Genetic secrets of good wine

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Discovering the genetic secrets of good wine is at the heart of a project launched by Spanish and Canadian scientists, who are conducting the first large-scale, integrated genomics effort focused on single-model cultivars for wine and table grapes.

The genetic determinants of grape quality are practically unknown, and how local environmental factors interact at the cellular and molecular levels to cause differences in fruit quality is not understood.

"Understanding grapevine genomics is now a prerequisite to further improvement of viticultural practices as well as for the development of new varieties through breeding programs and adapting the best clones to the most suitable vineyard environments," José Miguel Martínez-Zapater, the Spanish coordinator of the project at Madrid's National Center of Biotechnology, told us.

The grape genomics project, funded by Genome Spain and Genome Canada, is meant to elucidate developmental and metabolic pathways underlying grape development and quality traits and predict how these pathways are modified by microclimate and common viticultural practices as well as by genetic differences among grapevine cultivars.

The project, announced last month (April 7) by the University of Navarra, is expected to generate useful tools for genomic analysis, such as full length cDNA libraries.

"The proposal is highly committed to the development of tools for functional analyses at different organismal levels (i.e., whole plant, organ, and cell), including cell-based assays and whole plants for functional studies as well as detached shoots for greenhouse experiments concerning the environment and berry ripening," notes Martínez-Zapater.

Steven Lund, the Canadian coordinator of the project at the University of British Columbia in Vancouver, said that "[this] is a new, exciting project where in more than one way, the Old World meets the New World. Spain, in 'Old World' Europe, is one of the largest grape and wine producers in the world, whereas Canada, in the 'New World,' is one of the very youngest."

"Throughout the project," Lund told us, "using complementary areas of expertise, our two countries will together have the opportunity to begin to dissect the traditional practice of viticulture using modern, 21st-century genomics technologies in order to unlock age-old secrets underlying this romantic craft."

Specifically, the Canadian researchers will develop single-model cultivars for the wine grape *Vitis vinifera* cv. Cabernet Sauvignon.

"We will discover and characterize molecules under different environments to determine through biostatistical analyses and subsequent functional assays those that serve as the best markers for ripening and quality - these could potentially be developed into DNA- or protein-based diagnostic tools for viticulturalists to use to fine-tune their management practices from season to season," Lund said.

"It does sound like a good idea," said Gabriel Suberviola, the chief of production at Catalan wine and champagne company Segura Viudas. But he told us he thought it would be a complex process, and in any case, the traditional process for wine elaboration should be respected.

Lund stresses that the end goal "is not the production of genetically modified grapevines for commercialization, but rather information for viticulturalists and grapevine breeders to use to improve popular cultivars grown in Spain and Canada to achieve consistent, high fruit quality from season to season."

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