

Very berry study aims to improve wine quality

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A gene expression study of grapevine berries grown in different Italian vineyards has highlighted genes that help buffer the plants against environmental change and may explain the different quality performances of grapevine when grown in different "terroirs". The research, reported in the open access journal *Genome Biology*, could be used to help identify and breed grapevine varieties better suited to climate change and improve berry and wine quality.

Much to the inconvenience of winemakers and drinkers, grapevine berries vary within berries on vines grown in different vineyards and in different vintages. This means they may ripen unevenly, affecting the quality of wine from place to place and from vintage to vintage. But although the differences are known to reflect environmental change and differing grape-growing practices, the [molecular mechanisms](#) underlying this variability are unclear.

To address the issue, Silvia Dal Santo from the [Plant Genetics](#) Lab headed by Mario Pezzotti of the University of Verona, Italy grew a single grapevine clone (*Vitis vinifera*, cultivar Corvina) in eleven very different vineyards across the Verona region. They then harvested berries at various stages of ripening, across three consecutive years, and used microarrays to study patterns of gene expression across the genome, linking interesting finds to the grapevine's DNA sequence.

The team were able to highlight various environmentally-sensitive genes thought to influence berry quality. These included genes regulating

[metabolic pathways](#) – such as the production of [phenolic compounds](#) which contribute to taste, colour and 'mouth-feel' of wine – that were highly sensitive towards different climates.

It was hard to pick out generalised gene expression signatures reflecting common environmental conditions or viticulture practices, instead patterns of [gene expression](#) clustered by year of growth. However, during a typical climate vintage, the authors were able to link sets of differentially-expressed transcripts to particular environmental attributes or specific agronomical parameters, such as the vine trelling system.

They also showed that the early stages of berry ripening are most responsive to changes in environmental conditions, highlighting a critical period during which the winegrower is most vulnerable to the whims of the weather and, in turn, may have a great impact on the entire ripening course under different weather conditions.

Environmentally non-responsive genes, constant across vineyards and weather conditions, were also identified. These, the authors suggest, could be developed into universal markers to monitor grape ripening in the field, helping to optimise picking times and standardise wine quality.

The grapevine is the most widely-cultivated perennial fruit crop in the world, with 67.5 million tons of berries produced in 2011. [Climate change](#) is expected to significantly impact agriculture, and the wine growing industry, in the near future. The new findings provide a good starting point from which to further explore the molecular processes governing berry development, and highlight the environmentally-dependent and agriculturally-important factors essential for identifying existing or breeding new, weather-tolerant grapevine varieties.

More information: The plasticity of the grapevine berry transcriptome, Silvia Dal Santo, Giovanni Battista Tornielli, Sara Zenoni,

Marianna Fasoli, Lorenzo Farina, Andrea Anesi, Flavia Guzzo, Massimo Delledonne and Mario Pezzotti *Genome Biology* 2013 14:6.
genomebiology.com/2013/14/6/R54

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