

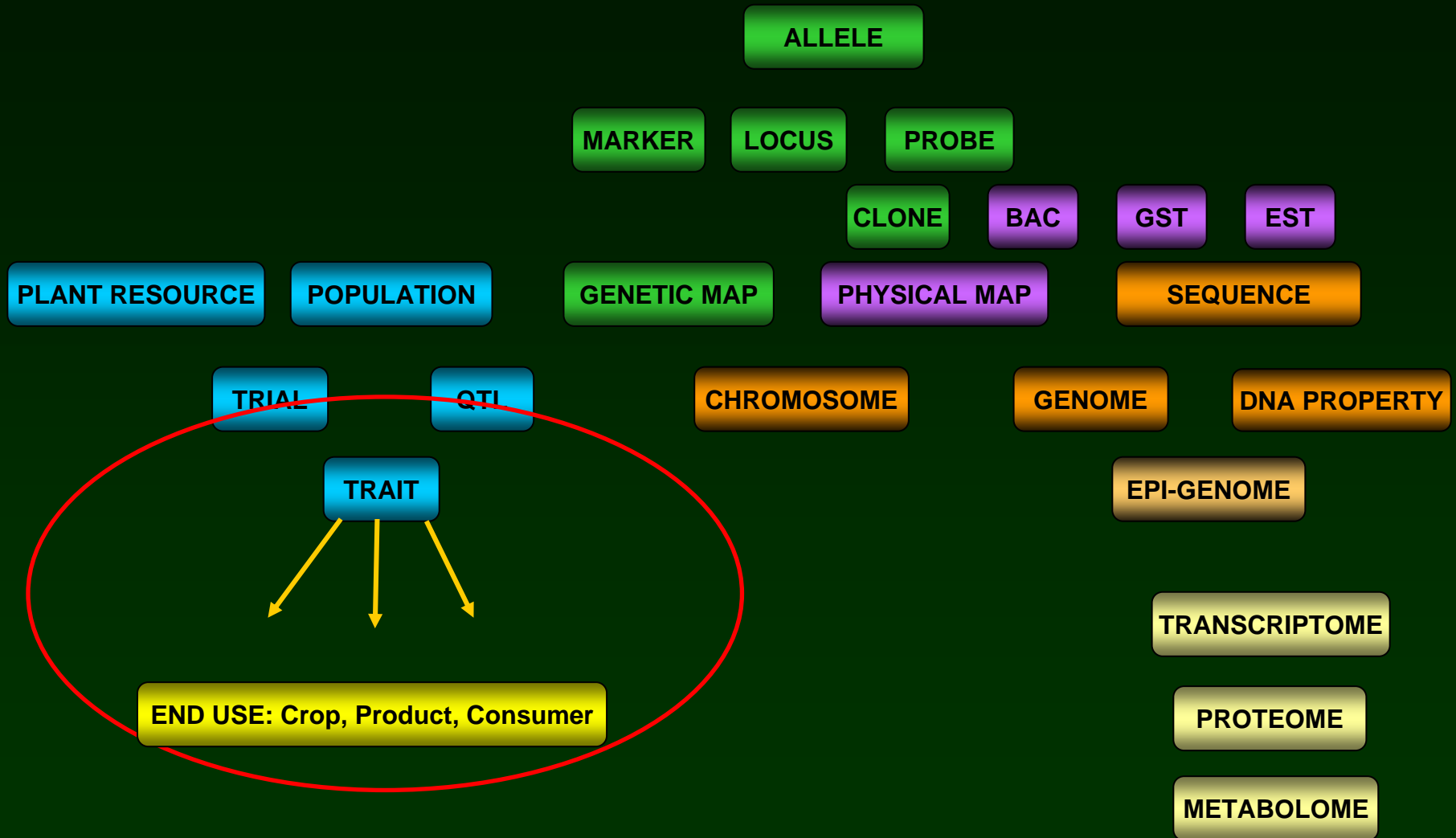


OREGIN – *wider networking & data collation*

Graham J. King



'Joined-up Crop Genetics' : information management






+



?

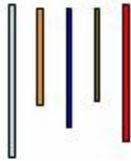
Plant Resource Database developments

- 
- adopt GERMIMATE as public-domain repository
 - collate and curate data locally in CropStore
 - use agreed **nomenclature**
 - input template spreadsheets
 - parse into GERMIMATE
 - Perl-cgi **Web interface**

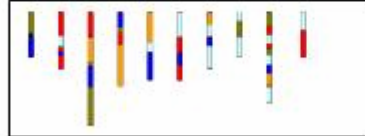
Brassica: U's triangle



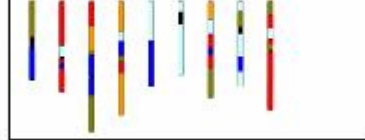
Arabidopsis



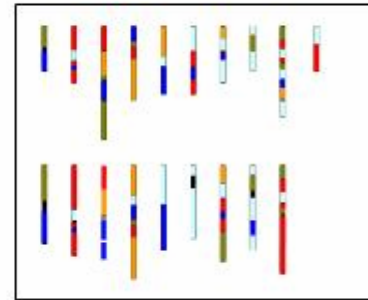
A genome: *B. rapa*, n=10



C genome: *B. oleracea*, n=9



***B. napus*, n=19 (Oilseed Rape)**



AC genome



Mb



B. rapa

A = 10

~480Mb



Sequence – tagged genetic maps



B. rapa

CKDH

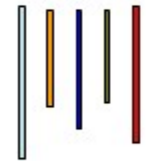
JWF3

IMB211 x R500 (RI)

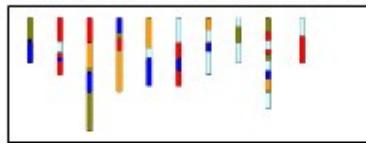
545 STS (1 per Mb) + 500 sequenced anchor BACs

254 STS (236 SSR)

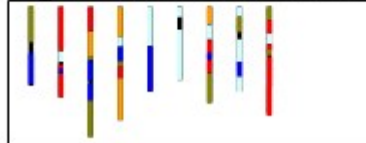
Arabidopsis



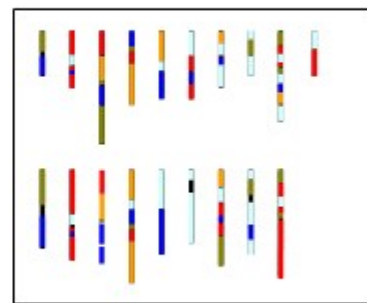
A genome: *B. rapa*, n=10



C genome: *B. oleracea*, n=9



***B. napus*, n=19 (Oilseed Rape)**



AC genome

B. napus

TNDH

DYDH

TV_subst.

Lowe et al.

Parkin et al. 1317 STS

B. oleracea

AGDH

NGDH

+ Lan et al.

Babula et al.

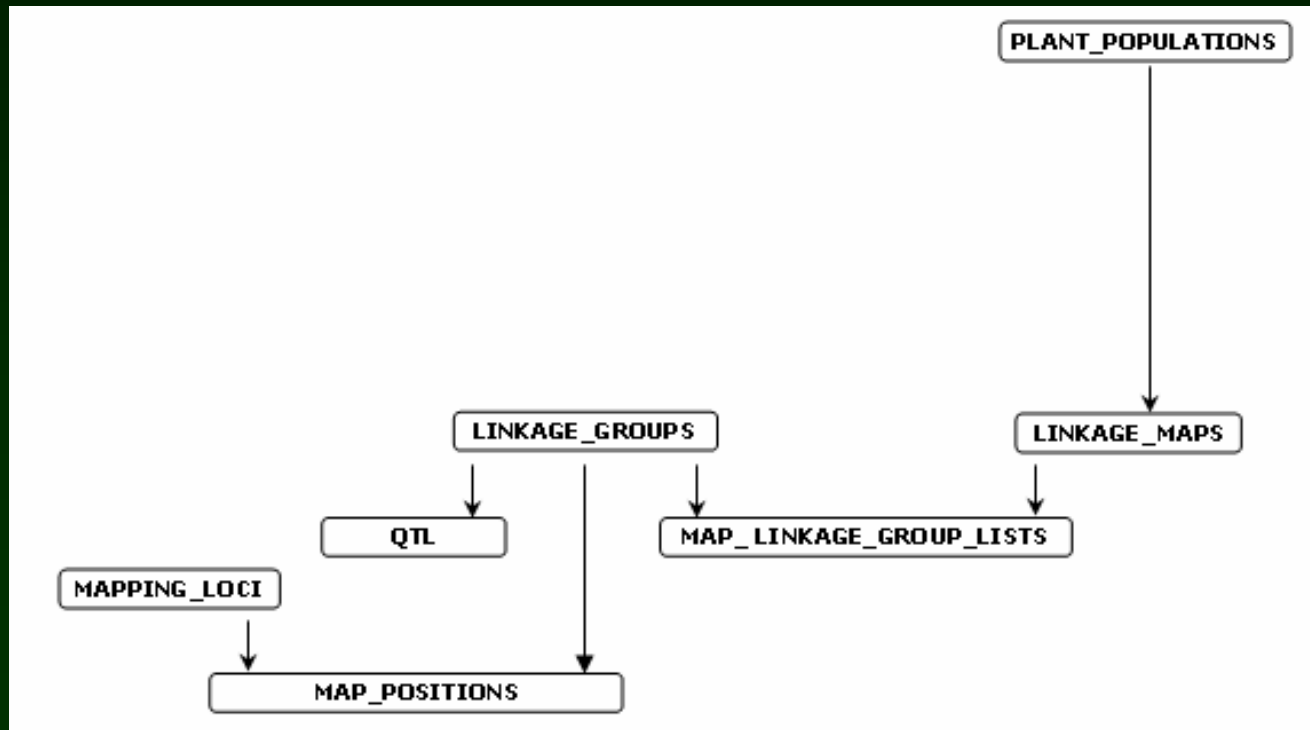
etc..

367 STS

212 STS

Data collation:

Linkage maps



OREGIN data presented from GERMINATE interface



Experiment ID | **Population Name** | **Population Description**

3	BolAGDH_Set_0	A12DHd x GDDH33 segregating DH population canonical set of 209 lines; "AG"
---	---------------	--

Additional information and the plant line array associated with the population are retrieved by clicking on the population name

Population 'BolAGDH_Set_0' Information

Population Information	Value
Population ID	3
Population Name	BolAGDH_Set_0
Date Established	1999-12-31
Submitting Author	Graham King
Population Description	A12DHd x GDDH33 segregating DH population canonical set of 209 lines; "AG"

Population Additional Information

Value	BolAGDH_Set_0' Addition Information
Data comments	Reference: Sultan BB, Kothari, Parkin SP, Sharpe AJ, Lydiate DJ (1998). Alignment of the conserved C genomes of Brassica oleracea and Brassica napus.
Organisation	John Innes Centre, Norwich
Established by	Graham King
Population type	Doublet Hybrid
Male parent line	G03423
Female parent line	G12014

Plant Lines For Population: 'BolAGDH_Set_0'

Additional information and the accessions array associated with the plant line are retrieved by clicking on the plant line name

Plant Line ID	Plant Line Name
1	AGDH1001
2	AGDH1002
3	AGDH1003
4	AGDH1004
5	AGDH1005

Plant Line Additional Information

Value	AGDH1004 Addition Information
DATA STATUS	public
DATA OWNED BY	public
DATA PROVENANCE	P. Bohuon thesis;
DATE ENTERED	unspecified
ENTERED BY	Graham King

Accessions for Plant Line: 'AGDH1004'

Additional information associated with accession is retrieved by clicking on the accession name

Plant Line	Accession
AGDH1004	GK98024
AGDH1004	GK97924
AGDH1004	GK00219
AGDH1004	GK00196
AGDH1004	GK00185

Accession: 'GK98024' Additional Information

Value	Accession: 'GK98024' Addition Information
Derivation	single plant
Originator	EMC
Ownership	EMC
Organisation	unspecified
Year	1997
Pollination	bud self
Harvested	unspecified
Female parent line	GK97924
Male parent line	GK97924
Data comments	none
Data entered by	unspecified
Date entered	unspecified
Data provenance	EMC
Data Owned by	unspecified
Status	unspecified
Data entry confirmed by	EMC

- Populations (TN, DY, et al)
- *BnDFS*, *BnDFFS*
- Maps (TN, DY, Parkin et al.)
- Marker loci and sequence-tags
- Links to A and C genome maps

Brassica linkage maps, in GERMINATE with CMAP (GMOD) viewer



Maps in database 'acc3'
(Click on a map name to retrieve more information and access the data)

Map information and linkage groups are retrieved by clicking on the map name

Map ID	Map Name	Map Description
1	BoIAG_1999_A	B.oleracea AG, Teakle & King, 1999
2	BoIAG_1996_A	Bohuon et al. (1996), TAG 93: 833-39

Dataset 'BoIAG_1999_A' Information

Genetic Linkage Map Information		Value
Map ID		1
Map Name		BoIAG_1999_A
Date Established		1999-08-11
Submitting Author		Graham King@iberc.ac.uk
Map Description		B.oleracea AG, Teakle & King, 1999

Method Information		Value
Method ID		0
Method Name		Linkage groups
Method Description		Linkage groups for genetic mapping

Metadata Information		Value
ID		2
Name		genetic data for mapping, text arrays
Abbreviation		mapping data
Description		sets of genetic data used for mapping scored as text arrays

Linkage Groups For BoIAG_1999_A

Linkage Group ID	Linkage Groups Assigned to	LOD Threshold	LO Total Length	Browse Maps
1	BoIAG_1999_A_01	01	unspecified	View Map (Using CMAP)
2	BoIAG_1999_A_02	02	unspecified	View Map (Using CMAP)
3	BoIAG_1999_A_03	03	unspecified	View Map (Using CMAP)
4	BoIAG_1999_A_04	04	unspecified	View Map (Using CMAP)
5	BoIAG_1999_A_05	05	unspecified	View Map (Using CMAP)
6	BoIAG_1999_A_06	06	unspecified	View Map (Using CMAP)
7	BoIAG_1999_A_07	07	unspecified	View Map (Using CMAP)
8	BoIAG_1999_A_08	08	unspecified	View Map (Using CMAP)
9	BoIAG_1999_A_09	09	unspecified	View Map (Using CMAP)

Linkage group information, loci and the corresponding positions are retrieved by clicking on the linkage group name

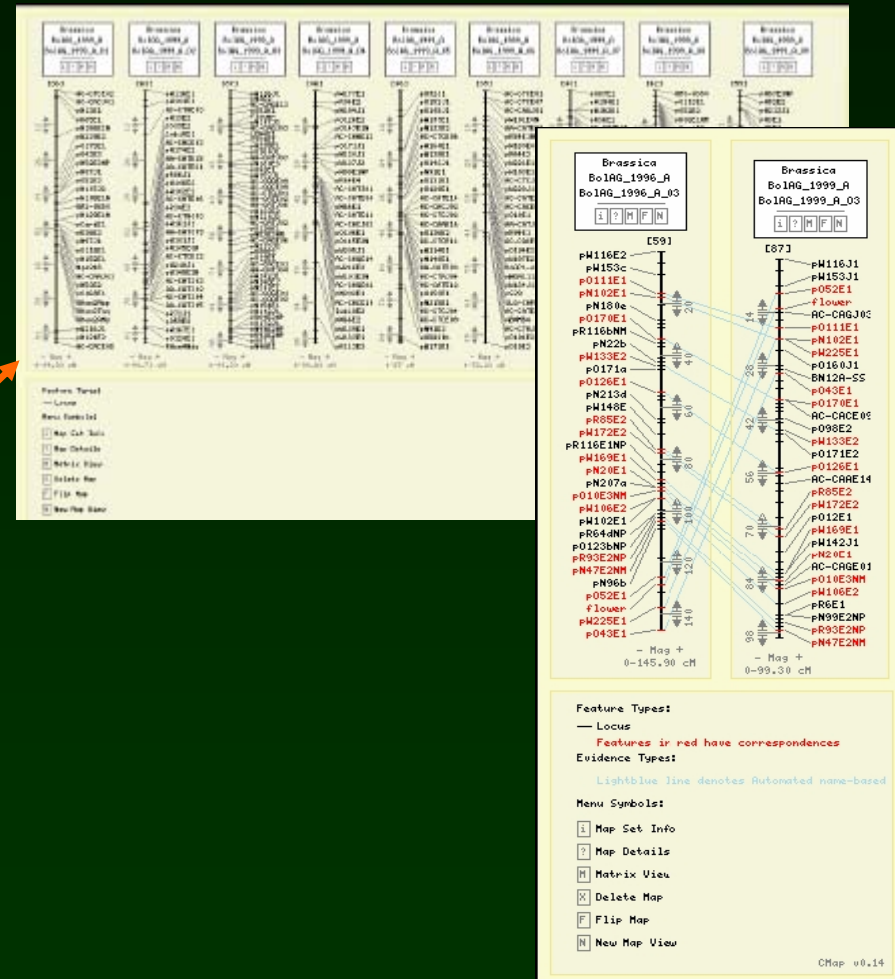
Linkage Group 'BoIAG_1999_A' Additional Information

Type	Linkage group: 'BoIAG_1999_A_01' Additional Information
Linkage groups total length :	unspecified
LOD Threshold for linkage groups :	unspecified
Date assigned to :	01
Data assignments :	Geno data to text (germinate, although should be accurate)
Data entered by :	graham.king@iberc.ac.uk
Data provenance :	graham.teakle@warwick.ac.uk
Data owned by :	Warwick HRI
Data entry confirmed by :	graham.king@iberc.ac.uk

Loci positions For BoIAG_1999_A_01

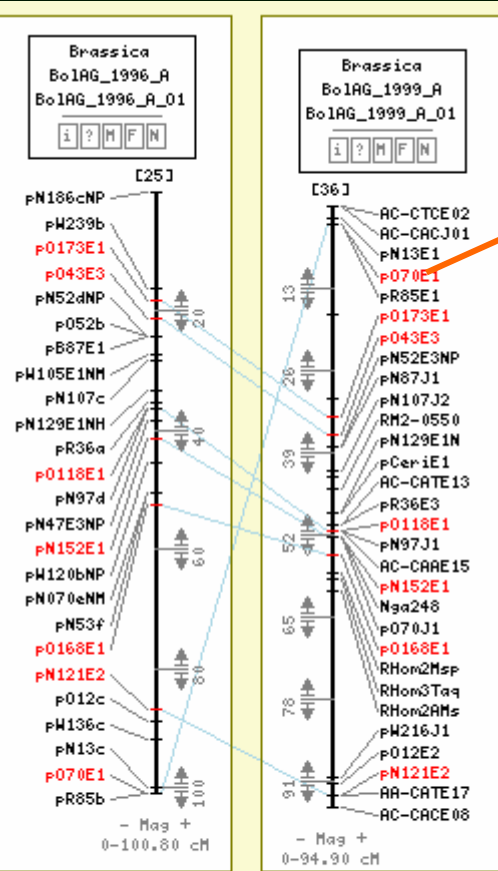
View Genetic Linkage Maps Using CMAP

Linkage Group	Locus ID	Locus Name	Position
BoIAG_1999_A_01	1	AC-CTCE02	0
BoIAG_1999_A_01	2	AC-CAC301	0.1
BoIAG_1999_A_01	3	pN18E1	2
BoIAG_1999_A_01	5	pR8E1	3.2
BoIAG_1999_A_01	4	pO70E1	3.2
BoIAG_1999_A_01	6	pN186E1N	17.1



Loci linked to Ensembl (genomics)

Brassica linkage maps linked to Genome data



Feature Types:
 — Locus
 Features in red have correspondences

Evidence Types:
 Lightblue line denotes Automated name-based

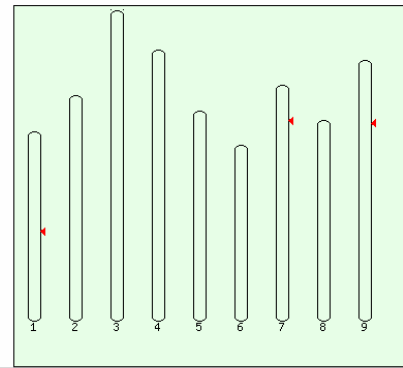
CMap Home | Maps | Map Search | Feature Search | Matrix | Map Sets | Feature Types | Map

Feature "p070E1"

Feature Name: p070E1
 Aliases: N/A
 Accession ID: 4
 Feature Type: Locus
 Map: Brassica-BoIAG_1999_A-BoIAG_1999_A_01
 Start: 3.20 cM
 Stop:

Cross-references: [\[Genbank sequence \]](#)
[\[Brassica Ensembl at WHRI \]](#)

Feature	Map	Map Type	Aliases Evidence
p070E1	Brassica-BoIAG_1996_A-BoIAG_1996_A_01	Population Mapping	None



Location	Length	Name(s)	Alignment length	Ref ori	%id	score	p-value
1:31125593-31125693(1)	101	1-100	100	100	100	100	100
7:11125988-11126088(1)	101	1-100	100	100	100	100	100
9:19584260-19584360(1)	101	1-100	100	100	100	100	100

Adding Value to the UK *Brassica* Crop Science Community

Summary

Objectives

Technical summary

Beneficiaries

..

Forward genetics

[Existing linkage maps](#)
[Map integration](#)
[Reference populations](#)
[Diversity sets](#)
[QTL collation](#)
[Data management](#)

Reverse genetics

[Induced variation](#)
[\(TILLING\)](#)
[MBGP TILLING](#)
[consortium](#)
[RNAi pipeline](#)
[B. rapa transformation](#)
[Functional validation](#)
[Dissemination](#)


funded by BBSRC



A BBSRC Innovations in Crop Science Project

The AdVaB consortium will fill gaps in information and technology to enable research findings relating to *Brassica* genetics and genomics to be translated more rapidly into practical outcomes, particularly through genetic crop improvement. Researchers and plant breeders will be provided with tools and information to enable explicit understanding of crop traits in terms of the function of underlying genes. This will capitalise on the BBSRC-funded UK contribution to the multinational effort to sequence the complete *Brassica* 'A' genome, and previous investment in the related reference plant species *Arabidopsis*.

Brassica crops are major components of UK arable agriculture and horticulture, with opportunity to exploit their vast genetic diversity. Oilseed rape, the primary source of vegetable oil in Northern Europe, is high in polyunsaturates with huge potential to provide new nutritional and renewable non-food products. Brassica vegetables contain beneficial nutrients, with elevated amounts of anti-oxidants, vitamins, anti-carcinogenic compounds, as well as uptake of minerals such as zinc and iron

Project Partners:

Graham King (co-ordinator): Rothamsted Research

Lars Ostergaard, Judith Irwin : John Innes Centre, Norwich

Dave Pink, Graham Teakle: Warwick HRI, University of Warwick



Reference populations

Reference *Brassica* mapping populations will be made available together with the associated key data sets (genetic linkage map, provenance and quality assurance validation). Seed will be provided in the form of quality assured 'starter packs'. DNA from founder lines of species-specific diversity sets will be made available for molecular allelic screening.

Integrated genetic maps

Integrated consensus linkage maps for the *Brassica* A and C genomes with sequence tagged markers and reference 'conserved synteny block' nomenclature will be developed based on existing screening of SSR markers on parent lines. Mapping populations will be scored with polymorphic markers and the data used to generate reference maps based on consensus conserved synteny blocks in common with *Arabidopsis*.

The CropStore data schema

The CropStore relational database has been developed to address the need for low maintenance, explicit curation and management of integrated datasets for crop plant genetics. [detail](#)

Reverse genetics tools

Exploitation of *Brassica* genome sequence through reverse genetic approaches requires access to TILLING and RNAi capability. *B. rapa* EMS - TILLING and radiation populations will be developed for induced variation. An RNAi pipeline for down regulation of multiple gene copies will be established initially in *B. oleracea* and *B. napus*, and a *B. rapa* transformation system developed for UK researchers.

Collation of QTL data

To underpin ongoing trait-led genetic and genomic projects QTL datasets will be collated and prioritised, and converted to a consensus format for comparative analysis. This will also assist in making direct connections between fundamental research and crop-related traits selected in breeding programmes.

Validation of technologies

Validation of the reverse genetic technologies will focus on specific genes with well characterised phenotypic effects, and will allow comparison of the different approaches in polyploid brassicas.

Induced variation:

MBGP TILLING Consortium

- Lars Østergaard (JIC, Norwich) co-ordinator

- Initiatives (EMS):

B. rapa R-O-18 (UK)

B. rapa Chiifu (Korea)

B. rapa rcb (USA)

B. rapa L58 (China)

B. napus Ningou7 (China)

B. napus Tanto (France)

B. napus DH12075 (Canada)

B. napus Zhongshuan 9 (China)

EcoTILLING on DFFS (UK)

- Aim to share pools and access via registry

Multinational *Brassica* Genome Project

Achievements: resources now in public domain

- Genetic maps and populations
- Collation of public-domain SSR markers
- ESTs in public repositories
- BAC libraries and physical (BAC) contig maps
- Initiation of ***B. rapa* sequencing project**
- Analysis of *B. oleracea* shotgun sequences
- www.brassica.info website and links
- Draft “White Paper”



Multinational *Brassica* Genome Project

B. rapa Sequencing Project: the 'A' Genome (~500Mbp)

- Homozygous Chinese cabbage Chiifu-401
- Large BAC libraries (Korea)
- BAC-end sequencing – multinational effort
- Seed BACs being sequenced (Korea) 620 – anchored to genetic map
- Reference linkage map (CKDH) + alignment to existing maps
- Chromosome assignment : BAC-by-BAC sequencing of gene-space



Multinational *Brassica* Genome Project

B. rapa Sequencing Project

R1

R2

R3

R4

R5

R6

R7

R8

R9

R10

Status:

110,000+ BACs end-sequenced

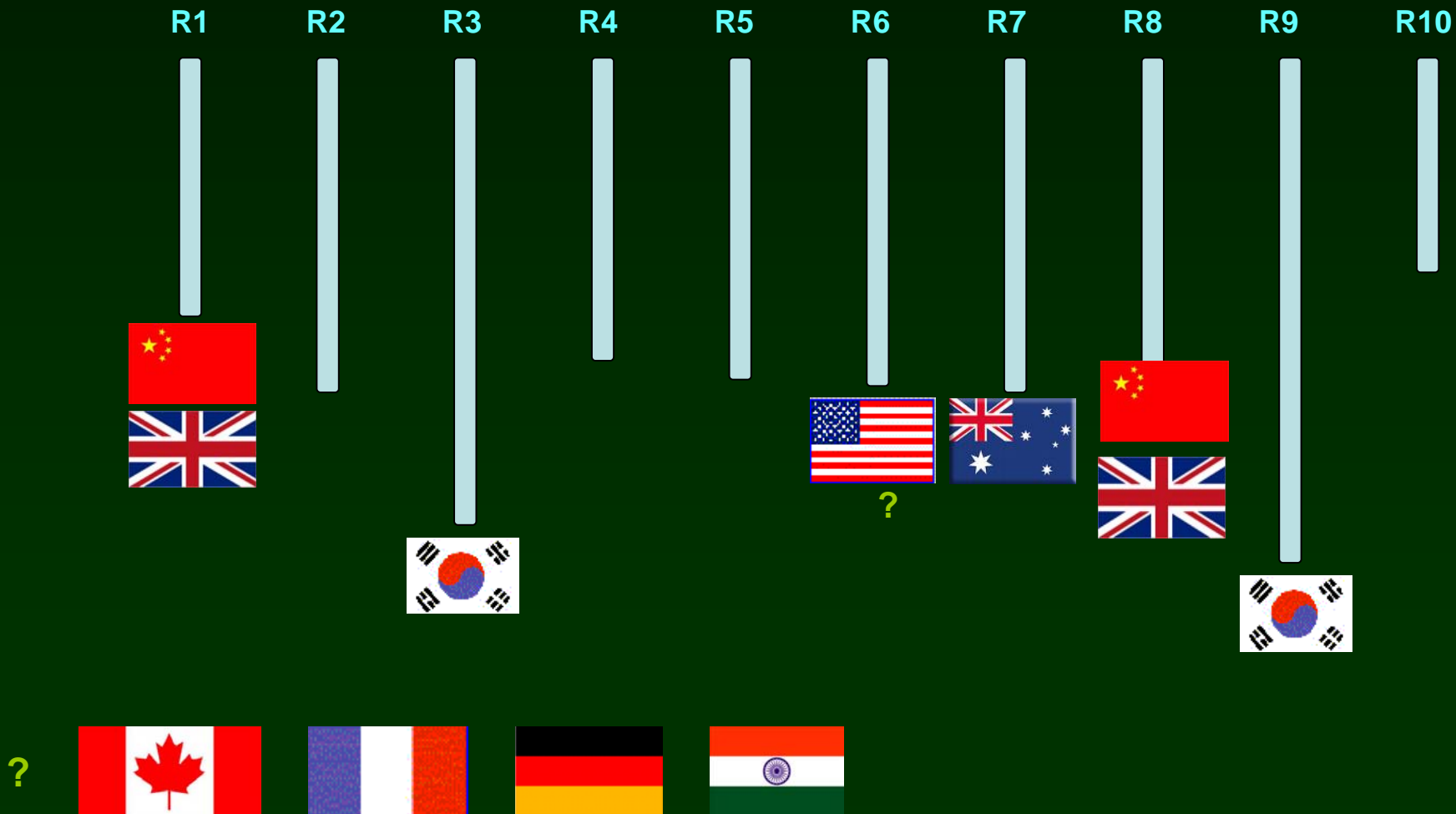


500+ anchor BACs to phase 2  **15%**

50Mb in GenBank/EMBL since July 1st 2006

Multinational *Brassica* Genome Project

The *Brassica* 'A' genome: Multinational *B.rapa* Sequencing Project



sharing information worldwide for
The Multinational Brassica Genome Project

MBGP

and Multinational *B. rapa* Sequencing Project

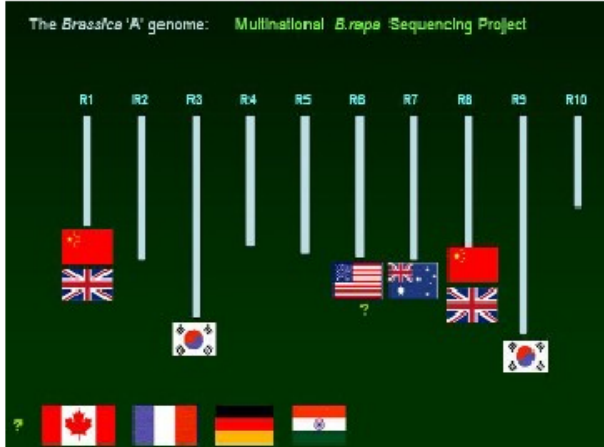
	B. rapa	All	ESTs	GSS
	B. oleracea	All	ESTs	GSS
Live from	B. napus	All	ESTs	GSS
NCBI	B. nigra	All	ESTs	GSS
(Entrez)	B. juncea	All	ESTs	GSS
	B. carinata	All	ESTs	GSS
	Brassica spp	All	ESTs	GSS
Mar 6th,	Total of 1,027,524 genbank accessions			
2007				

[Daily update totals](#) from [BrassicaDB](#).

The BrassicaDB [BLAST server](#) allows you to [BLAST any sequence](#) against all current *Brassica* sequences and BrassicaDB contents, as well as Arabidopsis TIGR v5

[Overview of the *B. rapa* sequencing project](#)

[Status of the Multinational *Brassica rapa* Sequencing Project](#)



Rapid rise in DNA sequence data

Feb 2007 : > 1 million entries

➔ easier to find genes

Brassica sequences in Genbank

B. rapa Sequencing Status

Affymetrix *Brassica* community GeneChip®

- 620,000 ESTs in GenBank by June 2007
- Design by Affymetrix, community review – summer 2007
- Chip release Q4, 2007



Welcome To OREGIN

The Defra funded Oilseed Rape Genetic Improvement Network

Use the tabs at the top of this area to navigate around the site:

- Home - What is OREGIN, project outline, news, contact details and information on the other Defra crop genetic improvement networks
- Research activities - An overview of the project and detail of the six workpackages
- Resources - Databases, standard operating procedures, information, relevant links, images and more
- Stakeholders - Who are the OREGIN stakeholders, details of future and past meetings
- Admin login - a password protected area for the OREGIN management team

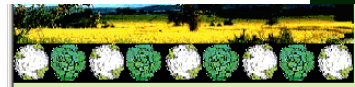
OREGIN in the news:

Agenda for the Fifth Stakeholder Forum (Wednesday 7 March 2007)
 Minutes/notes for the Fourth Stakeholder Forum now available
 HGCA Oilseed Rape Growers guide
 OREGIN featured at Cereals2005
 OREGIN featured at the HGCA spring OSR workshops

- Feedback from workshop questionnaires now available -



Printer Friendly Page



UK-Brassica Research Community

(UK-BRC)

March 6, 2007

- [News](#)
- [Meetings](#)
- [Resources](#)
- [Research](#)
- [Links](#)
- [Outreach](#)
- [Email list](#)

Welcome to the UK-BRC

The UK *Brassica* research community (UK-BRC) consists of a wide range of research groups, breeders and other end-users, holds annual meetings of academic and industry-based scientists, and operates a mailing list of >180 members. This website provides details of research projects, resources and interests of its members.. The UK-BRC plays a prominent role in the international *Brassica* research community, including via the [Multinational Brassica Genome Project](#).

Brassica crops are major components of the UK's arable agriculture and horticulture. Oilseed rape, the primary source of vegetable oil in Northern Europe, is high in polyunsaturates with huge potential to provide new nutritional and renewable non-food products. Brassica vegetables contain beneficial nutrients, with elevated amounts of anti-oxidants, vitamins and anti-carcinogenic compounds, as well as uptake of minerals such as zinc and iron.

The close relationship between *Brassica* and the reference species *Arabidopsis* provides exciting opportunities to translate fundamental information about gene function to understanding and manipulating crop traits, and the UK-BRC has many interactions with the UK *Arabidopsis* research community, including through [GARNet](#).

AdVaB Project starts

The BBSRC Innovations in Crop Science Project "[Adding Value to the UK Brassica crop science community \(AdVaB\)](#)" commenced Jan 8th 2007.

UK B. rapa sequencing

The BBSRC has announced funding for the UK contribution to Phase 2 sequencing of the Multinational *Brassica rapa* genome sequencing project. (Dec 06)

OREGIN stakeholders

The Defra [Oilseed Rape Genetic Improvement Network Stakeholders Forum](#) will be held **March 7th, at WHRI, Wellesbourne**. [Download Programme](#).

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