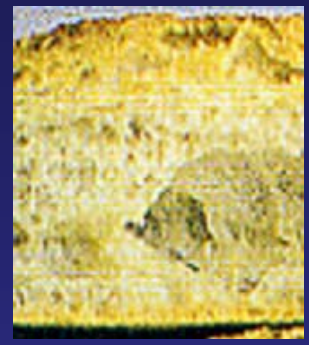
Wheat Genetic Improvement Network

http://www.wgin.org.uk

THE DEFRA WGIN



Grain Producers and Utilisers

UK WHEAT BREEDING COMPANIES

MODEL SPECIES

OTHER CEREALS

WGIN

EU

INTERNATIONAL

BBSRC

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

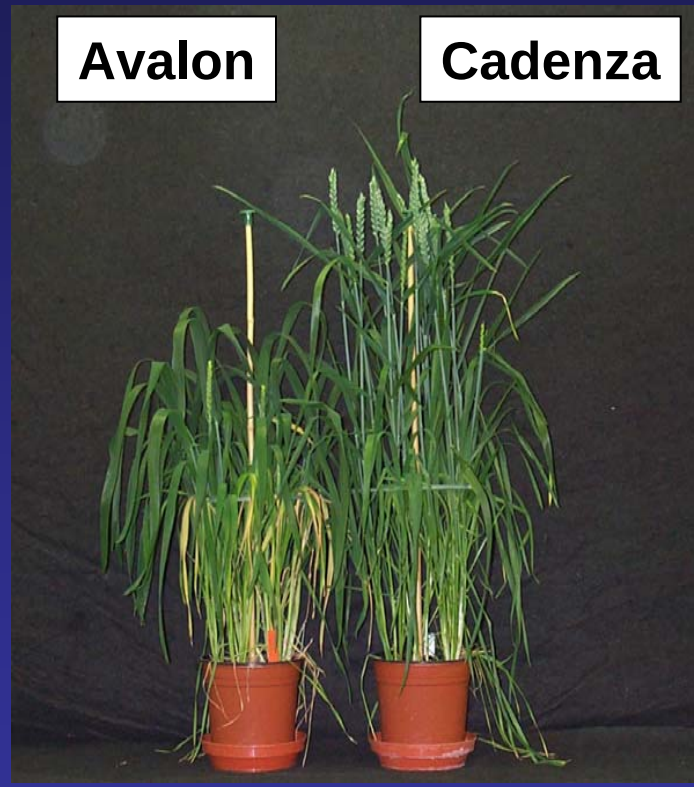
Funded Research Partners:

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, 50, 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, eg. Beaver (good) and Soissons (poor)

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**

ROTHAMSTED RESEARCH

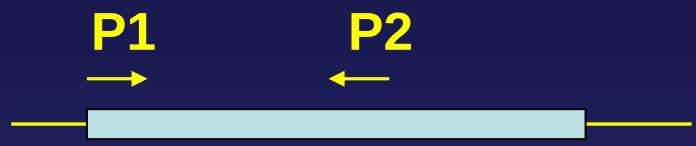
JOHN INNES CENTRE

BHP

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- 9

PCR product line 10

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

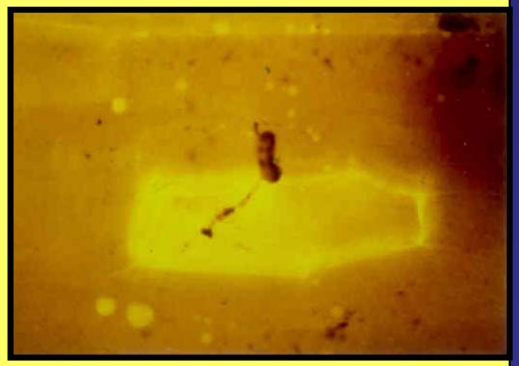
PATHOGEN RECOGNITION

↓

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
- E. mail address (WGIN.defra@bbsrc.ac.uk)

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)