UK Press Release

INTERNATIONAL CONSORTIUM SEQUENCES TOMATO GENOME

A group of over 300 scientists from 14 countries has sequenced the genomes of the domesticated tomato (*Solanum lycopersicum*) and its wild ancestor, *Solanum pimpinellifolium*. This achievement, by The Tomato Genome Consortium (TGC), will give breeders a map of important tomato genes allowing them to deliver new varieties more quickly and efficiently. The results of the sequencing projects are reported in this week's issue of *Nature*.

The genomes will help breeders to deliver tomatoes with beneficial traits like improved taste and higher concentrations of nutrients, like lycopene, which are believed to have health benefits. Having a map of the tomato's genes could also lower costs by helping us develop tomatoes that are better equipped to combat the pathogens, droughts and diseases that plague growers. Developing better tomatoes will help to ensure global food security.

The market for tomatoes is worth around £625 million a year in the UK alone [1] but, by benefitting breeders of other crops in the *Solanaceae* family like potatoes, peppers and aubergines, the genome could be more valuable still.

Initially, the UK contribution to the project focused on chromosome 4, one of the 12 chromosomes which contain the tomato's genes. The UK team produced high quality sequence which set the standard for other chromosomes being sequenced around the world. Thanks to international collaboration and the adoption of new technologies the final assembled sequence is of outstanding quality and coverage making it a powerful and readily accessible tool for crop improvement.

The UK effort was led by researchers at Imperial College London and the University of Nottingham in collaboration with leading scientists at The Genome Analysis Centre, the James Hutton Institute, the University of East Anglia (UEA) and the Natural History Museum. The project was funded in the UK by the Biotechnology and Biological Sciences Research Council (BBSRC), Defra and the Scottish Government and the sequencing was undertaken by the Wellcome Trust Sanger Institute.

Dr Gerard Bishop, former Reader of Plant Biology at Imperial College London, co-led the BBSRC-funded research team in the UK. Dr Bishop said "The publication of the tomato genome sequence has been eagerly anticipated both by the international research community and by tomato growers and breeders worldwide. Coordinating the efforts of over 300 scientists across 14 countries has been a considerable achievement in which the UK has played an important role, and the outcomes of this effort are already having an impact on the global research effort to deliver better tomatoes."

Co-author and co-leader **Graham Seymour**, Professor of Biotechnology at Nottingham University, said "Tomatoes are one of the most important fruit crops in the world, both in terms of the volume that we eat and the vitamins, minerals and other phytochemicals that both fresh and processed tomato products provide to our diets. The tomato is also the model plant we use to investigate the process of fruit ripening, so understanding this genome will help us unravel the molecular circuits that make tomato and other fruits ripen and give them their health promoting properties."

Together, the sequences provide the most detailed look yet at the functional portions of the tomato genome, revealing the order, orientation, types and relative positions of all of its 35,000 genes. The sequences will help researchers uncover the relationships between tomato genes and the characteristics they encode. They will broaden the understanding of how genetic and environmental factors interact to determine the health and viability of this important fruit crop. Tomato is a member of the *Solanaceae* or nightshade family, and the new sequences are expected to provide reference points helpful for identifying the most beneficial genes in tomato's *Solanaceae* relatives. This includes potato, pepper, eggplant and

petunia and as such is the world's most important vegetable plant family in terms of both economic value and production volume. Plants of the *Solanaceae* family serve as sources of food, spices and medicines.

The sequences also offer insight into how the tomato and its relatives have diversified and adapted to new environments. They show that the tomato genome expanded abruptly about 60 million years ago, but subsequently, most of this genetic redundancy was lost. Some of the genes generated during that expansion were involved in the development and control of the ripening process and so are of interest to tomato breeders.

The genome sequences will also allow researchers to probe more deeply into why humans have been able to domesticate some plants and not others. This could be useful in one day helping us to use a wider variety of plant species for food than the few which we currently rely on.

Prof Jane Rogers, Director of The Genome Analysis Centre, worked on the sequence whilst at the Wellcome Trust Sanger Institute. She said "The UK team made important contributions with physical maps, clone-based sequencing of chromosome 4 and sharing knowledge through training provision for other international partners. The international collaboration was key to the project and helped to establish the high standard for the highly usable sequence that we have today."

The tomato now joins a growing number of crop plants with genome sequences available for plant researchers that include rice, maize, sorghum, poplar, potato, soybean, strawberry cucumber and grape.

Professor Douglas Kell, Chief Executive of BBSRC said, "This is a great achievement. As this project shows, advances in technology and computing are knocking years off the time it takes to sequence even a complicated organism like a tomato plant. This is very exciting as it will allow us to equip breeders with the tools they need to deliver increased yields of better crops, and to do so sustainably."

Press contacts:

BBSRC External Relations

Mike Davies, Tel: 01793 414694, email: mike.davies@bbsrc.ac.uk

Rob Dawson, Tel: 01793 413 204, email: rob.dawson@bbsrc.ac.uk

Notes to editors

1 – data from the British Tomato Growers Association

On publication, this paper will be freely available at:
www.nature.com/nature/journal/v485/n7400/full/nature11119.html

Prior the publication, please contact BBSRC External Relations

About the Tomato Genome Consortium

The TGC was established as a result of a scientific conference organized in 2003 in Washington, DC. Consortium members include scientists from Argentina, Belgium, China, France, Germany, India, Israel, Italy, Japan, Korea, the Netherlands, Spain, the United Kingdom and the United States.

The genome sequence and related resources can be accessed at the Solgenomics website (http://solgenomics.net) and at http://mips.helmholtz-muenchen.de/plant/tomato/index.jsp. The genome sequences have been deposited at NCBI (http://www.ncbi.nlm.nih.gov/genome/).

About BBSRC

BBSRC invests in world-class bioscience research and training on behalf of the UK public. Our aim is to further scientific knowledge, to promote economic growth, wealth and job creation and to improve quality of life in the UK and beyond.

Funded by Government, and with an annual budget of around £445M, we support research and training in universities and strategically funded institutes. BBSRC research and the people we fund are helping society to meet major challenges, including food security, green energy and healthier, longer lives. Our investments underpin important UK economic sectors, such as farming, food, industrial biotechnology and pharmaceuticals.

For more information about BBSRC, our science and our impact see: http://www.bbsrc.ac.uk

About the University of Nottingham

The University of Nottingham, described by *The Sunday Times University Guide 2011* as 'the embodiment of the modern international university', has 40,000 students at award-winning campuses in the United Kingdom, China and Malaysia. It is ranked in the UK's Top 10 and the World's Top 75 universities by the Shanghai Jiao Tong (SJTU) and the QS World University Rankings. It was named 'the world's greenest university' in the UI GreenMetric World University Ranking 2011.

www.nottingham.ac.uk

About Imperial College London

Consistently rated amongst the world's best universities, Imperial College London is a science-based institution with a reputation for excellence in teaching and research that attracts 14,000 students and 6,000 staff of the highest international quality. Innovative research at the College explores the interface between science, medicine, engineering and business, delivering practical solutions that improve quality of life and the environment - underpinned by a dynamic enterprise culture.

www.imperial.ac.uk

About the James Hutton Institute

The James Hutton Institute was formed in 2011 by the Macaulay Land Use Research Institute in Aberdeen and SCRI, the Scottish Crop Research Institute based in Invergowrie near Dundee, Scotland. The Institute encompasses a distinctive range of integrated, world-class strengths in land, crop, water, environmental and socio-economic science. It undertakes a wide range of research for customers

including the Scottish and UK Governments, the EU and other organisations worldwide. The institute has a staff of nearly 600 and 125 PhD students.

www.hutton.ac.uk

About the University of East Anglia (UEA)

The University of East Anglia (UEA) is ranked in the top one per cent of universities in the world and is consistently in the top ten for student satisfaction. It is a leading member of the Norwich Research Park, one of Europe's biggest concentrations of researchers in the fields of environment, health and plant science. www.uea.ac.uk.