

# RD 2.1.2: Crop Genetic Improvement

New genomic/genetic approaches

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## Aim:

Improve translational pipelines to enable the production of new crop plant varieties with improved performance in terms of yield, quality and resilience to pests, pathogens and climate change.

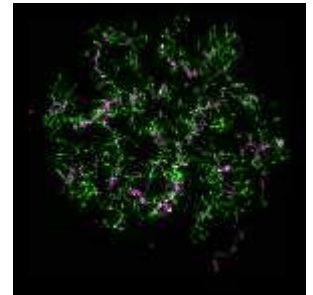
New genomic/genetic approaches allow key traits in crop plants to be dissected. This provides an important vehicle for the delivery of improved cultivars to cope with climate change and improve food security over the next 20-30 years.

Crop genomics will be used to investigate the genetic architecture of key traits and explore genomic, transcriptomic, metabolomic and proteomic signatures shaped by the natural processes of mutation, selection and adaptation.

## Research Objectives

- Identify novel alleles for adaptation in barley
- Find genes controlling morphological and developmental variation
- Manipulate barley recombination
- Develop tolerance to future climate and environmental change
- Improve product quality for consumers and producers
- Develop biotic stress resistance

Recombinant barley chromosomes during meiosis

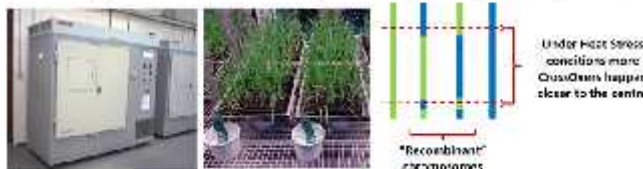


## Manipulating barley recombination

- Outcomes of breeding programmes are dependent on patterns of recombination - the natural process of DNA exchange (CrossOvers) during gamete (pollen/ovule) formation
- In barley recombination tends to happen at the ends of the chromosomes which means the central parts do not exchange
- However there are important genes for breeders in the central regions (malting quality, nutrient use efficiency, disease resistance etc. )
- In order to address this we are developing a breeding tool using heat stress to change the patterns of recombination in barley



Using growth cabinets where environment conditions can be controlled, Barley plants are stressed during meiosis by raising the temperature.



## Acknowledgements

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## Impact

- Using a genetic marker platform we have shown that a simple heat stress imposed at a critical stage influences the pattern of recombination
- This approach has the potential to allow breeders to use a broader range of crop biodiversity to breed for important agronomic, socio-economic and environmental targets
- This work has attracted significant interest from breeding companies (KWS-UK, SESvanderHave, Limagrain etc.) and underpins externally funded work EU-ITN COMREC , Innovate UK DRRUM