

Simple soybean anything but - genetically, researcher says

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(PhysOrg.com) -- Think humans are complex creatures? Consider the lowly soybean, said a Purdue University researcher. When it comes to genetics, the soybean plant is far more intricate than that of a human, said Scott Jackson, a plant genomics and cytogenetics researcher in Purdue's Department of Agronomy.

Jackson was among a team of researchers that mapped and sequenced the soybean genome for a project sponsored by the U.S. Department of Energy Joint Genome Institute (DOE JGI). The genome was released to the public this past week and can be viewed online at www.phytozome.net/soybean .

Soybean plants have tens of thousands more genes per cell nucleus than humans, even though the plant's complete genetic profile is much smaller, Jackson said.

"The soybean genome is about half the size of the human genome, but almost all of the genes in soybean are present in multiple copies," Jackson said. "Most of the genes in humans are present in just one copy. So while the number of genes per nucleus in humans is between 20,000 and 25,000, with soybean it's about 66,000."

A genome is the entire deoxyribonucleic acid, or DNA, in an organism, including genes and chromosomes. Genes carry information for producing the proteins necessary for all organisms. The proteins determine an organism's biological characteristics, such as appearance,

size, shape and predisposition to disease. By knowing the genetic makeup of soybean plants, scientists and plant breeders can develop stronger and more productive varieties.

"With this information we can more easily target genes that are important for, say, drought resistance, yield and seed quality," Jackson said. "Up to now, we would randomly mix soybean plants to obtain the genetic traits we were looking for. In the future, we'll be able to work with specific soybean genes. It's a much more precise approach."

Soybean is an important crop for farmers in Indiana and the United States. In 2007 Hoosier growers produced 210.6 million bushels of the oilseed - fourth highest among the states - while U.S. soybean production reached 2.59 billion bushels. Soybean is the source of about 70 percent of the world's edible protein and, according to the U.S. Census, more than 80 percent of the nation's biodiesel production.

The genome project started at Purdue in 2006 and also included researchers from DOE JGI, the University of Missouri-Columbia and Iowa State University, with support from the U.S. Department of Agriculture and the National Science Foundation.

Although the genomes of other living organisms, including humans, have been mapped and sequenced, the sheer complexity of the soybean plant made documenting its genetic composition more difficult, Jackson said.

"Before this project we knew soybean DNA had 20 chromosomes and a genome of about 1 billion base pairs, but we didn't know what those 1 billion base pairs were," Jackson said. "The entire genome has been duplicated two times. What was originally one copy was duplicated, and then all that was duplicated again."

Purdue entomologists also have made significant contributions to

genomics research, said Sonny Ramaswamy, director of Purdue Agricultural Research Programs and associate dean of agriculture.

"Catherine Hill worked on sequencing the tick genome, Greg Hunt the honeybee and former Purdue entomologist Barry Pittendrigh the head louse," Ramaswamy said.

"The genomics research we do at Purdue is intended to enhance food productivity and improve the lives of people."

Provided by Purdue University

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