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New Mexico State University researchers sequence chile genome, hope to unlock genetic secrets

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Researchers with New Mexico State University's Chile Pepper Institute, working in cooperation with researchers in South Korea, have completed a high-resolution draft of the chile pepper genome. This is the first time the scientific feat has been performed with chile. The announcement was made today at the New Mexico Chile Conference.

"This puts NMSU and the Chile Pepper Institute on the cutting edge with a new level of research," said Paul Bosland, an NMSU Regents Professor and director of the university's Chile Pepper Institute. "This gives us a tool for mapping genes that we didn't have before. Having a sequenced genome will unlock the genetic secrets of the chile pepper providing a powerful tool to examine previously unimagined questions and will accelerate efforts to breed improved cultivars."

Bosland said the genome map has the potential to benefit the New Mexico chile pepper industry by improving chile peppers so that the plants can adapt to climate change, use less agricultural water and are able to resist insects and diseases. He said chile peppers might even be improved to better treat human diseases.

"Lack of vitamin A is a public health issue in more than half of all countries in the world," Bosland said. "Severe lack of vitamin A causes hundreds of thousands of unnecessary cases of blindness in the world. Breeding chile peppers with increased levels of pro-vitamin A is one potential solution that can help end this health problem."

Genome mapping is a complex, time-consuming process. NMSU graduate student Greg Reeves traveled to Seoul National University in South Korea last summer to work with professor Doil Choi. Choi's laboratory uses an Illumina sequencer, a very expensive, incredibly advanced machine that only takes a few days to do the same amount of genetic processing work that previously took 600 machines 10 years to accomplish.

"Analysis of the chile pepper genome sequence data provides a new and very powerful foundation for breeding future generations of chile pepper cultivars more quickly and more precisely," Bosland said. "What the sequence provides us is a crucial part of the instruction manual for how to breed a better chile pepper plant. One can now find where genes that underlie certain traits are located, and, thus, one has the tools for how to breed those desired traits into new cultivars."

Because this approach changes the chile peppers own DNA and does not introduce foreign DNA, the cultivars are not genetically modified organisms, or GMOs, and organic farmers should be able to grow the new cultivars.

Bosland said the data collected indicted the chile pepper has approximately 3.5 billion base pairs, which are the building blocks that make up the DNA double helix. They also estimate there are 37,000 chile pepper genes.

Bosland said NMSU researchers plan to first use the data to examine disease resistance to phytophthora, also known as chile wilt, one of the leading problems for chile growers in New Mexico, the U.S. and abroad. The data should also be useful to researchers looking at carotenoids, which provide the red color in chile peppers and are used commercially in food coloring.