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Tomato genome gets fully sequenced – paves way to better, healthier fruits and veggies

Boyce Thompson Institute leads U.S. arm of international tomato sequencing group

Ithaca, NY - For the first time, the genome of the tomato, *Solanum lycopersicum*, has been decoded, an important step forward to improving the yield, nutritional value, disease resistance, taste and color of the tomato and other crops, say the researchers involved. The full genome sequence, as well as the sequence of a wild relative, is jointly published in the May 31 issue of the scientific journal Nature.

The publication of the genome caps years of work by members of the Tomato Genomics Consortium (TGC), an international collaboration between Argentina, Belgium, China, France, Germany, India, Israel, Italy, Japan, the Netherlands, South Korea, Spain, United Kingdom, United States and others. James Giovannoni, a scientist at the Boyce Thompson Institute for Plant Research (BTI) and U.S. Department of Agriculture (USDA) Agricultural Research Service, both located on the Cornell University campus, leads the U.S. tomato sequencing team, which includes researchers at several other universities.

TGC researchers report that tomatoes possess some 35,000 genes arranged on 12 chromosomes. "For any characteristic of the tomato, whether it be taste, natural pest resistance or nutritional content, we've captured virtually all those genes," Giovannoni said, "the possibilities for researchers and plant breeders are boundless." The sequences of these genes and their arrangement on the chromosomes are described in the journal article, information that will allow researchers to move at a quicker pace and plant breeders to produce new varieties with specific desired characteristics. "Tomato genetics underlies the potential for improved taste every home gardener knows and every supermarket shopper desires", Giovannoni said, "and the genome sequence will help solve this and many other issues in tomato production and quality".

Now that the genome sequence of one variety of tomato is known, it will also be easier and much less expensive for seed companies and plant breeders to sequence other varieties for research and

development, he added. Whereas the first tomato genome sequence came at a cost of millions of dollars, subsequent ones might now only cost $10,000 - $15,000, by building on these initial findings. To provide access to the gene sequences of the tomato and related species, BTI scientist Lukas Mueller and his team have created an interactive website (www.solgenomics.net). In the U.S., BTI scientists Zhangjun Fei and Joyce Van Eck contributed to the sequence and its analysis, along with researchers at Colorado State, University of Florida, University of Oklahoma, University of Georgia, University of Arizona, Cold Spring Harbor Laboratory and others.

The sequencing of the tomato genome has implications for other plant species. “The things we learn about tomatoes have potential applications to other important food crops,” Giovannoni said. Strawberries, apples, melons, bananas and many other fleshy fruits, share some characteristics with tomatoes, so information about the genes and pathways involved in fruit ripening can potentially be applied to them, helping to improve food quality and reduce costs. “Now we can start asking a lot more interesting questions about fruit biology, disease resistance, root development and nutritional qualities,” Giovannoni said. Tomatoes represent a $2 billion market in the United States alone. The USDA estimates that Americans consume, on average, more than 72 pounds of tomato products annually.

The sequencing would not have been possible without the work of Cornell’s Steven Tanksley and BTI’s Greg Martin in the 1990s. Tanksley, Martin and other Ithaca scientists developed genetic maps and other molecular tools for tomatoes to study mechanisms of disease resistance, and those tools ultimately paved the way for the TGC’s sequencing efforts.

Tomato genome and sequencing research in the United States was supported by the National Science Foundation and the USDA. BTI is located on the Cornell University campus in Ithaca, New York. Founded by William Boyce Thompson in 1924, BTI is a private, non-profit institution that explores fundamental aspects of plant biology to positively impact society.

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