Genetic analysis to help predict sunflower oil properties

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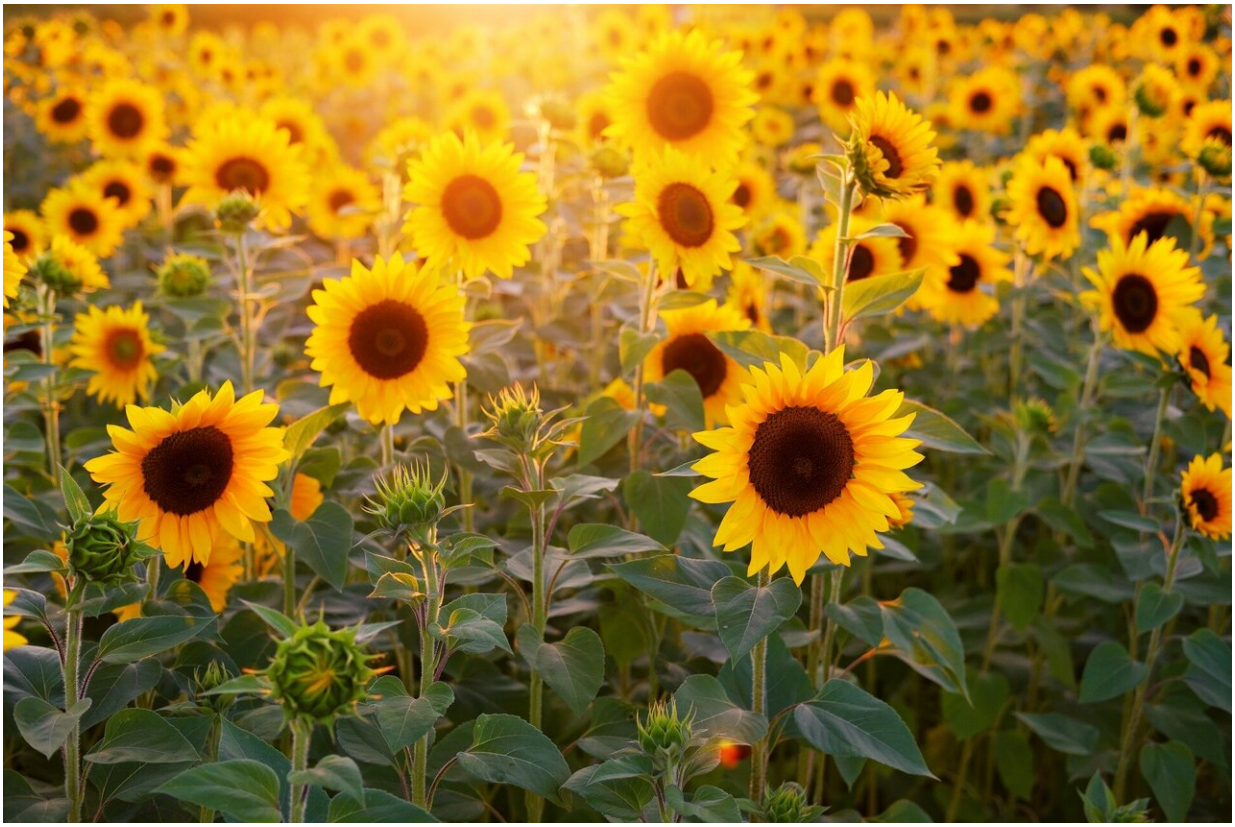

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Skoltech researchers and their colleagues from the University of Southern California have performed genetic analysis of a Russian sunflower collection and identified genetic markers that can help predict

the oil's fatty acid composition. The research was published in *BMC Genomics*.

Genomic selection, which helps quickly create new crop varieties, has been a much-discussed topic worldwide for the last 10 years. DNA sequencing and extensive genotyping have been applied to obtain genetic profiles of crops. When analyzed and compared to field data, those profiles help identify genetic markers for traits of interest to farming and predict the properties and value of a crop based on its genetic profile alone.

"Our work is the first large-scale study of the Russian sunflower genetic collection and one of the first attempts to create new varieties using genomic selection. Predicting what a plant will be like before actually planting it—an idea that seemed utterly unrealistic until recently—has become commonplace in many countries thanks to technological advances. Classical breeding can hardly cope with the challenges posed by the global climate change, growing human needs, and evolving food quality requirements. To get a head start, we should turn to genetics," Alina Chernova, Skoltech Ph.D. and lead author of the study, notes.

This long-term research project has been carried out by a joint team led by Skoltech professor Philipp Khaitovich and featuring scientists from Skoltech, the University of Southern California, Vavilov All-Russian Institute of Plant Genetic Resources, and Pustovoit All-Russian Research Institute of Oil Crops, joined by breeders from the seed-producing company Agroplasma.

The team looked at species from two major Russian sunflower gene banks and Agroplasma's collection. Their genetic analysis covered 601 lines of cultivated sunflower to check genetic diversity against the global collection and compare the results with chemical tests of oil obtained from these lines. Bioinformatic analysis revealed genetic markers that

can help control the oil's fatty acid content.

"The reason we chose the sunflower is that it is a key source of vegetable fats, and Russia is the world's leading supplier of sunflower oil. You can vary the oil's fatty acid composition—which was the focus of our research—to obtain oils with different properties suitable for roasting, dressings or industrial uses," Skoltech Ph.D. student and study co-author Rim Gubaev says.

"Thanks to this project, we have gained valuable insights and built a team of like-minded people keen on helping breeders to introduce genetics in their work. We have founded Oil Gene—it's a startup that will focus on practical tasks and provide genomic selection services," Gubaev adds.

More information: Alina I. Chernova et al, Genotyping and lipid profiling of 601 cultivated sunflower lines reveals novel genetic determinants of oil fatty acid content, *BMC Genomics* (2021). DOI: 10.1186/s12864-021-07768-y

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