

Scientists unravel genetic ancestry of cultivated strawberry

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UNH scientists constructed a linkage map of the seven chromosomes of the diploid *Fragaria iinumae*, which allows them to fill in a piece of the genetic puzzle about the eight sets of chromosomes of the cultivated strawberry. Credit: UNH

Scientists from the University of New Hampshire have unlocked a major genetic mystery of one of the ancestors of cultivated strawberry. A genetic analysis conducted by New Hampshire Agricultural Experiment Station researchers, which took four years to complete, aims to improve modern cultivation efforts of strawberry growers.

The focus of the UNH research is one of cultivated strawberry's wild ancestors, *Fragaria iinumae*. Strawberry species have seven unique chromosomes. Like humans, this species of strawberry has two sets of chromosomes, as opposed to the cultivated strawberry, which has eight sets chromosomes and is among the most genetically complex plants. The UNH study relied on samples of this strawberry species collected on the Japanese Island of Hokkaido by an American-Japanese expedition in 2004 that included UNH

plant geneticist Thomas Davis.

UNH scientists, including Davis and experiment station researcher Lise Mahoney, constructed a linkage map of the seven chromosomes of the diploid *Fragaria iinumae*, which allows them to fill in a piece of the genetic puzzle about the eight sets of chromosomes of the cultivated strawberry. The cultivated strawberry is believed to trace its genetic ancestry to as many as four diploid ancestral strawberries, one of which is *Fragaria iinumae*.

"Many people are trying to understand the ancestry of the cultivated strawberry so that they can better understand traits associated with specific genetic markers, such as fruit quality, flowering habits, and resistance to diseases," Mahoney said. "Defining the genomes of the cultivated strawberry's wild ancestors will ultimately help guide the use of genetic information in breeding for a better cultivated strawberry."

The research on *Fragaria iinumae* is the second time experiment station researchers have mapped the genes of an ancestral diploid strawberry of the cultivated strawberry. In 2011, UNH researchers were part of a team that sequenced *Fragaria vesca*, another diploid ancestor of the cultivated strawberry. This reference sequence immediately became an indispensable resource in strawberry genetic research throughout the world.

"This remarkable genetic map, which is the highest resolution linkage map for any ancestral diploid strawberry species, is a valuable research tool in and of itself. More importantly, it provides a necessary resource for assembly of a *Fragaria iinumae* reference genomic sequence as a much needed complement to the previously published reference genome for ancestral diploid *F. vesca*," Mahoney said.

To create the genetic map of *Fragaria iinumae*, experiment station researchers used the IStraw90

strawberry SNP array, an advanced genomics tool for marker-assisted mapping that the Davis lab helped develop as part of the International RosBREED Consortium. Prior to the advent of the marker-assisted mapping approach, breeders had to rely only on the evaluation of physiological traits such as fruit yield, disease resistance, and flavor for hundreds of plants to identify those with the desired traits, while having little or no knowledge of each plant's underlying [genetic](#) composition. The evaluation of traits in very large breeding populations is costly and time-consuming.

"UNH is recognized as one of a very small handful of institutions worldwide working at the forefront of strawberry genomics and its application to strawberry breeding. We are leading a multi-institutional collaboration to assemble a new genomic resource, the *F. iinumae* reference genome. Of particular local interest, we are putting the genomic knowledge, resources, and technologies to work at UNH to develop new strawberry varieties that will be locally adapted and suitable for organic production, to the benefit of regional strawberry growers and consumers," Mahoney said.

The researchers present their findings in the journal [The Plant Genome](#).

The United States is the world's leading producer of strawberries. In 2012, the United States produced more than 3 billion pounds valued at \$2.4 billion, according to the USDA. Most U.S. strawberries are grown in California. Strawberries are also an important crop in New Hampshire, with estimates of the retail value of New Hampshire's [strawberry](#) crops at about \$1.85 million.

Provided by University of New Hampshire

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