BBSRC-funded scientists took a major step towards fully sequencing the wheat genome in summer 2010, publicly releasing the first draft sequence of a reference bread wheat.

Why was this significant?

The project makes an important contribution to our understanding of wheat genetics by providing direct access for scientists and breeders to nearly all the genes in wheat. This has the potential to support global food security efforts by helping to meet the challenges that new diseases, climate change, altering trade and sustainably increasing production will pose in the coming decades and to increase the competitiveness of UK farming. The wheat harvest is worth around £1.6bn a year to the UK economy [1].

Who was involved?

The work was conducted by scientists from the Universities of Liverpool and Bristol and the John Innes Centre, an Institute of BBSRC in Norwich. The researchers collaborated with The Genome Analysis Centre (TGAC), also in Norwich, a national sequencing and bioinformatics facility established by BBSRC.

What did they do?

The researchers produced genome sequences from a commonly-used laboratory variety of wheat. Whilst they can’t determine the precise order of the genes, the sequences are sufficient to give scientists and breeders access to 95% of all wheat genes so are immediately useful. This is among the largest genome projects undertaken, and the rapid public release of the data is expected to accelerate significantly the use of the information by wheat breeding companies.

Universities and Science Minister David Willetts said:

“This is an outstanding world class contribution by the UK to the global effort to completely map the wheat genome. By using gene sequencing technology developed in the UK we now have the capability to improve the crops of the future by simply accelerating the natural breeding process to select varieties that can thrive in challenging conditions.”

Key facts

£1.6Bn
Value of wheat harvest to UK economy each year

5x
Larger than human genome.

3
Genomes in each plant
Completing this sequence represents a major achievement because wheat has a very large and complex genome, five times larger than that of humans. The data produced will be used to help scientists understand the function of specific genes and identify genetic variations between different wheat types. Both of these are valuable to wheat breeders in combination with new genetic technologies as they will speed the development of new, commercially useful varieties.

**How will the data be used?**

The data from this project was made freely available online as soon as the research was completed in order to accelerate its use by plant breeders and by other research teams, increasing the impact and reach of the science.

The genome data was released in an un-analysed format, comprising sequence reads of the wheat genome in the form of letters representing the genetic ‘code’. The sequence reads are fragments of the complete genome, like the pieces of a jigsaw that hasn’t yet been pieced together.

**Benefits for UK agriculture**

Throughout the project the research teams have worked closely with UK plant breeders. The industry group, the British Society of Plant Breeders, called the project “an excellent example of how to achieve technology transfer from research lab through to practical deployment”.

This approach meant that UK breeders have been able to network with the researchers, establish the objectives of the project and discuss progress.

Since last summer, the research teams have started to sequence the genomes of four important commercial wheat varieties grown in the UK. The sequence coverage of these genomes is almost complete. They will be compared to the more complete laboratory strains to identify differences. Early comparison of the sequences has been used by the UK group to generate genetic markers, the first 1,000 of which have already been provided to UK breeders. The breeders are now using these markers to identify regions of the wheat genome carrying useful traits that can be incorporated directly into breeding programmes. This will place wheat breeding on a new foundation to produce wheat crops more quickly and more precisely with improved yield, quality and adapted to withstand pests and climate change. Access to the complete wheat genome sequence will further accelerate these changes and allow ever more precise genetic analysis and breeding.

By being the first to release the draft coverage of the wheat genome the research team and BBSRC have helped make a major contribution to global wheat genetic improvement efforts. Building on this achievement and cementing the UK as a key international partner in wheat genetics, and therefore positioned to reap the economic and social benefits, is a key strategic aim for BBSRC. BBSRC expects to be able to announce further significant investment in wheat genomics in the next few months.

**Contact**

Name: Prof Mike Bevan,  
Institution: John Innes Centre, Norwich  
Tel: 01603 450520  
Email: michael.bevan@bbsrc.ac.uk  
Web: www.jic.ac.uk

**About BBSRC:**

BBSRC is the UK funding agency for research in the life sciences and the largest single public funder of agriculture and food-related research.

Sponsored by Government, in 2010/11 BBSRC is investing around £470 million in a wide range of research that makes a significant contribution to the quality of life in the UK and beyond and supports a number of important industrial stakeholders, including the agriculture, food, chemical, healthcare and pharmaceutical sectors.

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