



defra

Department for Environment
Food and Rural Affairs



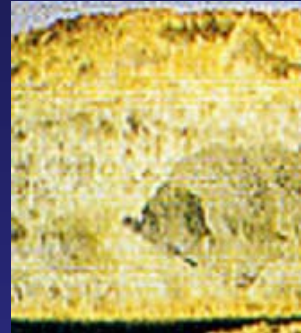
Wheat
Genetic
Improvement
Network

<http://www.wgin.org.uk>

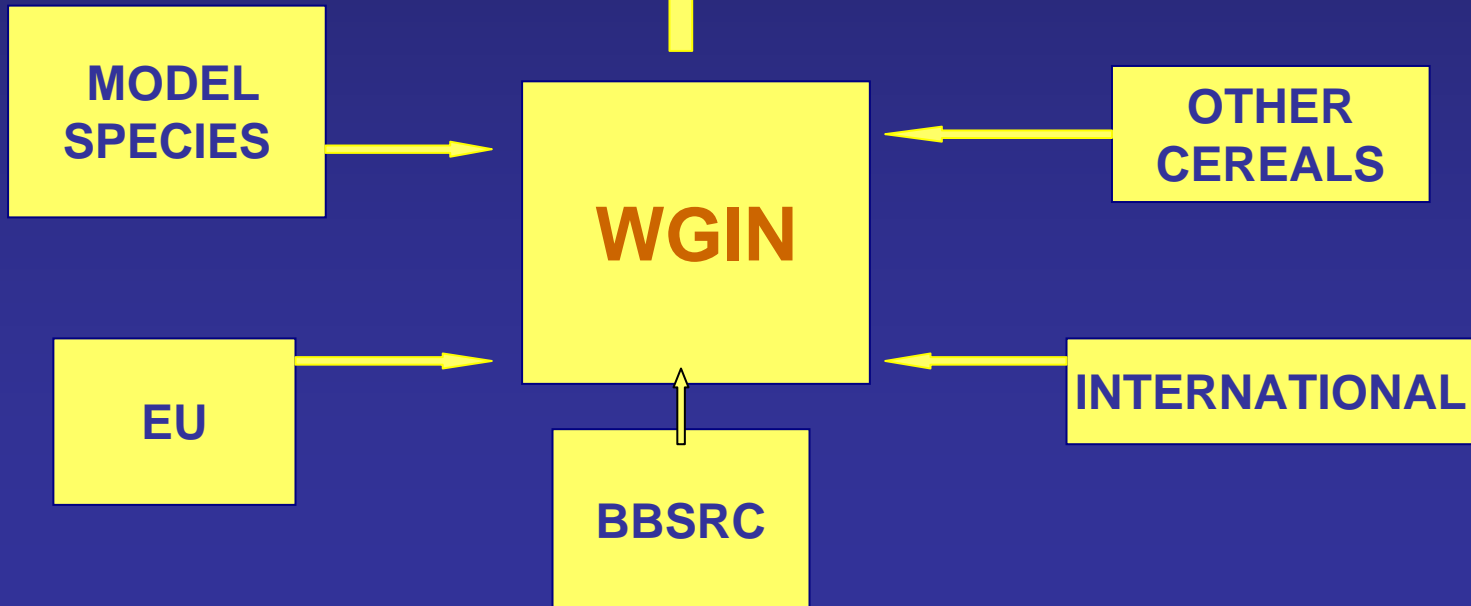
THE DEFRA WGIN



Grain Producers and Utilisers



UK WHEAT BREEDING COMPANIES



THE DEFRA WGIN CORE PROJECT

Aims:

To underpin wheat improvement by plant breeders

Approaches:

1. Characterisation and provision of genetic resources
2. Genetic mapping and marker development
3. Trait identification
4. Identification and generation of novel variation in key traits: using non-GM approaches
5. Central storage of grain from field trials
6. Liaison and communication

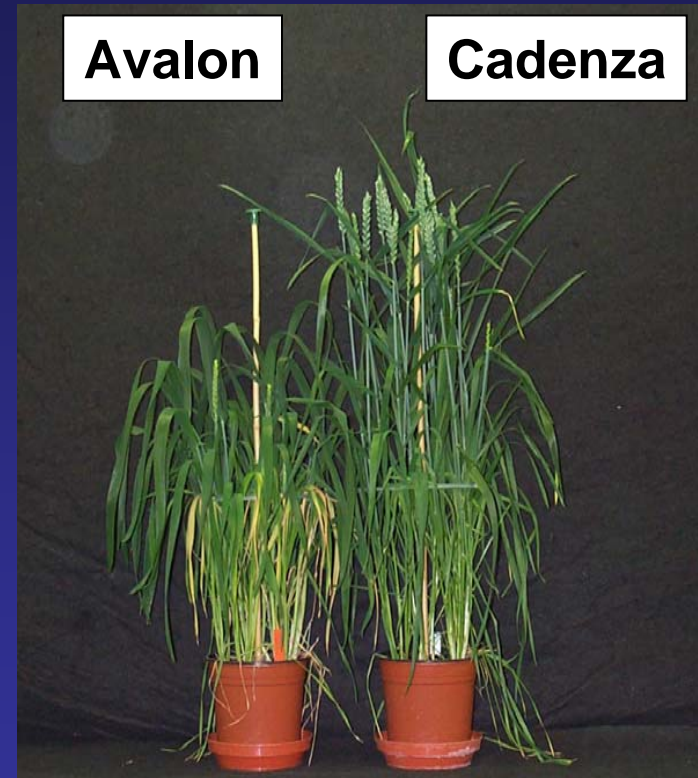
Funded Research Partners:

Rothamsted Research and John Innes Centre

GENETIC MAPPING AND MARKER DEVELOPMENT

- **Establish a reference UK mapping population**

**Avalon x Cadenza -
204 double haploid lines**



- **Switch to 'within the gene' molecular markers**
> 500,000 wheat ESTs available

TRAITS 1. Nitrogen Use Efficiency

2003/04 Field Trial

- 31 cultivars : 20 UK, 5 French, 5 German, 1 Polish
- 4 N levels : 0, 100, 200, 350 kg/ha
- measured N uptake efficiency (NupE), N utilisation efficiency (NutE) and N use efficiency (NUE)

2004/05 Field Trial

- 20 cultivars
- 2 N levels.

2005/06 Field trial

- 24 cultivars

Preliminary results show significant variation between cultivars in NUE at low N application

TRAITS 2. Plant Architecture and Disease Resistance

***Septoria* leaf blotch**



***Fusarium* ear blight**



IDENTIFICATION AND GENERATION OF NOVEL VARIATION IN KEY TRAITS

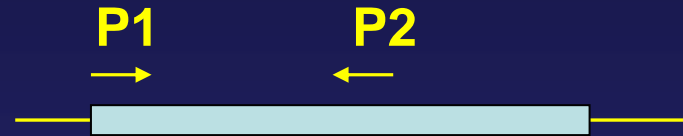
- 1. Establish TILLING technique on diploid and hexaploid wheats**
 - EMS mutagenised populations
 - Diverse germplasm collections
- 2. Provide a “cost recovery” service for the UK research community**



The Vavilov
Institute,
St. Petersburg
Russia

THE USE OF MUTAGENESIS AND TILLING TO IDENTIFY GENE VARIANTS

Gene of interest



Pool of PCR products (500 bp)

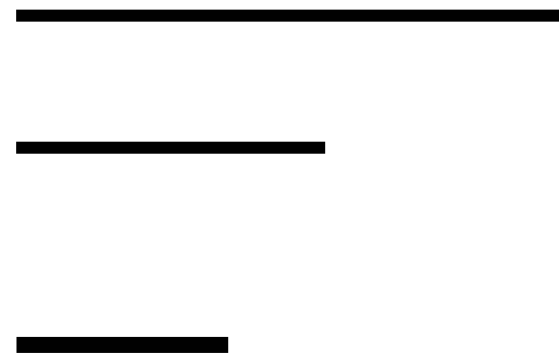


PCR product lines 1- 99

PCR product line 100

Single bp mis-matches cut in heteroduplex DNA by Cel1 enzyme

denaturing electrophoresis



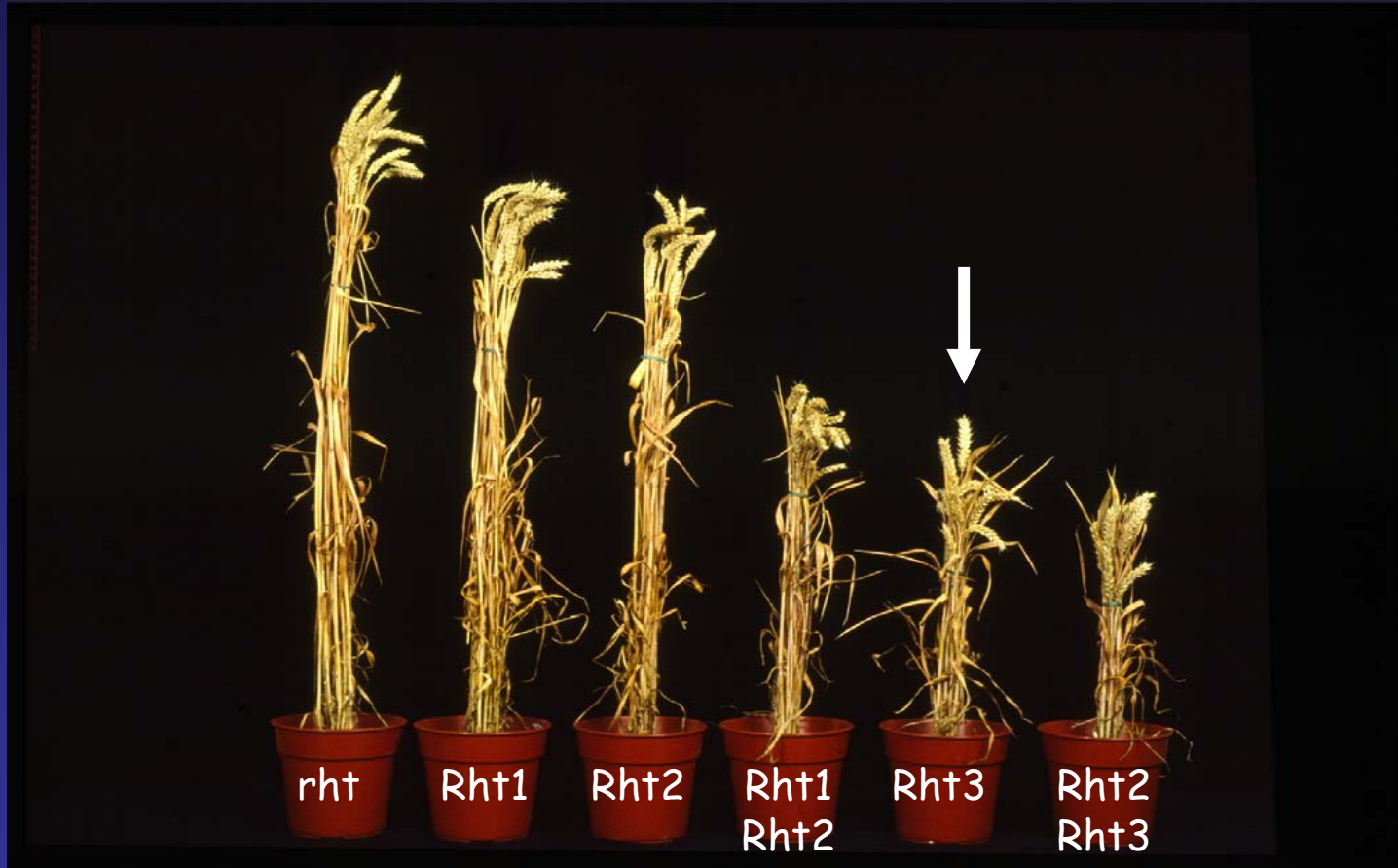
Wild-type allele

Variant allele

Assess lines carrying variant allele for novel phenotypes

TILLING DEMONSTRATION PROJECT - 1

Rht3 gene variants - wild-type phenotype extreme dwarf



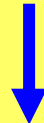
EMS mutagenised - Mercia *Rht3* line

TILLING DEMONSTRATION PROJECT - 2

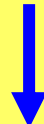
Global plant defence signalling regulators
in **both** cereal and non-cereal species

3 COMPONENTS TO INDUCIBLE PLANT DEFENCE

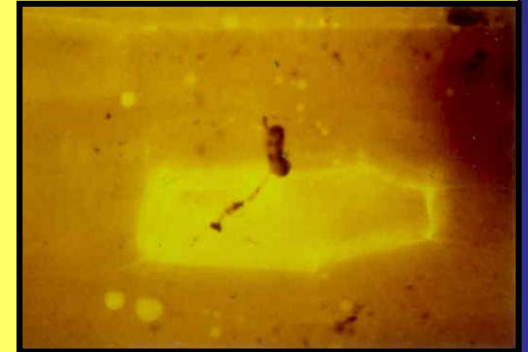
PATHOGEN RECOGNITION



PLANT CELL SIGNALLING



A MULTI-COMPONENT
RESISTANCE RESPONSE



THE WGIN MANAGEMENT TEAM

Defra

Funded partners

Rothamsted Research

John Innes Centre

Other Partners*

ADAS

University of Nottingham

NIAB

University of Bristol

BBSRC*

UK Wheat breeders*

HGCA*

(*Ex-Officio Members)

THE WGIN STAKEHOLDERS

Millers and Bakers

Brewers and Distillers

CCFRA

Livestock Feed Producers

Food processors

Agrochemical/Biotech Companies

Wheat Researchers

Field Trials Contractors

THE DEFRA WGIN:DISSEMINATION, LIAISON AND COMMUNICATION

- Annual “Stakeholders’ Forum” (Nov)
- Annual “Small Grain Cereals Workshop” (with BBSRC) (March/April)
- Annual “ Traits Workshop ” (April)
- Workshops with overseas partner organisations
CIMMYT (Dec 2004), INRA (May 2005) etc
- Web Site (www.WGIN.org.UK)
- Six Monthly Electronic Newsletter

THE WIDER ACTIVITIES OF WGIN

- 1. Liaison with other Defra programmes on wheat**
- 2. Liaison with other UK bodies supporting wheat research:**
 - BBSRC, HGCA, FSA
- 3. Liaison with overseas organisations:**
 - CIMMYT/ICARDA (International)
 - USDA/Agriculture Canada (N.America)
 - CSIRO/Waite Institute, Adelaide (Australia)
 - DSIR Crop and Food (New Zealand)
 - CSIR (South Africa)
 - EU (FP6/7)