Using Gramene For Maize-Rice Genome Comparisons

49th Annual Maize Genetics Conference

22-25 March 2007

www.gramene.org

Maize Species Pages

Maize Queries

Gramene Database information on *Zea mays*

Zea Species Page: Introduction | Facts | Anatomy | Taxonomy | Agronomic Statistics | Research | Education | Nutrition | Recipes | News | Germplasm Resources | Gramene Statistics | **Gramene Queries**

Pre-designed *Zea* Queries

- Show me all the maize markers in Gramene.
- Show me all the maize QTL in Gramene.
- What are the best maps to use to compare maize to rice?
- Show me a syntenic region between maize and rice.

Show me all the maize markers in Gramene.

- To perform this query, open the Markers database by using the main navigation bar of Gramene.
- Use the Marker navigation bar to open the Marker Search function.
- Type "*" in the "Marker Name" box and select "Maize" from the "Species" drop-down menu.

Show me all the maize QTL in Gramene.

- To perform this query, open the QTL database by using the main navigation bar of Gramene.
- Use the QTL navigation bar to open the QTL Simple Search function.
- Type "*" in the "Search for" box and select "Maize" from the "Species" drop-down menu.
- A QTL search results page will appear with a list of all Maize QTL in Gramene.
- Note: Maize can be replaced by another species to perform similar QTL searches.

- In the "Restrict Reference Sets By" section, select maize from the "All Species" field, and then click on "Submit."
- A Matrix results table will appear. Down the page vertically, all the maize maps will appear. Across the page horizontally, all the other maps in CMap will appear.
- Scroll horizontally until you reach the rice section. The numbers in the individual cells indicate the number of correspondences the maps contain, i.e., the greater the number, the better the maize map to compare to rice.
- Note: Maize can be replaced with any other species in Gramene to perform similar searches.

Show me a syntenic region between maize and rice.

- Using the above example, examine the numbers in the Matrix table.
- The GR TIGR Assembly and IBM2 Neighbors 2004 have a large number of correspondences. Selecting that number will display a Matrix table that will display the individual number of correspondences for each chromosome.
- Maize chromosome 1 and rice chromosome 3 have a large number of correspondences. Selecting that number will display a comparative map view of the two maps.

Gramene Modules

- Genomes [Ensembl]
  - ESTs, markers, genes, etc. from Poaceae on rice, maize & Arabidopsis
- BLAST
  - Sequence similarity search to genomes
- Maps [CMap]
  - Comparative map viewer
  - Genetic, physical, sequence & QTL maps
- Markers
  - Find markers and map positions
  - View marker details

- Proteins
  - Grass proteins from Swissprot & TrEMBL
  - Cellular locations and functions
- Genes
  - Genes and alleles associated with phenotype
- QTL
  - Quantitative trait loci from major cereal crops
- Ontologies
  - Controlled vocabularies
- Literature

Maize Genome Browser

Browse the Maize genome (Zea mays)

Current Release

Assembly

The Gramene Browser for maize presents results from the Maize Genome Sequencing Project.

Further details are available from the MaizeSequence.org web site.

Accessioned BAC Browser

▸ The BAC database contains the 504 full-length Zea mays clones deposited with GenBank as of 26-Jan-2006.

▸ Sequences from various grass species including rice and maize were mapped to the BACs using the Gramene pipeline. E.g. AC149836. Mapping results for the sequence data sets are available in detailed form.

▸ Gene models were predicted using the FGENESH HMM-based *ab initio* gene prediction program, and their domains annotated using interproscan. E.g. FGENESHP0005329

▸ Putative orthologs between rice, *Arabidopsis* and maize gene models were generated using Ensembl's compara pipeline. E.g. FGENESHG0005329

Maize Agarose FPC Map

▸ The FPC database contains the 721 contigs from the AGI 19 Jul 2005 agarose map. [more] [citation]

▸ Accessioned BACs within the FPC map have been highlighted. E.g. ctg3

▸ Syntenic regions between the maize FPC map (AGI maize FPC map released on April 5, 2006) and the rice genome (TIGR v4) were estimated, and loaded into Ensembl. E.g. Maize chr9 Vs Rice

▸ The accessioned BACS will be merged into the FPC map database in the near future.

Entry Points

Lookup an Accessioned BAC

BAC: AC007410 (30650bp) ▾ Go

Lookup an AGI FPContig

FPC: ctg1 (2101248bp) ▾ Go

Browse by FPC Map Chromosome

1 2 3 4 5 6 7 8 9 10
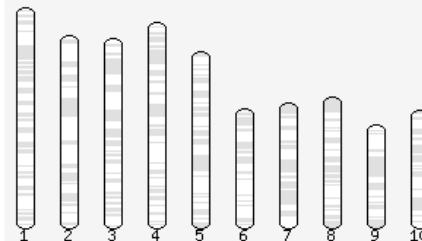
Lookup a Chromosome Location

Chr: 1 ▾ from 1M - 2M Go

FPC Synteny Vs. Rice Genome

Maize Chr 1 vs. Rice ▾ Go

Synteny Viewer
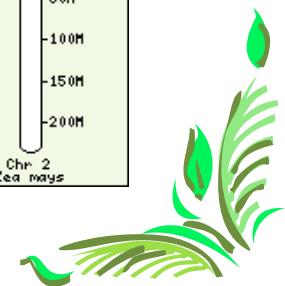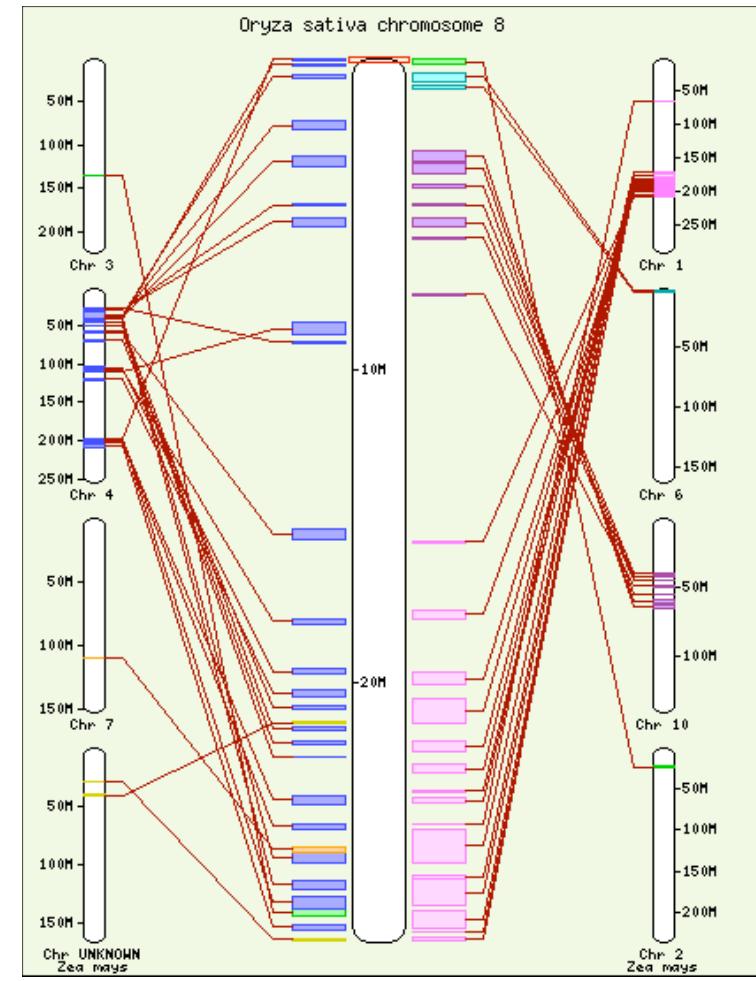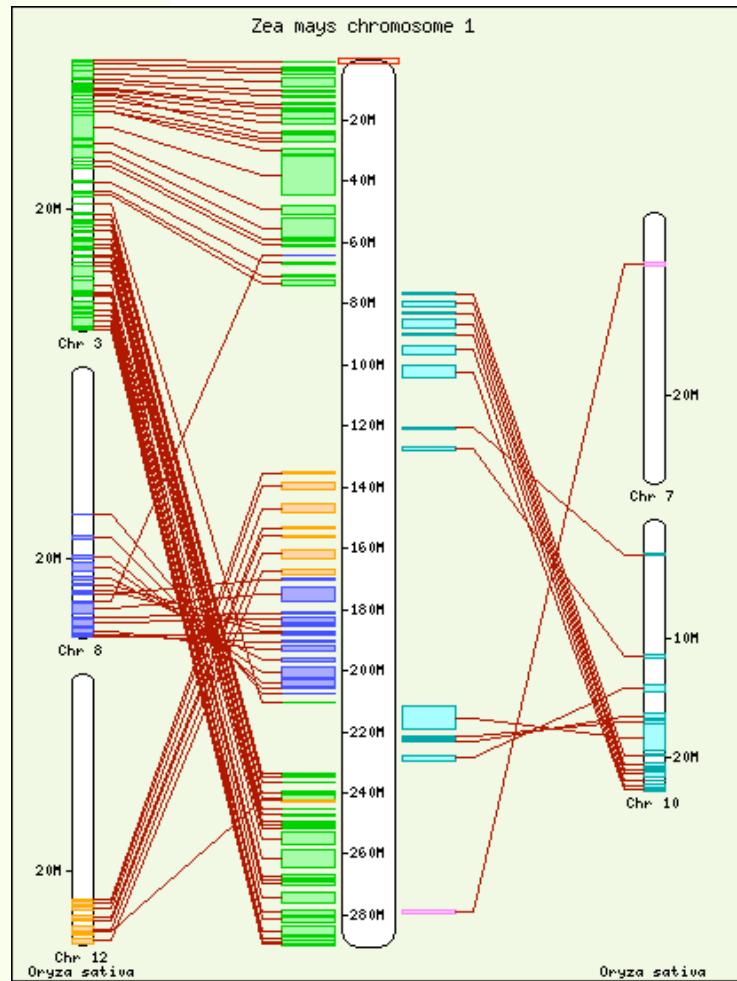
Maize Genome Viewer
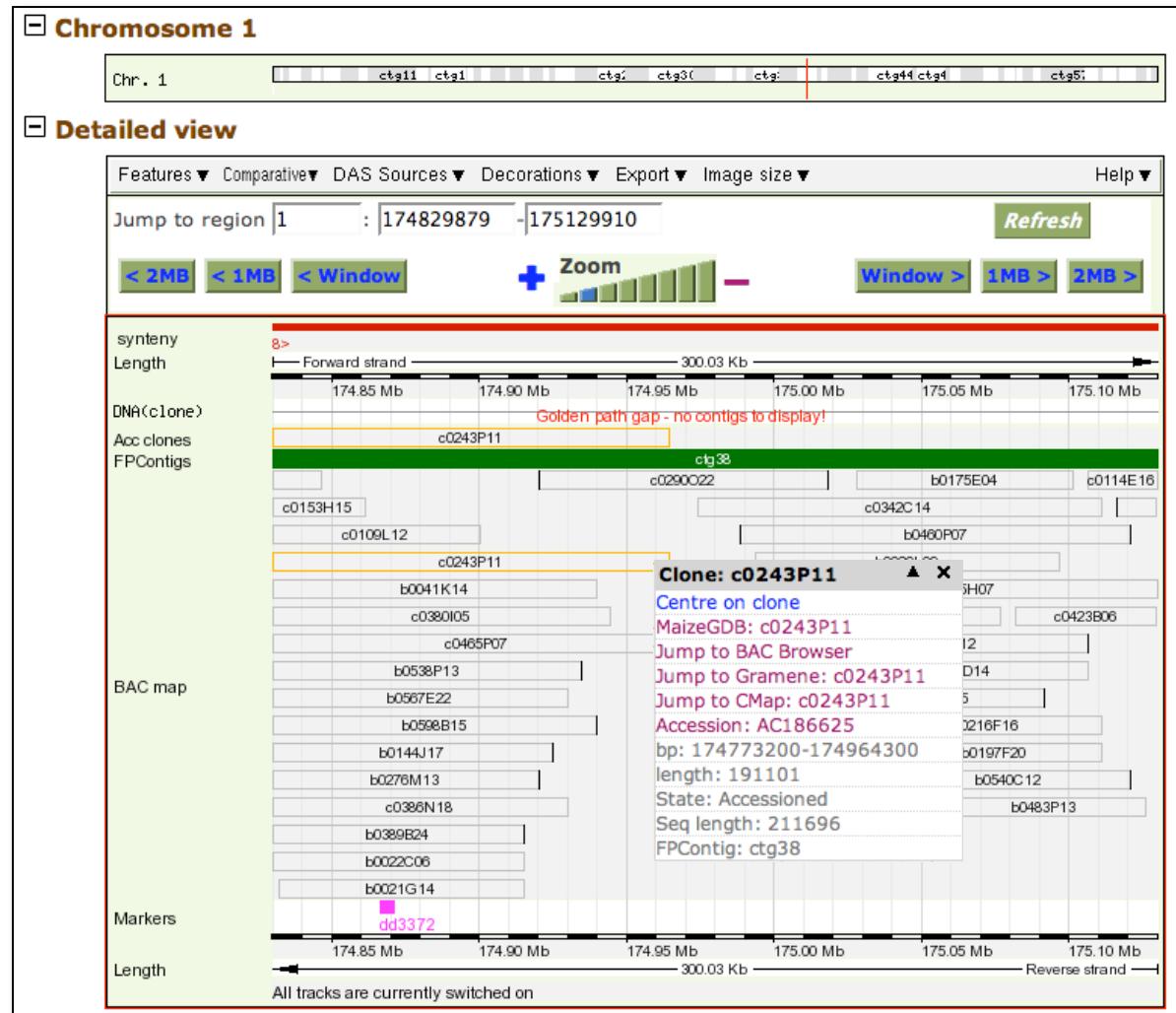
Rice Genome Viewer
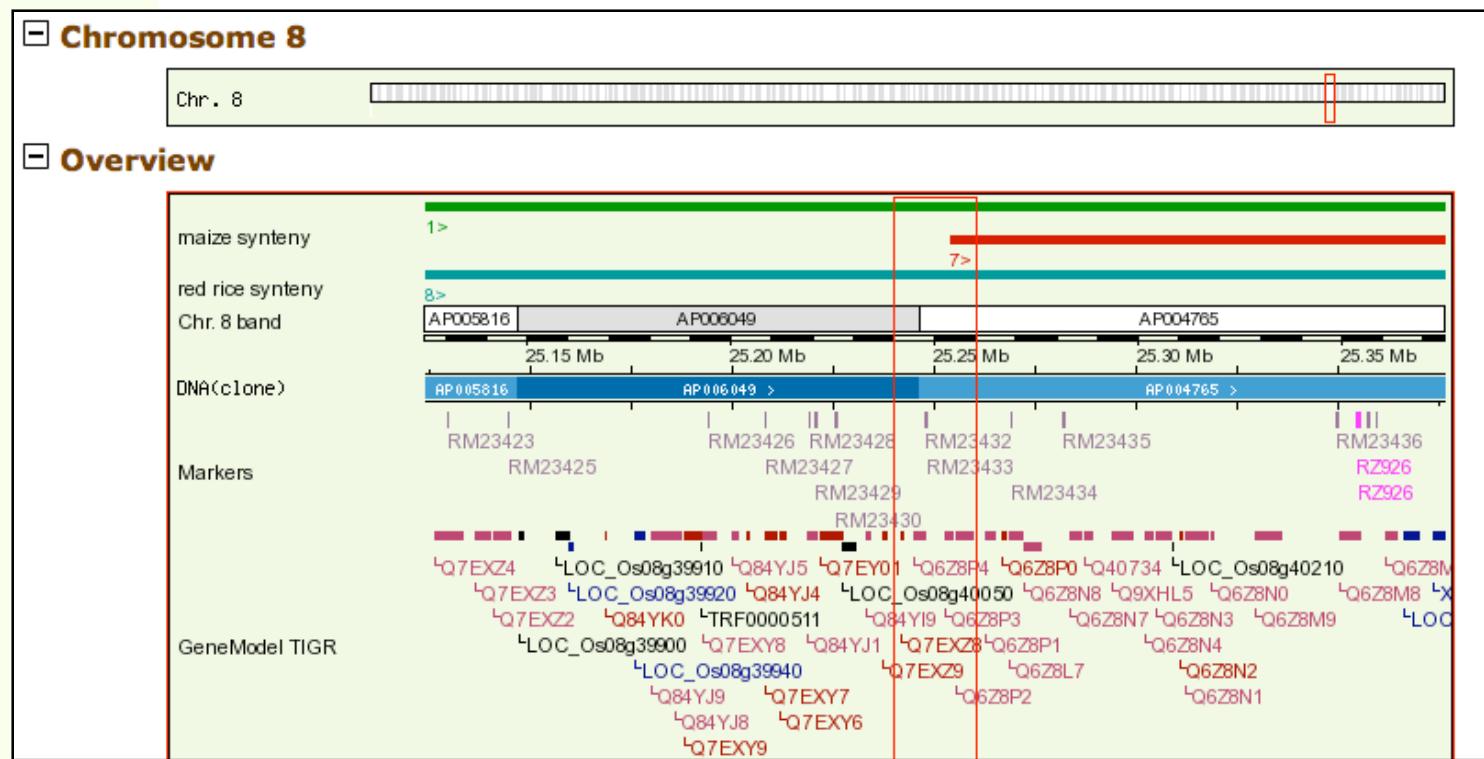
Rice Genome - Detailed View
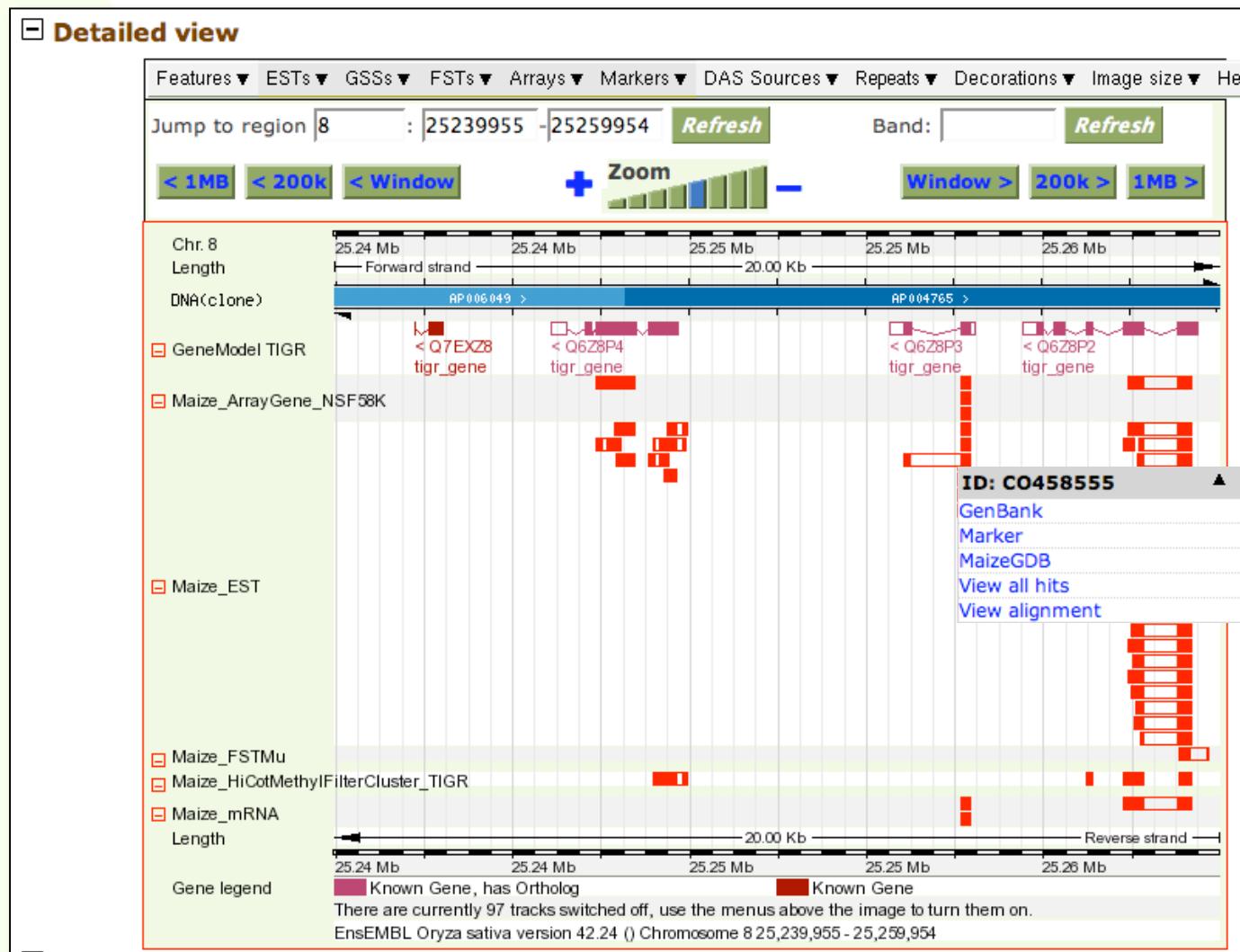
Maize Maps

- Physical
- Genetic
  - IBM 2002
  - IBM neighbors 2002
  - IBM2 neighbors 2004
  - SSR IBM 2001
  - BNL 1996
  - UMC 1998
  - CU 1999

- Bin
- QTL
  - MISCU H123/AG19 BC1 QTL 2003
  - NCSU B73/Mo17 QTL 1992
  - INRA Io/F2 Composite QTL 1996
  - Iowa Mo17/H99 RI QTL 1996
  - CIMMYT Ac7729/Ac7643S QTL 1996
  - Bologna Os420/Iab78 QTL 1998

Maize Bin Map
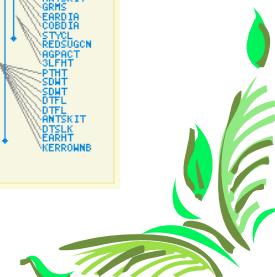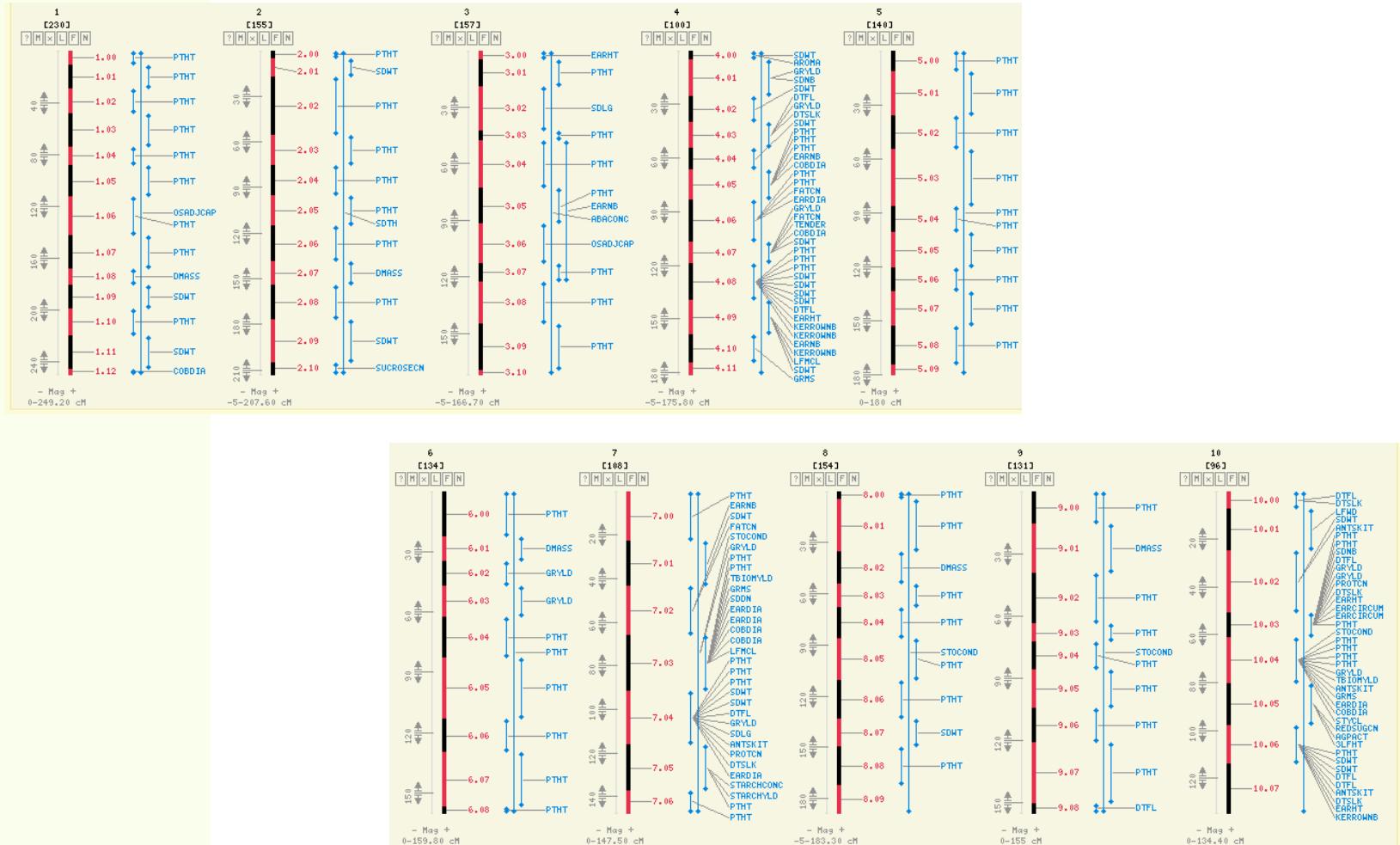
Maize chr 1
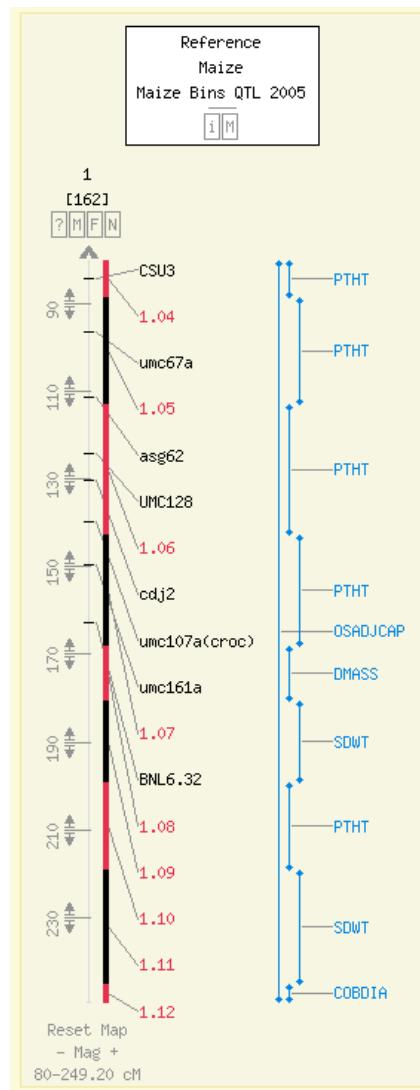
Maize chr 1
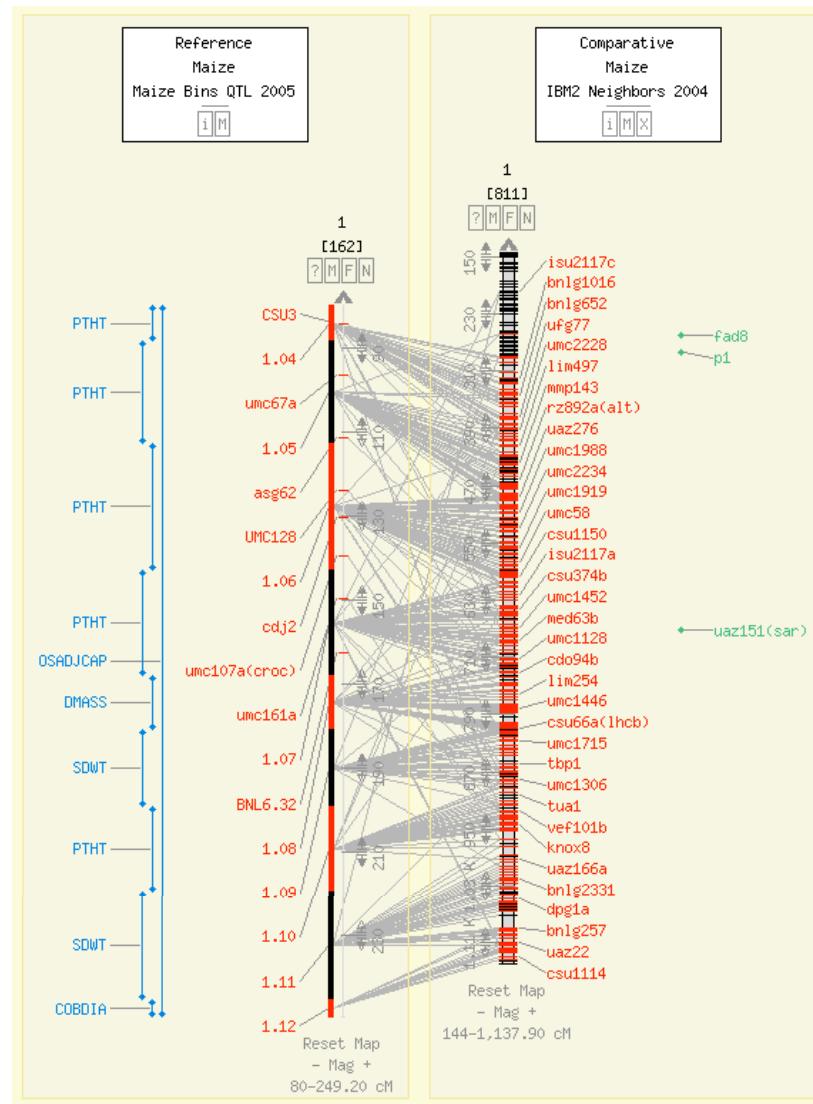
Rice chr 8 - maize chr 1
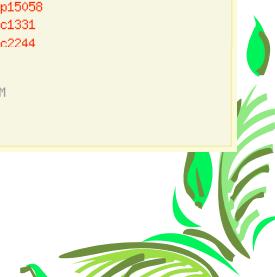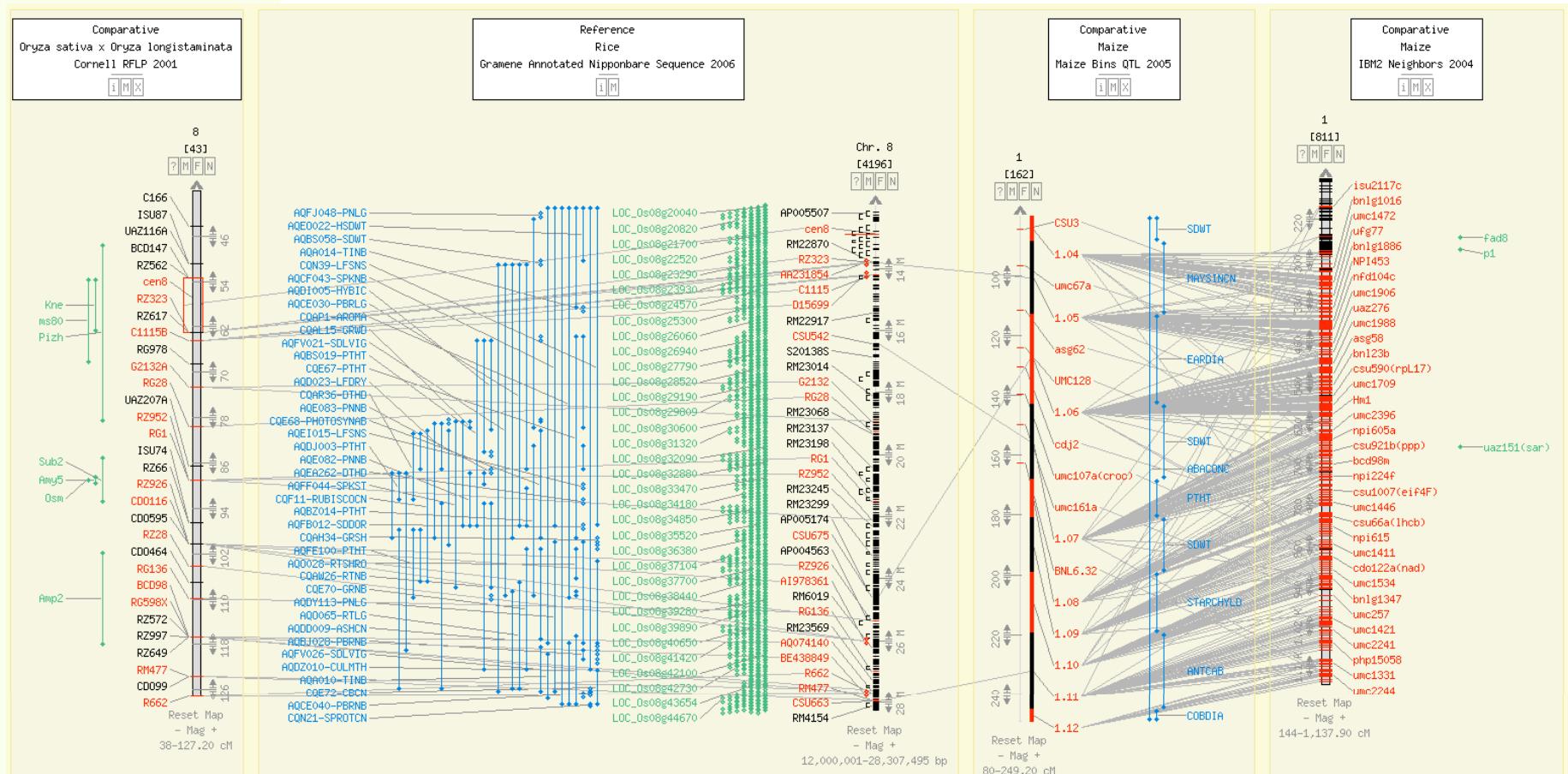
Marker Database

View Maize RFLP "CSU675"

Details	Source/Library	Map Positions (8)	Associations (5)	Images (0)

ID	4273
Name	CSU675
	csu675a(prh)　　　　csu675b(prh)
	CSU675E3　　　　csuh00675

Details	Source/Library	Map Positions (8)	Associations (5)	Images (0)

Species	Map Type	Map Set	Name	Map	Start	Stop	Map Links	Comments
Oryza sativa (Rice)	Sequence	Gramene Annotated Nipponbare Sequence 2006	CSU675	Chr. 8	24,568,487 bp	24,568,660 bp	View in Genome Browser / View Comparative Map	
Sorghum bicolor (sorghum)	Genetic	Paterson 2003	CSU675	J	3.8 cM		View Comparative Map	
Zea mays (Maize)	Genetic	IBM neighbors	csu675a(prh)	1	479 cM		View Comparative	

Details	Source/Library	Map Positions (8)	Associations (5)	Images (0)

| Direction	Name	Type	Species	Analysis	Assoc. Type
To	AA072449	EST	Zea mays	gss_poaceae	shared_synonym
To	SOG0631	OVERGO	Zea mays	SOG_OVERGO	related_probe
From	AA072449	EST	Zea mays	gss_poaceae	shared_synonym
From	Bin 1.06	Maize Bin	Zea mays subsp. mays	bin_marker	bin_marker
From	Bin 8.01	Maize Bin	Zea mays subsp. mays	bin_marker	bin_marker
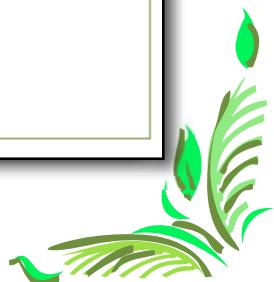
Ontologies

- **Plant ontology**
  - Plant structure (morphology, organs, tissue and cell types)
  - Growth stages

- **Trait ontology**
  - Plant traits and phenotypes

- **Gene ontology**
  - Molecular functions
  - Biological processes
  - Cellular components

- **Environment ontology**
- **Taxonomy ontology**

Taxonomy Ontology

Gene Ontology

Summary for GO Term: *defense response* (GO:0006952)

Term Name	defense response
Synonym	antimicrobial peptide activity, defence response, defense/immunity protein activity, GO:0002217, GO:0042829, physiological defense response.
Aspect	Biological Process
Definition	Reactions, triggered in response to the presence of a foreign body or the occurrence of an injury, which result in restriction of damage to the organism attacked or prevention/recovery from the infection caused by the attack.
External References	GOC:go_curators
Source Ontology Database Link	The GO browser of Gene Ontology Database.

- [i] evasion or tolerance of defense response of other organism during symbiotic interaction (GO:0051807) #0
- [i] cell wall thickening during defense response (GO:0052482) #0
- [i] callose deposition during defense response (GO:0052542) #0

|				
Total Number of Annotations:	1346 objects, 1359 associations Gene(9) Ensembl rice gene(470) Ensembl maize gene(18) Ensembl arabidopsis gene(368) Protein(481)			
Gene:	Oryza sativa(9)			
Ensembl rice gene:	Oryza sativa(470)			
Ensembl maize gene:	Zea mays(18)			
Ensembl arabidopsis gene:	Arabidopsis thaliana(368)			
Protein:	Aegilops tauschii(7)	Aegilops ventricosa(7)	Avena sativa(7)	Hordeum vulgare(72)	Hordeum vulgare subsp. vulgare(3)
	Lolium perenne(13)	Oryza meyeriana(6)	Oryza officinalis(2)	Oryza rufipogon(7)	Oryza sativa(26)
	Oryza sativa (indica cultivar-group)(14)	Oryza sativa (japonica cultivar-group)(196)	Pennisetum glaucum(3)	Saccharum sp.(1)	Secale cereale(1)
	Secale strictum(1)	Sorghum bicolor(17)	Thinopyrum intermedium(3)	Triticum aestivum(48)	Triticum aestivum/Thinopyrum intermedium alien addition line(2)
	Triticum monococcum(2)	Triticum turgidum subsp. durum(5)	Zea mays(38)		

Defense response proteins in maize

Term _defense response_ (GO:0006952) Associations

Items 1 to 25 of 38.   Page 1   of 2. | Next   Download

Rust resistance-like protein RP1-2

Rust resistance protein Rp1-kp3

Term Name	Object Type	Object Access			ecies	Evidence
defense response	Protein	Q8S455				IEA
defense response	Protein	Q8S458				IEA
defense response	Protein	Q8S454	206C17.1	Rust resistance-like protein RP1-3	Zea mays	IEA
defense response	Protein	Q8S453	206C17.8	Rust resistance-like protein RP1-4	Zea mays	IEA
defense response	Protein	Q9AY31	es1	Female gametophyte-specific protein ES1 precursor	Zea mays	IEA
defense response	Protein	Q9AY30	es2	Female gametophyte-specific protein ES2 precursor	Zea mays	IEA
defense response	Protein	Q9AY29	es3	Female gametophyte-specific protein ES3 precursor	Zea mays	IEA
defense response	Protein	Q9AY28	es4	Female gametophyte-specific protein ES4 precursor	Zea mays	IEA
defense response	Protein	P81008	Not available	Gamma-zeathionin 1	Zea mays	IEA
defense response	Protein	P81009	Not available	Gamma-zeathionin 2	Zea mays	IEA
defense response	Protein	Q6PT59	Not available	Rust resistance protein	Zea mays	IEA
defense response	Protein	Q8GS26	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6U5	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6U6	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6U7	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6U8	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6U9	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6V0	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6V1	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6V2	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6V3	Not available	Putative rp3 protein	Zea mays	IEA
defense response	Protein	Q8H6V4			ys	IEA
defense response	Protein	Q9AT65			ys	IEA
defense response	Protein	Q9AT66			ys	IEA
defense response	Protein	Q9AT73	Not available	Rust resistance Rp1-D-like protein	Zea mays	IEA
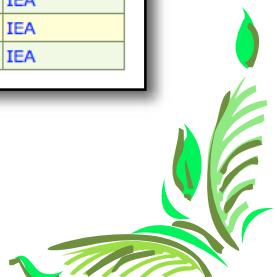
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