

Wheat pedigree and MAGIC population resources for genetics informed breeding

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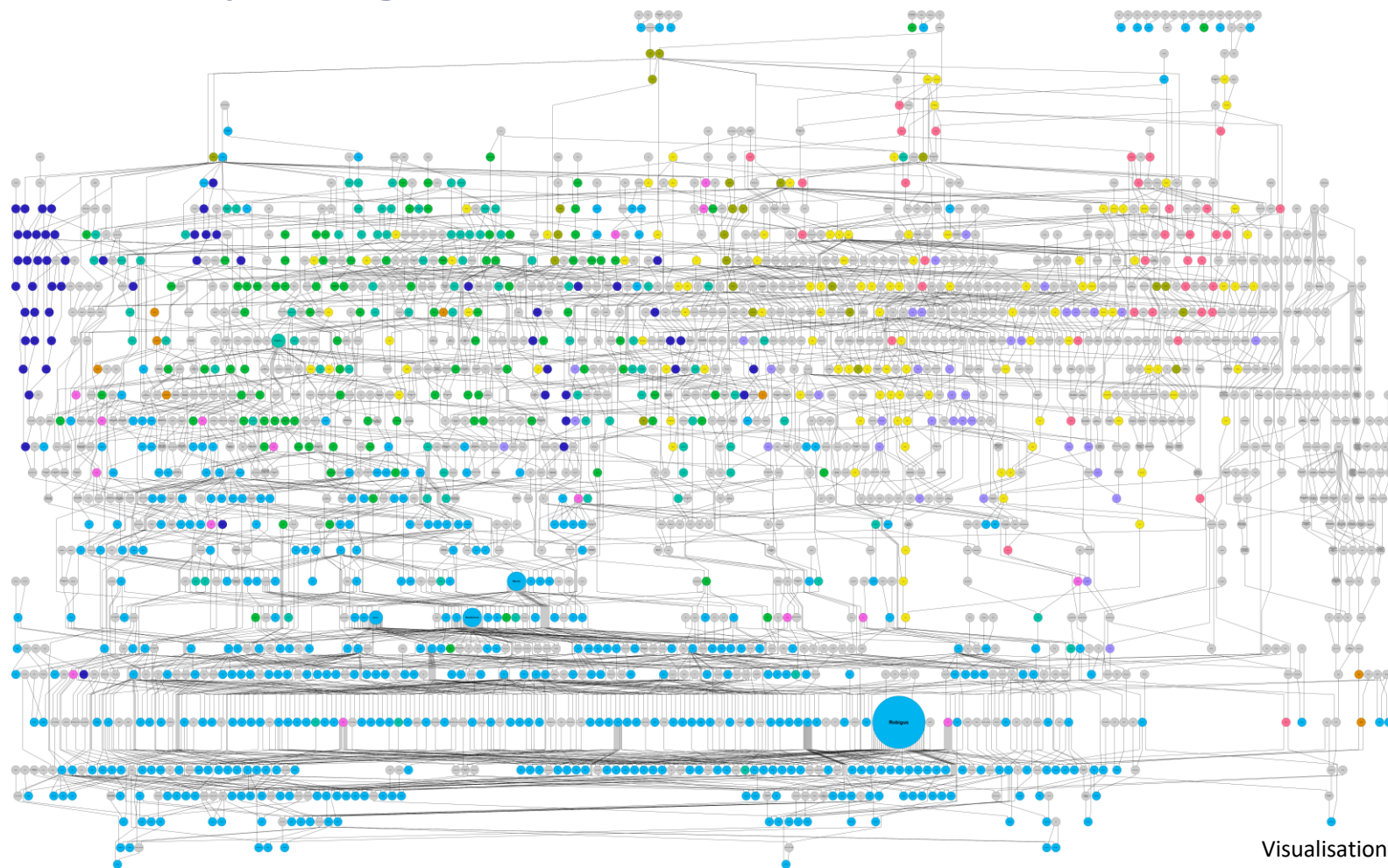


Outline

1. How has wheat genetic variation been used in the past?
2. How can genetic variation be more efficiently utilised for breeding?



The pedigree of UK wheat



- AUSL
- BEL
- CAN
- DEU
- FRA
- GBR
- MEX
- NLD
- SWE
- USA

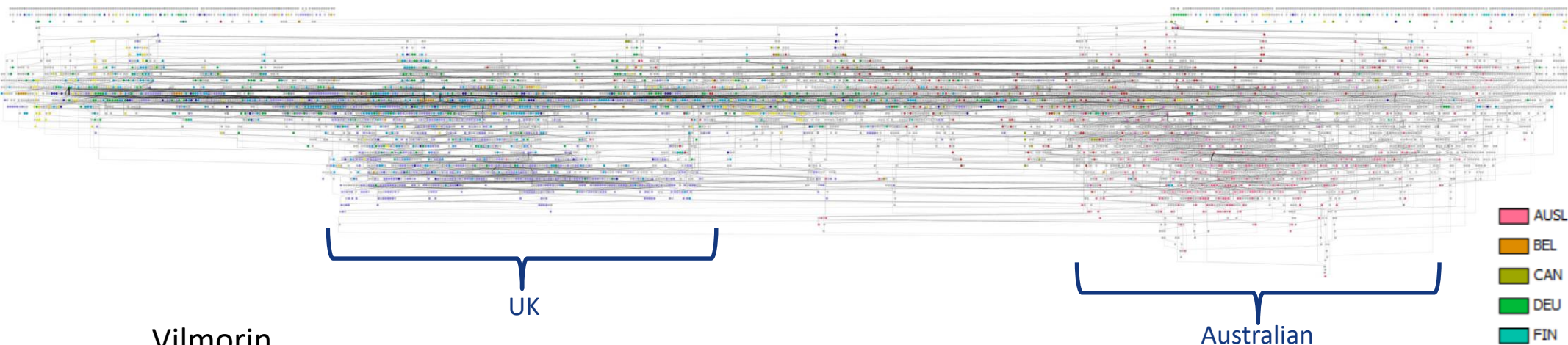
Fradgley et al. (2019) *PLOS Biology*

Current version:
<https://doi.org/10.6084/m9.figshare.9891431.v1>

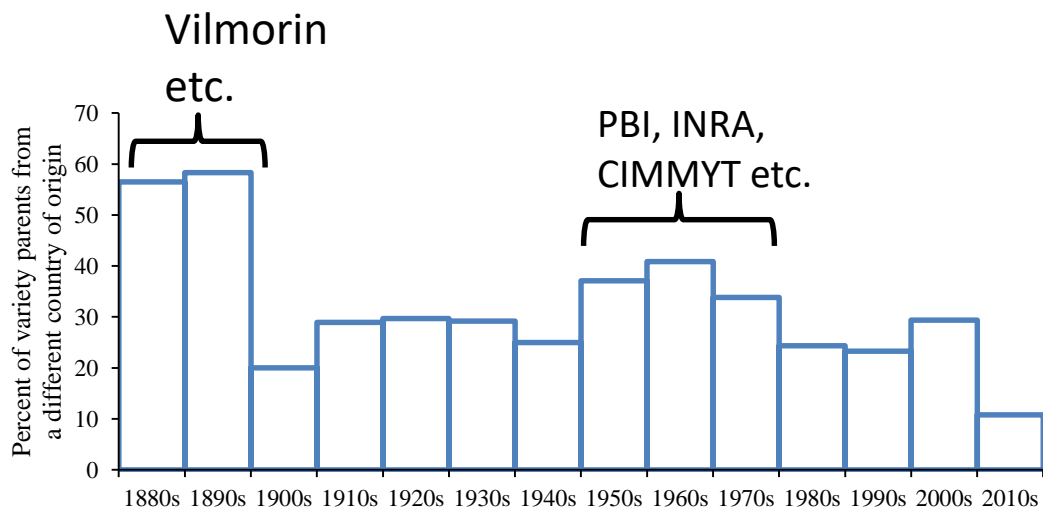
Visualisation software using Helium

Shaw et al. (2015) *BMC Bioinformatics*

Worldwide wheat pedigree in progress...

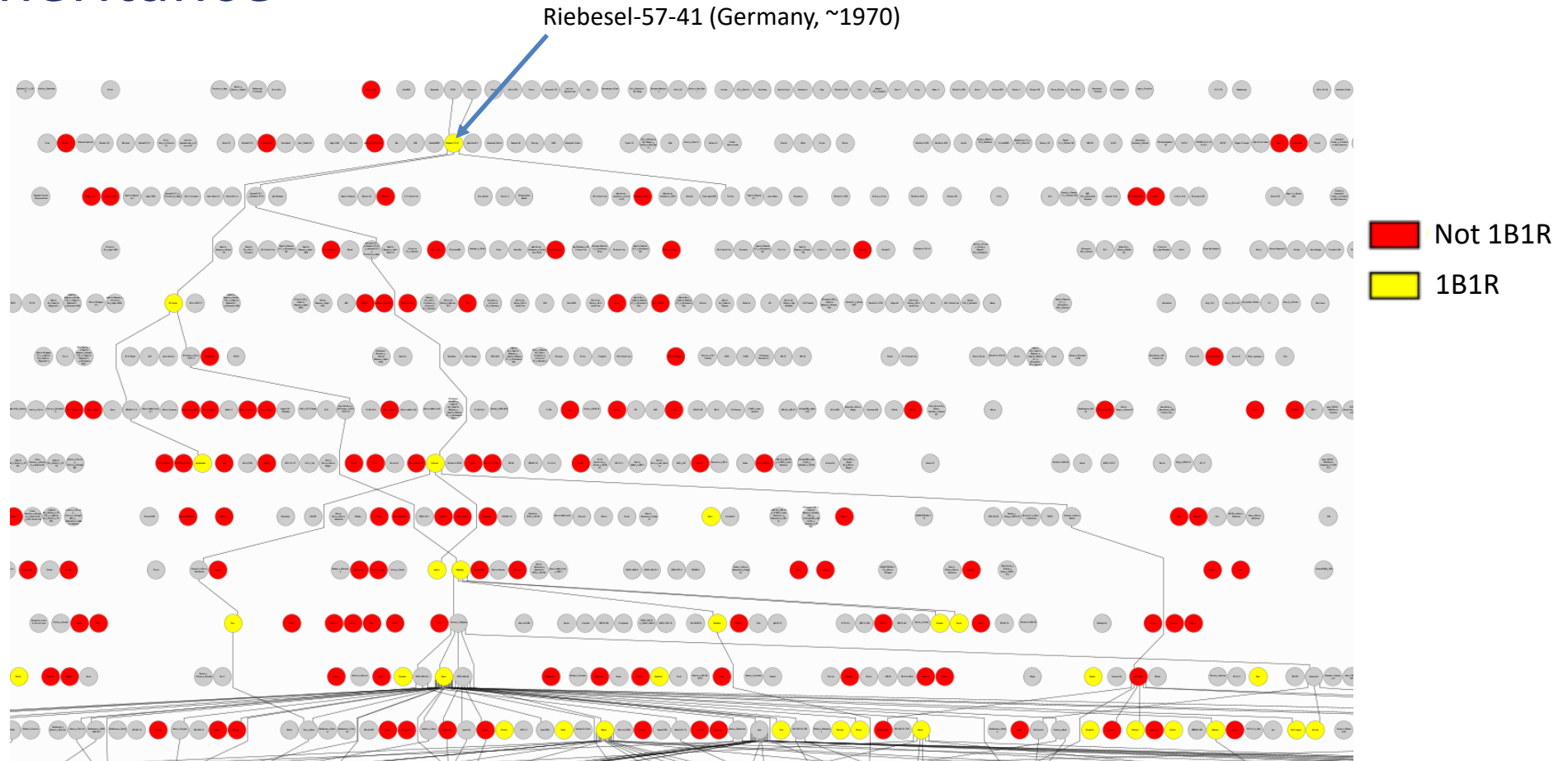


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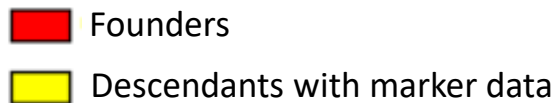
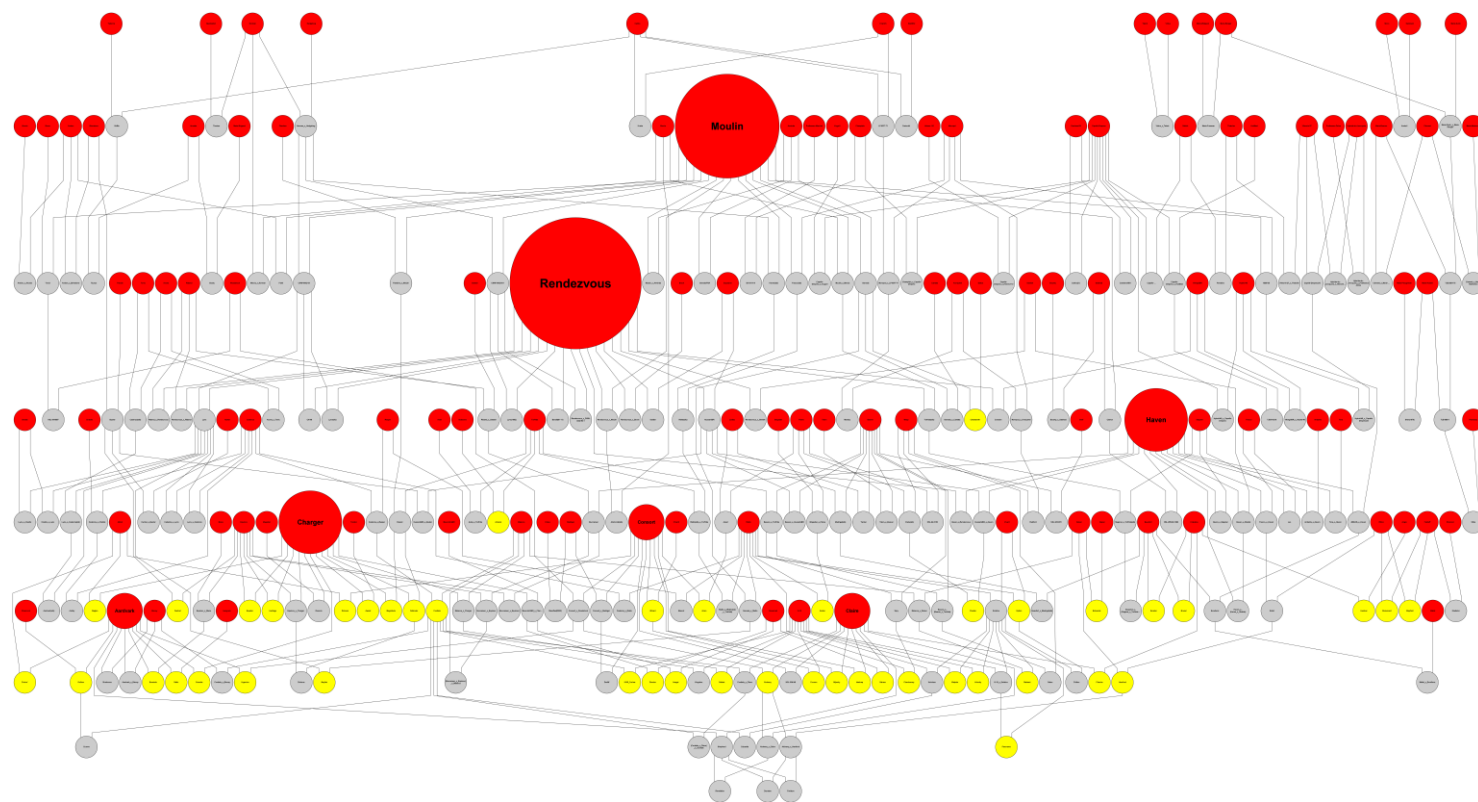
Jess Hyles

Pedigrees useful for research –tracking gene inheritance

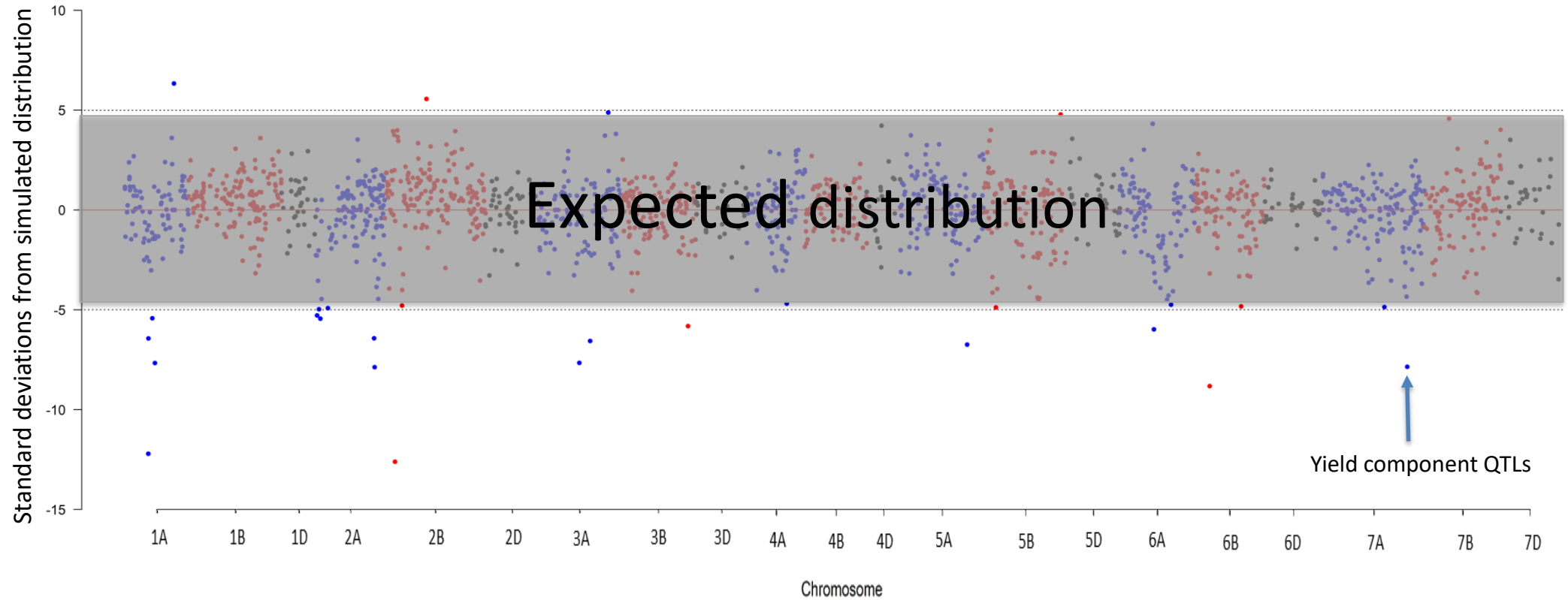


Selection simulations over the pedigree

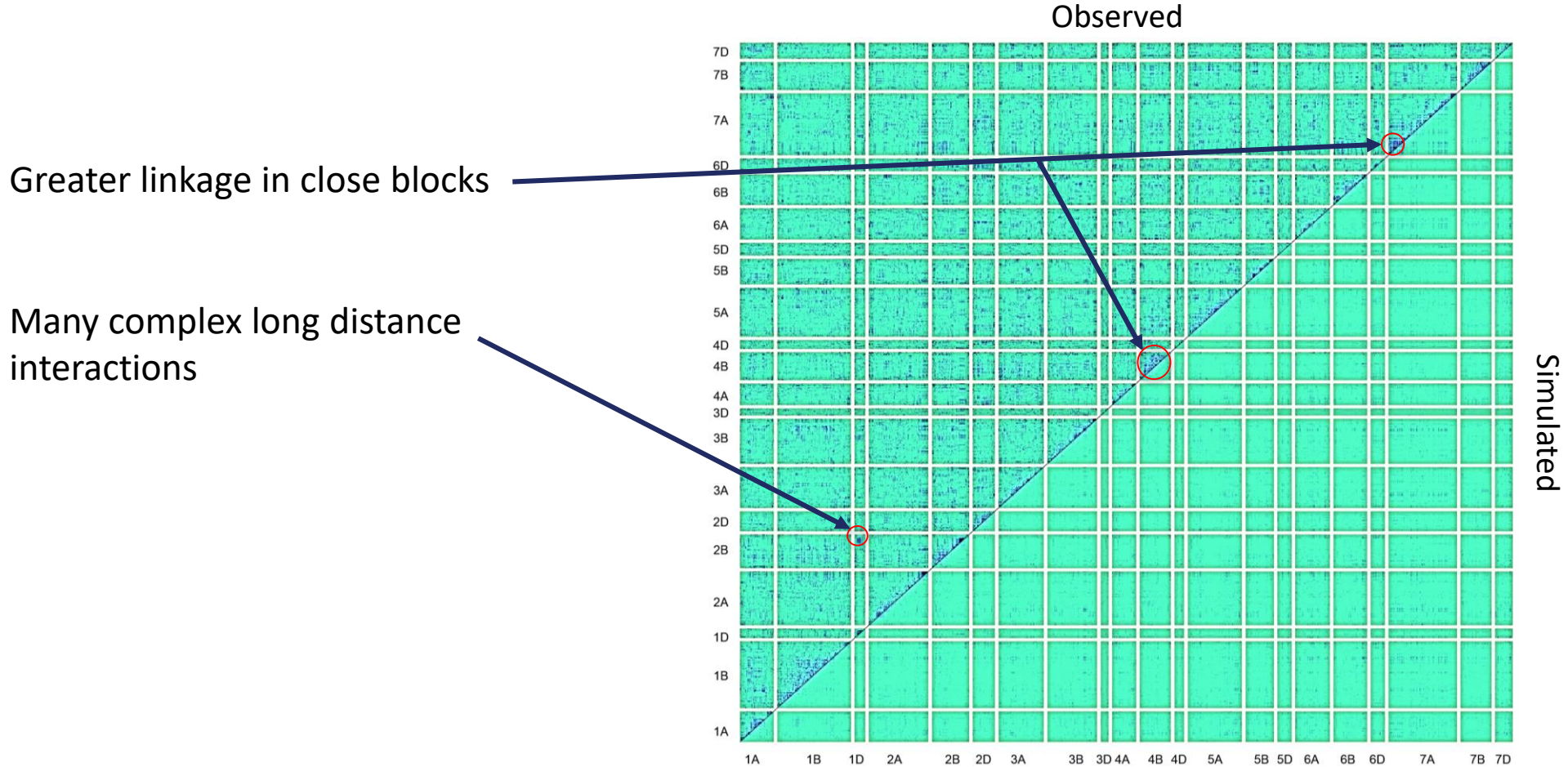
- Subset pedigree all within known genepool
- Compare observed vs simulated using 100 simulations



Evidence for breeders selection: Markers under selection



Breeders have combined beneficial gene assemblages rather than selection on single genes



Genotyping

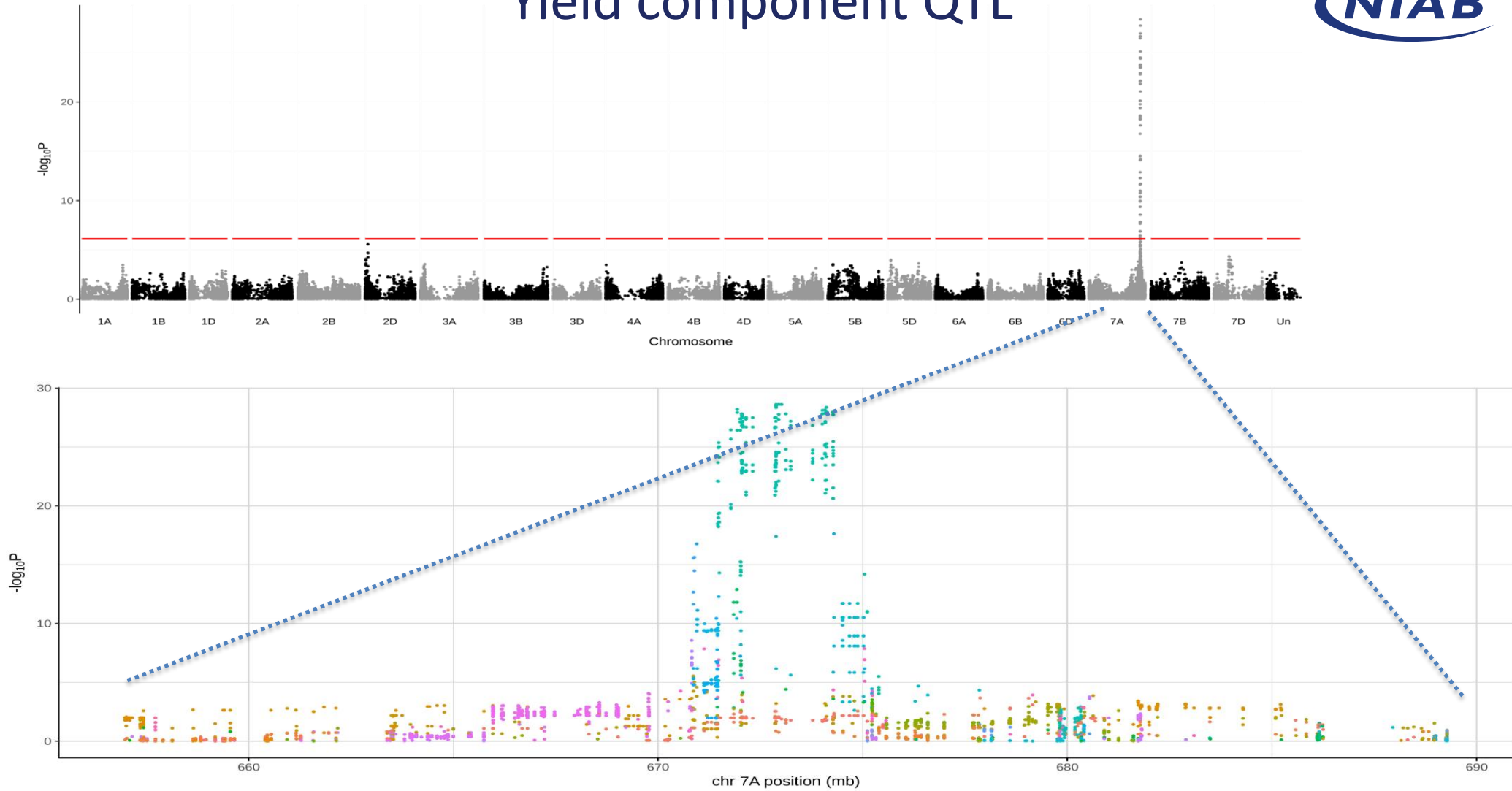


Phenotyping

- Sequencing founders: >1 million SNPs
- Low coverage sequencing on lines to impute from founders with a 99.6% call rate

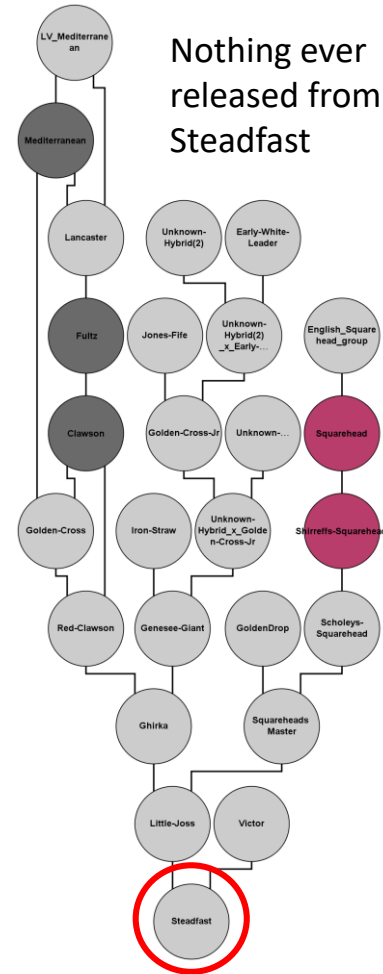


Yield component QTL

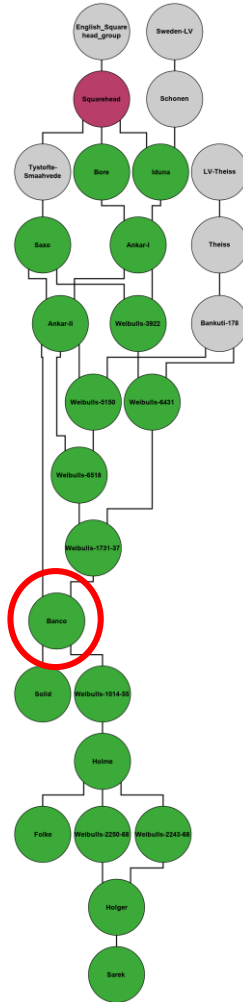


Novel diversity coming from Steadfast and Banco founders

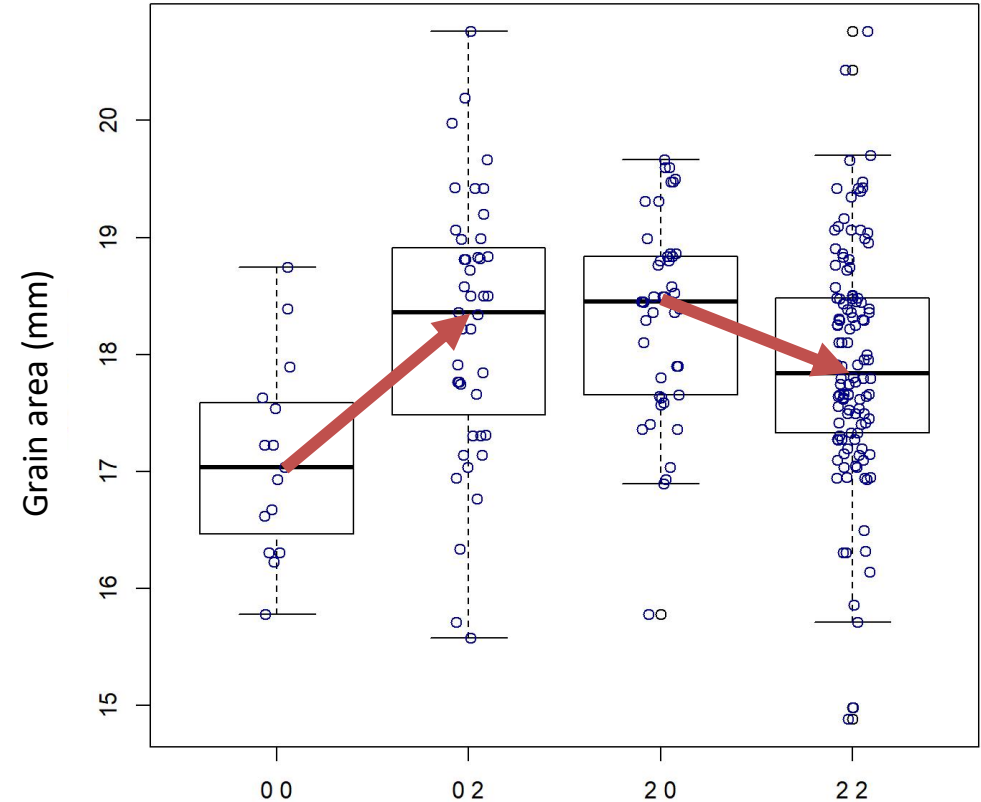
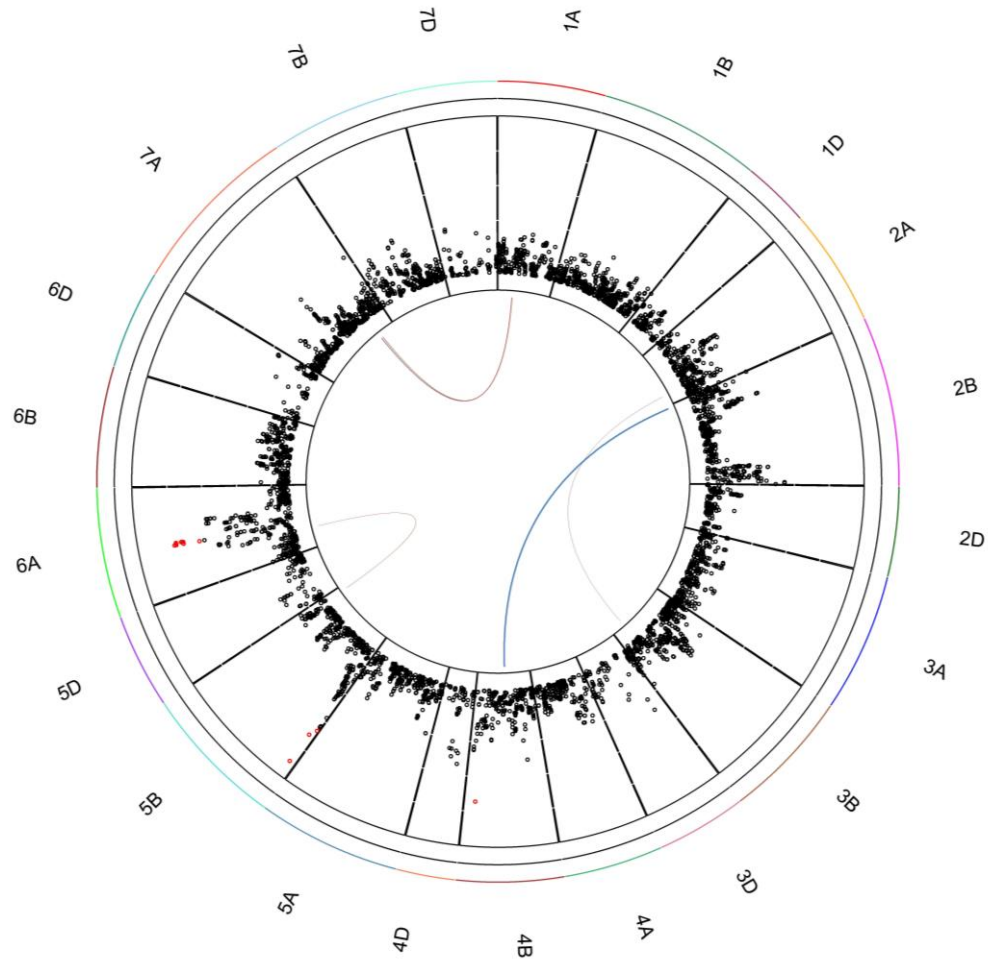
Spikelets per ear



Banco grown in UK briefly but pedigree only in Swedish varieties



Gene interactions for wheat quality traits – grain area



Open access resources

- Download pedigree and genotype data from NIAB website
<https://www.niab.com/pages/id/501/UK> Wheat varieties Pedigree
- NIAB MAGIC resources
<https://www.niab.com/MAGIC/>
- View pedigree in Helium software from JHI
<https://github.com/cardinalb/helium-docs/wiki/Download-Helium>

Acknowledgements



Alison Bentley (PhD Supervisor)

Michael Scott

Keith Gardner (PhD Supervisor)

Richard Mott

James Cockram

Ian Mackay

Rob Jackson

Phil Howell



Matt Kerton (PhD Supervisor)



Nik Cunniffe (PhD Supervisor)