

# Sunflower genome holds the promise of sustainable agriculture

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As agricultural land becomes increasingly valuable, the need to maximize its utilization increases and decisions about what crops to plant and where, become paramount.

The sunflower family includes a number of valuable food crops, with sunflower [seed production](#) alone valued at about \$14 billion annually. Yet the sunflower family is the only one of a handful of economically important plant families where a reference [genome](#) is not available to enable the breeding of crops better suited to their growing environment or consumers tastes.

A new research project, largely funded by Genome Canada, Genome BC, the US Departments of Energy and Agriculture, and France's INRA (National Institute for Agricultural Research), will create a reference genome for the sunflower family - currently the world's largest plant family, containing 24,000 species of plants, including many crops, medicinal plants, horticulture plants and noxious weeds.

The US\$10.5 million research project titled, Genomics of Sunflower, will use next-generation genotyping and sequencing technologies to sequence, assemble and annotate the sunflower genome and to locate the genes that are responsible for agriculturally important traits such as seed-oil content, flowering, seed-dormancy, and wood producing-capacity.

"The intent is to have the basis for a breeding program within four years," says project leader, Dr. Loren Rieseberg (University of British

Columbia).

One of the potential applications of this research includes a hybrid variety of sunflower, grown as a dual-use crop. The wild Silverleaf species of sunflower, known for its tall, woody stalks that grow 10 to 15 feet tall and up to 4 inches in diameter in a single season, could be crossbred with the commercially valuable sunflower plant that produces high quality seeds, capitalizing on the desirable traits of both species.

"The seeds would be harvested for food and oil, while the stalks would be utilized for wood or converted to ethanol. As a dual-use crop it wouldn't be in competition with [food crops](#) for land," says project leader, Dr. Loren Rieseberg (University of British Columbia).

In addition, this fast growing annual crop will be highly drought resistant, thanks to desirable traits from the Silverleaf variety, and would therefore be suitable for use in subsistence agriculture in places like Sub-Saharan Africa, as well as in much of North America.

Dr. Nolan Kane (University of British Columbia) is one of the co-investigators on the project and together with colleagues at INRA in France, is doing much of the bioinformatics for the genome project.

"The sunflower genome is 3.5 billion letters long - slightly larger than the human genome. The sunflower family is the largest plant family on earth - encompassing several important crops and weeds. Mapping its genome will create a very useful reference template for the entire plant family, which will enable us to work on closely related species," says Kane.

Dr. Steve Knapp (University of Georgia) is another co-investigator on the project, whose work includes genetic mapping for desirable traits such as wood formation, as well as the development of germplasm for breeding. "The complete sequence will give us a full draft of the genome

and eliminate the arduous one at a time process that we have been using up until this point," he says.

"Genome BC is very pleased to support this innovative project, which will capitalize on Canada's strong genomics infrastructure and leadership in [Sunflower](#) genomics, in collaboration with other experts worldwide," says Dr. Alan Winter, President and CEO of Genome BC. "The potential applications of this research are extremely important, both globally and locally."

Provided by Genome BC

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