Cereal Genomics Workshop
Cold Spring Harbor Lab
Gramene Exercise 2 – Comparisons
9/15/05

1 – You are a sorghum breeder, working with drought tolerance. There isn't a lot of information for sorghum, so you decide to compare sorghum with rice, a species with much more information. Where do you start?

1 - Maps are commonly used for making comparisons

Select the CMap link from the Gramene Home Page, then explore map information available from Gramene.

2a - How many different map sets does Gramene currently have?

2b - How many feature types?

2c – How many map types ?

2d – How many species?

2a – 159

2b – 36

2c – 6

2d – 22

| Genome Browser | BLAST | CMap | Markers | Protein | Onto... | Gene | Literat... | Species | Resources | ...ut Gramene | Site Map |

🔲 **CMap Home** | Maps | Map Search | Feature Search | Matrix | Map Sets | Feature Types | Map Types | Evidence Types | Species | Imported Links | Help | Tutorial

Welcome to CMap - the Comparative Map Viewer. CMap allows you to view various types of maps (e.g., genetic, physical, or sequence-based) from different species and construct comparisons between them.

In this release, we present five new physical maps: one from O. glaberrima and four from wild relatives of rice. There are also eight new QTL maps: one from barley, four from rice, two from tetraploid wheat (*Triticum turgidum*) and one from wheat. Five maps have had maintenance updates but are otherwise unchanged.

New Physical Maps   **New QTL Maps**   **Maintenance Updates**

- Maize-AGI FPC Oct 2004
- Maize-Curated AGI FPC Oct 2004
- Sorghum-TAMU FPC 2004
- O. nivara-OMAP O. nivara FPC 2005
- O. rufipogon-OMAP O. rufipogon FPC 2005

Map Set Info

Restrict by Species: Restrict by Map Type:

–All Species–   –All Map Types–

Submit

Items 1 to 25 of 159.   Page | 1 | of 7 | Next

Featu... Type Info

Display: –All Featur... ...es–   Submit

Items 1 to 25 of 36.   Page | 1 | of 2 | Nex...

Map Type In...

Display: –All Map Types–   Submit

Items 1 to 6 of 6.

Species Info

Display: –All Species–   Submit

2   Items 1 to 22 of 22.

Go to the Matrix, which shows correspondences between a pair of maps. Select sorghum from the species menu and search for maps.

3a - How many sorghum maps are there?
3b - What type(s) are they?
3c – Examine the maps with correlations to these sorghum maps. Which rice map has the highest number of correspondences to sorghum? *Hint, Correspondences are represented by the first number in the square.)*

3a – There are 2 sorghum maps, Klein 2004 and Paterson 2003
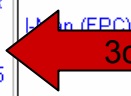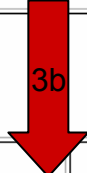3b – Both are Genetic maps
3c – The GR TIGR Assm IRGSP Seq 2005

Welcome to the Matrix

Each cell in the matrix shows the number of correspondences between a pair of maps. A correspondence is any relationship between two features.

Restrict Reference Sets By: —All Map Types— ▼   Sorghum ▼   —All Map Sets— ▼   —All Maps— ▼   ☐ Use Colors

Reference Set		Sequence		Physical							
		Rice	Rice	O. alta	O. australiensis	O. brachyantha	O. glaberrima	O. nivara	O. punctata	O. rufipogon	
		GR TIGR Assm IRGSP Seq 2005	I-Map (FPC) ... LETE]	AGI FPC ...	OMAP O. alta FPC 2005	OMAP O. australiensis FPC 2005	OMAP O. brachyantha FPC 2005	OMAP O. glaberrima FPC 2005	OMAP O. nivara FPC 2005	OMAP O. punctata FPC 2005	OMAP O. rufipogon FPC 2005	AG FF Oι 20ι
Genetic Sorghum	Klein 2004	45 (15)	-	12	-	-	-	-	-	-	-	5
	Paterson 2003	2071 (108)	137	124	-	-	-	-	-	-	-	8
		GR TIGR Assm IRGSP Seq 2005	I-Map (FPC) [OBSOLETE]	AGI FPC 2002 [OBSOLETE]	OMAP O. alta FPC 2005	OMAP O. australiensis FPC 2005	OMAP O. brachyantha FPC 2005	OMAP O. glaberrima FPC 2005	OMAP O. nivara FPC 2005	OMAP O. punctata FPC 2005	OMAP O. rufipogon FPC 2005	AG FF Oι 20ι

Select the box in the matrix with the highest number of correspondences to rice.
 4 - For each sorghum chromosome determine what rice chromosome has the highest number of correspondences with it.

Click on the Paterson 2003/GR TIGR Assm IRGSP Seq 2005
4 – A1, B7, C3, D4, E12, F2, G5, H11, I6, J8

Welcome to the Matrix

Each cell in the matrix shows the number of correspondences between apair of maps. A correspondence is any relationship between two features.

Restrict Reference Sets By: [—All Map Types— ▾] [Sorghum ▾] [Genetic-Sorghum-Paterson 2003 ▾] [—All Maps— ▾] ☐ Use Colors [Submit]

Reference Set			Sequence												Reference Set	
			Rice													
			GR TIGR Assm IRGSP Seq 2005													
			Chr. 1	Chr. 2	Chr. 3	Chr. 4	Chr. 5	Chr. 6	Chr. 7	Chr. 8	Chr. 9	Chr. 10	Chr. 11	Chr. 12		
Genetic	Sorghum Paterson 2003	A	205 (1)	14 (1)	5 (1)	8 (1)	9 (1)	2 (1)	4 (1)	11 (1)	5 (1)	2 (1)	-	7 (1)	A	Sorghum Paterson 2003	Genetic
		B	17 (1)	5 (1)	33 (1)	4 (1)	5 (1)	11 (1)	98 (1)	15 (1)	71 (1)	1 (1)	3 (1)	7 (1)	B		
		C	34 (1)	13 (1)	232 (1)	20 (1)	7 (1)	15 (1)	13 (1)	21 (1)	21 (1)	47 (1)	20 (1)	18 (1)	C		
		D	4 (1)	13 (1)	8 (1)	83 (1)	11 (1)	4 (1)	6 (1)	9 (1)	-	2 (1)	4 (1)	2 (1)	D		
		E	6 (1)	4 (1)	14 (1)	2 (1)	11 (1)	4 (1)	-	4 (1)	-	4 (1)	15 (1)	28 (1)	E		
		F	7 (1)	165 (1)	10 (1)	4 (1)	4 (1)	14 (1)	7 (1)	-	5 (1)	4 (1)	11 (1)	2 (1)	F		
		G	21 (1)	4 (1)	17 (1)	2 (1)	81 (1)	3 (1)	3 (1)	-	-	5 (1)	2 (1)	11 (1)	G		
		H	6 (1)	8 (1)	8 (1)	2 (1)	4 (1)	2 (1)	-	16 (1)	4 (1)	-	62 (1)	7 (1)	H		
		I	7 (1)	27 (1)	28 (1)	6 (1)	5 (1)	122 (1)	-	2 (1)	4 (1)	2 (1)	-	8 (1)	I		
		J	2 (1)	2 (1)	7 (1)	6 (1)	3 (1)	5 (1)	-	72 (1)	15 (1)	1 (1)	2 (1)	3 (1)	J		
			Chr. 1	Chr. 2	Chr. 3	Chr. 4	Chr. 5	Chr. 6	Chr. 7	Chr. 8	Chr. 9	Chr. 10	Chr. 11	Chr. 12			
			GR TIGR Assm IRGSP Seq 2005														

There is a known sorghum QTL for drought tolerance located at the bottom of Chromosome C.

5a- Is there a known rice QTL to drought tolerance in rice in the syntenic position on Chromosome C? *(Hint – you will need to compare maps)*

5a –Search QTL for drought tolerance. This was done in exercise 1, and there were 6 QTL for drought tolerance on rice from chromosomes 1, 3, 4, 5, 8 and 12. Sorghum C has high correspondences with rice chromosome 3, so you should compare these maps. Select the map position for rice chromosome 3.

From QTL search (Exercise 1)

Species	Trait Name	Trait	Linkage Group	Trait Category	Trait Symbol	Published Symbol	QTL Accession ID	Map	Position
Rice		Drought resistance	4	Abiotic stress	DRTL	NA	AQAN004	Rice-IGCN ZYQ18/JX17 DH QTL 1998-4	162.60-162.60 cM
			8	Abiotic stress	DRTL	NA	AQAN005	Rice-IGCN ZYQ18/JX17 DH QTL 1998-8	96.50-96.50 cM
Rice	tolerance	Drought resistance	3	Abiotic stress	DRTL	NA	AQAN006	Rice-IGCN ZYQ18/JX17 DH QTL 1998-3	11.30-11.30 cM
Rice	Drought tolerance	Drought resistance	5	Abiotic stress	DRTL	qDT-5	AQAN001	Rice-IGCN ZYQ18/JX17 DH QTL 1998	131.60-134.90 cM
Rice	Drought tolerance	Drought resistance	12	Abiotic stress	DRTL	qDT-12	AQAN002	Rice-IGCN ZYQ18/JX17 DH QTL 1998-12	69.10-93.60 cM
Rice	Drought tolerance	Drought resistance	1	Abiotic stress	DRTL	NA	AQAN003	Rice-IGCN ZYQ18/JX17 DH QTL 1998-1	97.30-97.30 cM

Items 1 to 6 of 6
[Download Data]
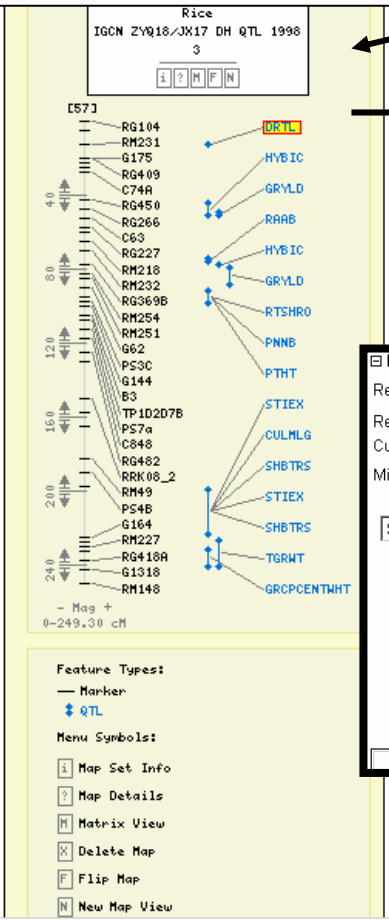
From this map, go below the map to select a comparison map. Select the TIGR Assembly IRGSP (2005) to compare the QTL map with a well-documented sequence map showing many features in that area. (be sure to click "redraw map."
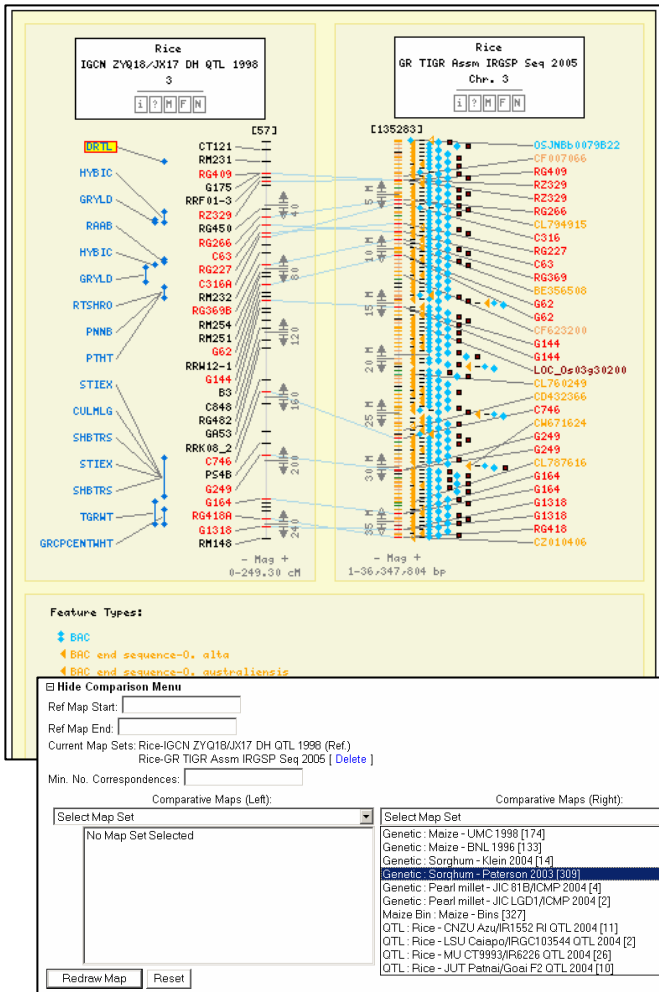
You will see that there are several relationships between the QTL map and the sequence map. You will compare this pair of maps to a map of sorghum by adding the Paterson sorghum map for comparison. Select Chromosome C because it has the most correspondences.
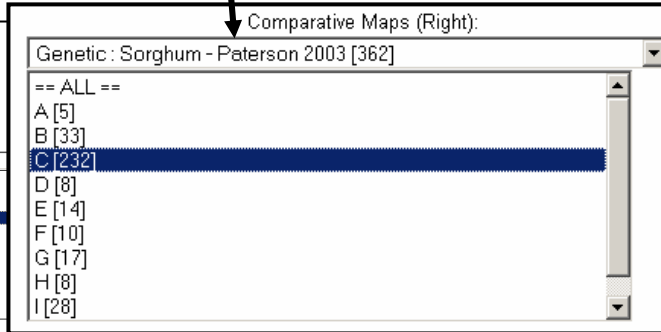
In this case there is synteny between the region of the drought tolerance QTL in rice chromosome 3 and the Sorghum Chromosome C.
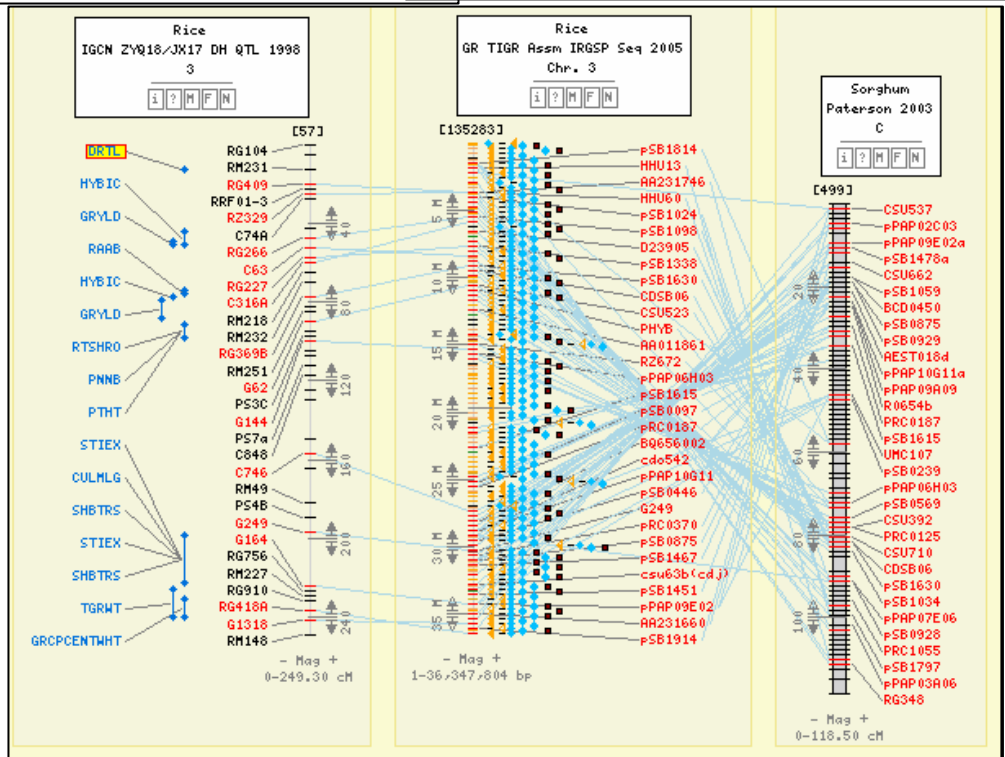
We can flip the sorghum map for easier comparison
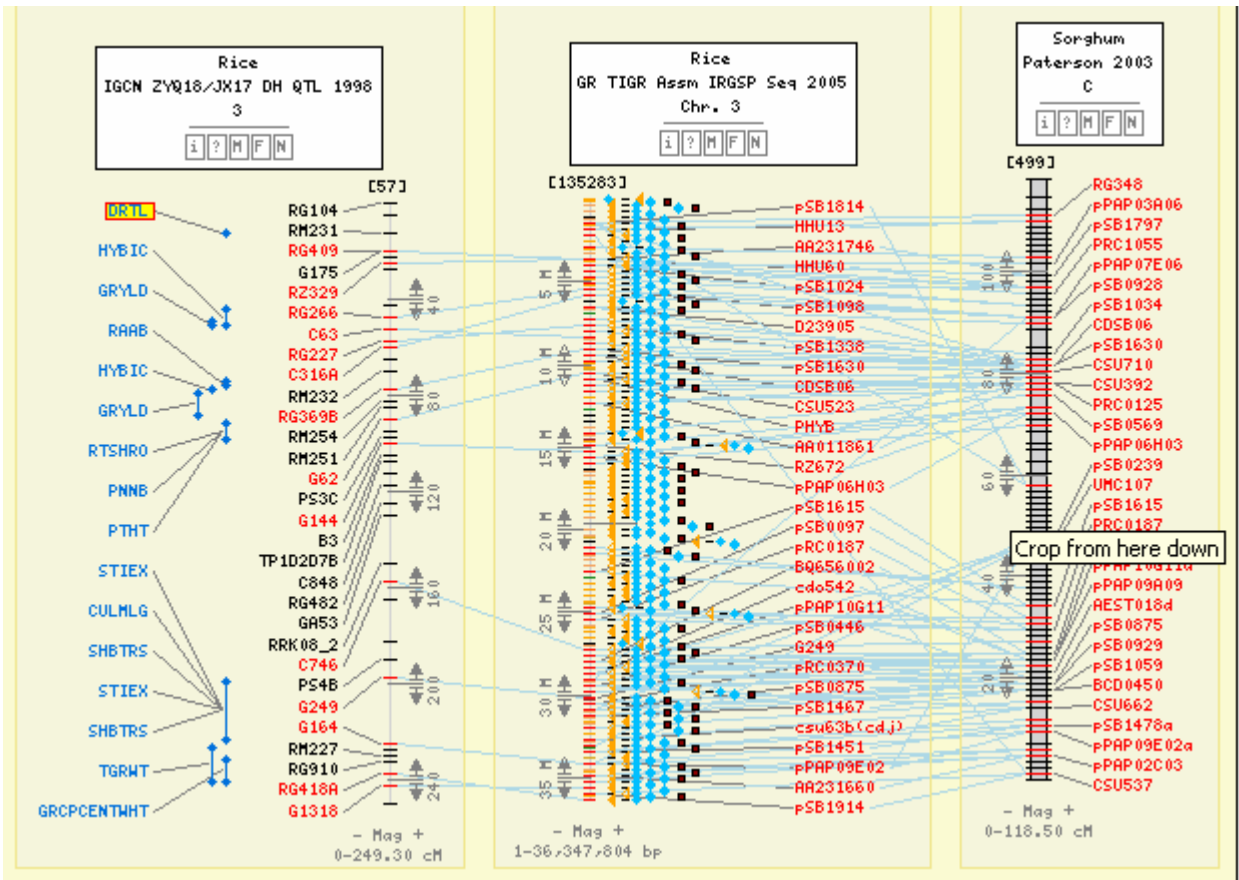
5b If so what is the accession ID for the QTL?

5b – Either refer back to the results from Exercise 1, or click on the QTL "DRTL" for information on it, and see it is AQAN006.

Feature "DRTL"

Feature Name: DRTL
Aliases: Drought tolerance   [View Alias Details]
Accession ID: AQAN006
Feature Type: QTL   [View Feature Type Info]
Map: Rice-IGCN ZYQ18/JX17 DH QTL 1998-3   [View Map Details]
Start: 11.30 cM
Stop: 11.30 cM
Cross-references: [QTL Detail Page]

Correspondences

No correspondences to show.