DTP PhD project 2015

PhD Title: MAGIC wheat quality: utilising next-generation biological and genomics platforms for quality improvement

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Background: Wheat is the UK's most important crop. Grain, flour and breadmaking quality are critical traits for suitability of wheat harvests for intended end use. Genetic improvement is the most sustainable approach towards improving wheat quality. Recent advances in wheat genomics, mapping-population design and statistical analyses provide a timely opportunity to perform UK-relevant, high-resolution genetic analyses of wheat quality traits.

Methodology: This project will use a unique wheat resources generated at NIAB: a multi-parent advanced generation inter-cross (MAGIC) population, generated from eight UK varieties via multiple rounds of intercrossing, resulting in 1,000 progeny (Mackay et al. 2014). Parents include four classified as NABIM quality group 2 or above (Hereward, Xi19, Rialto, Robigus). The population has been genotyped with a high-density 90k SNP array. Along with facilities for quality testing and molecular labs at NIAB, these resources will be used to undertake fine-scale dissection of the genetic regions controlling multiple wheat quality traits.

Project aims are to generate:

(1)   Fine-scale genetic analysis of multiple grain quality characters within a single high-resolution mapping platform.

(2)   Breeder friendly genetic markers tagging these traits, and ultimately, map-based cloning of selected QTL.

(3)   Tools and approaches with which to try to predict quality, and the ability to test these hypotheses via test bakes.

This project represents the first time a UK-relevant MAGIC population has been used to investigate wheat grain quality characteristics. The project is well aligned with industrial and grower interests, and ultimately aims to provide genomics-informed strategies for the development of new varieties with improved quality parameters.

References

Mackay I, Bansept-Basler P, Barber T, Bentley AR, Cockram J, Elderfield J, Gosman N, GreenlandAJ, Horsnell R, Howells R, O'Sullivan DM, Rose GA, Howell P (2014). An eight-parent multiparent advanced generation intercross population for winter-sown wheat: creation, properties and validation. G3: Genes Genomes Genetics, 4: 1603-1610.