



**BMT/12/13 Add.**

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**INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS**  
GENEVA

**WORKING GROUP ON BIOCHEMICAL AND MOLECULAR  
TECHNIQUES AND DNA PROFILING IN PARTICULAR**

**Twelfth Session**  
**Ottawa, Canada, May 11 to 13, 2010**

ADDENDUM

DEMONSTRATION OF SIGNIFICANT PROGRESS TOWARDS AN  
OPTION 1 APPROACH IN BARLEY

*Document prepared by experts from the United Kingdom*

## Plant Science into practice



National Institute of Agricultural Botany



Presenter Name Carol Norris Date May 2010



### SNPs for barley DUS assessment:


#### Advances in understanding the molecular basis for variation in barley characteristics

- BBSRC LINK project – Association Genetics of UK Elite Barley (AGUEB)
- ~600 barley varieties genotyped
- 1536 SNP loci
- Association mapping used to detect associations between SNPs and eight DUS characteristics



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### **Eight DUS barley characteristics (UPOV Test Guidelines: TG/19/10)**

- Grain: rachilla hair type (Char. 22)
- Grain: hairiness of ventral furrow hairs (Char. 26)
- Grain: spiculation of inner lateral nerves of dorsal side of lemma (Char. 25)
- Lowest leaves: hairiness of leaf sheath (Char. 2)
- Flag leaf: anthocyanin coloration of auricles (Char. 3 and 4)
- Awns: anthocyanin coloration of tips (Char. 8 and 9)
- Kernel: colour of aleurone layer (Char. 28)
- Sterile spikelet: attitude (Char. 20)

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### **Progress made in the AGOUEB project**

- The eight DUS characteristics were mapped at approx. 3cM resolution
- High degree of correlation between allelic state of SNP locus and characteristic state
- Candidate genes are currently being assessed in the immediate location of the eight trait association peaks
- Causative polymorphisms sought
- Convincing candidate gene and polymorphism found diagnostic for presence/absence of anthocyanin coloration.

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### Relevance to DUS testing

- Produce a rapid marker test for the eight DUS characteristics
- Assess linked and putatively causative SNPs for their ability to predict DUS characteristic states
- Include Seasonal Growth Habit (SGH) and ear row number in the marker test
- Include some VCU quality traits in the study to maximize the potential of the assay

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### Testing of high throughput genotyping system

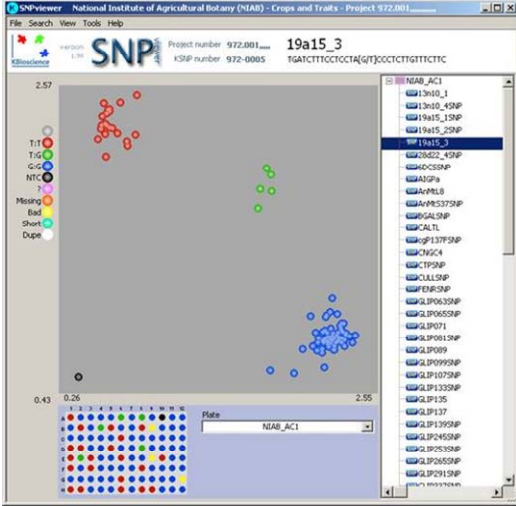
- KASPar is a high throughput and relatively cheap genotyping platform
- Provided as a service by KBiosciences (<http://www.kbioscience.co.uk/>)
- Based on recently developed singleplex technology
- Dispenses with the need for individually labelled fluorescent probes used in the Taqman system
- System tested at NIAB using field bean
- 75 of the 80 SNPs tested produced robust assays

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### Visualization of SNP data using KASPar



- SNP data from a single assay in field bean
- G/T SNP genotypes are clearly distinguishable
- G = blue
- T = red
- Heterozygotes = green

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### Design of assays for barley

- For each gene, one or more polymorphic DNA features were assayed
- DNA sequence with SNP positions shown
- GenBank accession number for the DNA sequence of the reference allele
- Reference number linking to the relevant scientific publication describing allelic variants
- Genetic map position of gene
- Information describing SNPs and their phenotypes

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### Results to date

- 60 assays designed from 27 barley genes
- Sequences submitted to KBiosciences for assay design
- Results expected in May 2010.....
- Thanks to Fera for funding the DUS part of this work

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