structure (PO): The controlled vocabulary of plant structures representing organs, tissue and cell types such as leaf, stem, root, seed, fruit, flower, petal, sepal, parenchyma, guard cell, etc. Cereal Plant Growth Stages (GR0): The controlled vocabulary of growth and developmental stages in various cereal species such as rice, maize, sorghum, wheat, oat and barley.	BROWSE	Ontology Definitions Ontology Definitions
Environment Ontology (E0) It represents a controlled vocabulary to describe different types of supplemental environments that have been reported in the experimental profiles of gene expression and phenotype (mutant and QTL) studies on cereal plants.	BROWSE	Ontology
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

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)

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

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

Click search

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)



Gene Ontology (GO) search results

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:0004566	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:0004574	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:0015066	Molecular Function	alpha-amylase inhibitor activity	None	Stops, prevents or reduces the activity of alpha-amylase .
4	GO:0030157	Biological Process	pancreatic juice secretion	None	The regulated release of pancreatic juice by the exocrine pancreas into the upper part of the duodenum. Pancreatic juice is slightly alkaline and contains numerous enzymes and inactive enzyme precursors including alpha-amylase , chymotrypsinogen, lipase, proelastase, propeptidase, procarboxypeptidase, proelastase, prophospholipase A2, ribonuclease, and trypsinogen. Its high concentration of bicarbonate ions helps to neutralize the acid from the stomach.

Ontology Accession for the ontology term. Select to view detailed information.

Synonyms (if any)



Ontology Term Accession Detail

Exact ontology term

Definition of the term

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
External References	EC:3.2.1.1 EC:3.2.1.1 MetaCyc:3.2.1.1-RXN
Derivation	

External references used for defining or associated to synonyms

The lineage of alpha-amylase activity as a molecular function

Term-term relationship

[i]: IS A (type of)

- [GO:0003674](#) #90530 +
- [activity \(GO:0003824\)](#) #39336 +
- [lase activity \(GO:0016787\)](#) #12313 +
- [hydrolase activity, acting on glycosyl bonds \(GO:0016798\)](#) #1400 +
 - [i] [hydrolase activity, hydrolyzing O-glycosyl compounds \(GO:0004553\)](#) #1304 +
 - [i] [amylase activity \(GO:0016160\)](#) #169 +
 - [i] [alpha-amylase activity \(GO:0004556\)](#) #101

+ Expandable tree. Click on term to expand.

Total Number of Annotations:	101 objects, 101 associations
Ensembl maize gene:	1 zea mays Ensembl maize gene
Ensembl gene:	16 oryza sativa Ensembl genes
protein:	84 protein products (oryza sativa(1), oryza sativa subsp. indica(1), oryza sativa subsp. indica cultivar-group)(17), sorghum bicolor(2), triticum aestivum(18), zea mays(10))

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

More information found at the [GO browser of Gene Ontology Database](#).

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 for oryza sativa example.)

Links to source that originally developed this ontology.

Clicking on the active column headers will sort by that column



Ontology Associations

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

Items 1 to 16 of 16

Download

Term Name	Object Type	Object Accession ID	Object Symbol	Object Name	Object Synonym	Object Species	Evidence
alpha-amylase activity	Ensembl gene	LOC_Os01g51760	LOC_Os01g51760	alpha-amylase		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os02g32660	LOC_Os02g32660	1,4-alpha-glucan branching enzyme iib, precursor (q-enzyme); 1,4-alpha-glucan branching enzyme (q-enzyme)		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os02g52700	LOC_Os02g52700	Alpha-amylase		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os02g52710	LOC_Os02g52710	Alpha-amylase		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os02g52710	LOC_Os02g52710	alpha-dextrin endo-1,6-alpha-glucosidase		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os02g52710	LOC_Os02g52710	alpha-dextrin endo-1,6-alpha-glucosidase, catalytic domain		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os02g52710	LOC_Os02g52710	beta starch debranching enzyme ISO2		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os02g52710	LOC_Os02g52710	isozyme 2a precursor (ec 3.2.1.1) (1,4-alpha-d-glucanglucanohydrolase)		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os06g51080	LOC_Os06g51080	1,4-alpha-glucan branching enzyme iib, chloroplast precursor(ec 2.4.1.18) (starch branching enzyme (q-enzyme).; 1,4-alpha-glucan branching enzyme (q-enzyme); 1,4-alpha-glucan branching enzyme precursor (ec 2.4.1.18))		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os08g32660	LOC_Os08g32660	1,4-alpha-glucan branching enzyme iib, chloroplast precursor (ec 2.4.1.18) (starch branching enzyme (q-enzyme).; 1,4-alpha-glucan branching enzyme (q-enzyme); 1,4-alpha-glucan branching enzyme precursor (ec 2.4.1.18))		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os08g32660	LOC_Os08g32660	1,4-alpha-glucan branching enzyme iib, chloroplast precursor (ec 2.4.1.18) (starch branching enzyme (q-enzyme).; 1,4-alpha-glucan branching enzyme (q-enzyme); 1,4-alpha-glucan branching enzyme precursor (ec 2.4.1.18))		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os08g42660	LOC_Os08g42660	1,4-alpha-glucan branching enzyme iib, chloroplast precursor (ec 2.4.1.18) (starch branching enzyme (q-enzyme).; 1,4-alpha-glucan branching enzyme (q-enzyme); 1,4-alpha-glucan branching enzyme precursor (ec 2.4.1.18))		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os09g28420	LOC_Os09g28420	alpha-amylase isozyme 3b precursor (ec 3.2.1.1) (1,4-alpha-d-glucanglucanohydrolase)		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os09g28430	LOC_Os09g28430	alpha-amylase isozyme 3c precursor (ec 3.2.1.1) (1,4-alpha-d-glucanglucanohydrolase)		Oryza sativa	IEA
alpha-amylase activity	Ensembl gene	LOC_Os09g29410	LOC_Os09g29410	isoamylase-type starch debranching enzyme ISO3		Oryza sativa	IEA

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

The term and its children (indirectly associated to parent term if any) for which the object type was annotated

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

Click to learn about evidence used to make associations of ontology terms with different data types



Other Options From Ontologies

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

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

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/pub/gramene/CURRENT_RELEASE/ftp_archive/ 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] • Human Gene Ontology associations [view]
Publications	Gramene development and integration of trait and gene ontologies for rice Genome and Functional Genomics , 2002, Vol 3(2), April, 2002 [Abstract] [Full Text] Gene Ontology™ Consortium and Plant Ontologies Genome and Functional Genomics , 2002, Vol 3(2), April, 2002 [Abstract] [Full Text] Gene ontology resource: design and implementation. Genome Research , 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

Learn more about Gramene ontologies

Click to submit your ontology suggestions

Learn more about ontologies from these publications



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

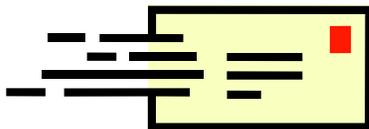
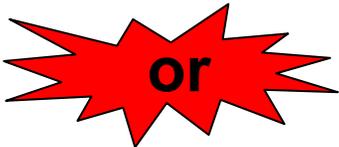
- Use current ontology terms in describing your data in publications and databases.
- If your project on cereal plants (especially rice [Oryza]) is generating data sets that may require these kinds of annotations and associations, we will be happy to help guide you through the annotation process and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