



## Local Research News

### Transformation and regeneration facility for grapevine

The ability to handle grapevine materials in tissue culture is key to many viticultural experiments, specifically in molecular biology, plant propagation and plant material quality studies. *The Transformation and Regeneration platform* has provided the grapevine community of South Africa with a centre to conduct such grapevine transformations and regenerations. Genetic transformations were continuously performed with different constructs to cultivars Sultana, Red Globe, Merlot and R110 as rootstock. The transgenic plants, cultures and cell-lines that have been established were sustained. The constructs included several antifungal genes, carotenoid genes, ascorbate/tartate metabolism genes as well as anti-viral constructs. The solid-plate cultures, suspension cultures, cryopreservation stock material, *in vitro* and *ex-vitro* plant material, as well as the methods used and the skilled people performing the work, form part of the platform. [www.sawislibrary.co.za/dbtextimages/VivierM.pdf](http://www.sawislibrary.co.za/dbtextimages/VivierM.pdf)

### The effect of heuweltjies on grapevines

Heuweltjies are fossil termite mounds occurring widely in the south-western Cape of South Africa. Below right is an aerial view of densely concentrated heuweltjies on a farm near Piketberg. The role of heuweltjies in modifying crop vigour and quality in cultivated landscapes remains largely unexplored. Two vineyard blocks on farms in two climatic regions of the Western Cape, Stellenbosch (Mediterranean climate, Cabernet Sauvignon) and Robertson (semi-arid climate, Shiraz) were selected to better understand how differences in heuweltjie soil characteristics may be carried through to vine ecophysiology, berry quality and wine characteristics.

Vine vigour was significantly altered on the heuweltjie-associated vines, exhibiting excessive vegetative growth in Stellenbosch, leading to variations in berry characteristics on and off the heuweltjies, with the opposite trend observed for Robertson. Lower sugar and alcohol percentages and higher titratable as well as malic acid concentrations were observed in the wines emanating from the heuweltjies in Stellenbosch. Sensory analyses showed lower astringency and alcohol burn in the Cabernet Sauvignon heuweltjie wines compared to the non-heuweltjie wines from Stellenbosch. No differences were observed in the wines from Robertson, but fruitiness was significantly lower in the Shiraz heuweltjie-wines when compared to the non-heuweltjie wines. Differences in soil water content between heuweltjies and its adjacent soils was the most prominent difference, and is probably the underlying factor that affects the soil-grapevine characteristics.

[www.sawislibrary.co.za/dbtextimages/JacobsS.pdf](http://www.sawislibrary.co.za/dbtextimages/JacobsS.pdf)



## International Research News

### Is fruit quality related to crop price?

A study has investigated whether ripeness uniformity and berry size are key determinants of fruit quality, and thus crop price. Three California Cabernet Sauvignon vineyards each of a high (\$9,000–10,000 /ton), a medium (\$4,000–5,000), and a low (\$500–1,000) crop price were selected, and fruit uniformity at commercial harvest was measured for two consecutive years. Substantial differences in crop price were associated with differences in vineyard size and crop management styles. Higher priced vineyards were managed more intensively with more hand operations and with more dropped crop at veraison.

The study found that there were no differences in mean values of Brix, pH, berry weights, anthocyanin concentration or fruit uniformity for different crop prices. Moreover, high crop price fruit had lower uniformity in Brix and pH compared to medium and low crop price fruit. Thus, in this study, the environments and production practices in high priced vineyards did not produce highly uniform fruit compared to low priced vineyards. This raises the question of how fruit composition, quality, and price are related. If the high price fruit in this study is better for winemaking than the low price fruit, then it is due to other flavour compounds or fruit parameters, or to extrinsic factors other than the fruit itself. <http://dx.doi.org/10.5344/ajev.2013.13084>

### Non-Saccharomyces yeasts reduce the alcohol content of wine

In the past two decades the maximum alcohol content of wine has crept up from about 13% to more than 17% percent, a side effect of the consumer preference for wine styles associated with increased grape maturity. Sugar content increases with grape maturity, and this results in increased alcohol content. However, high ethanol content impacts wine sensory properties, reducing the perceived complexity of flavours and aromas. And, for health and economic reasons, the wine sector is actively seeking technologies to facilitate the production of wines with lower ethanol content. Winemakers have tried to tinker with *S. cerevisiae* for years to reduce its alcohol production efficiency, but not with much success.

Non-conventional yeast species, in particular, non-*Saccharomyces* yeasts, have shown potential for producing wines with lower alcohol content, but are not usually capable of completing alcoholic fermentation. A study evaluated 50 different non-

*Saccharomyces* isolates belonging to 24 different genera for their capacity to produce wine with a lower ethanol concentration when used in sequential inoculation regimes with a *S. cerevisiae* wine strain. A sequential inoculation of *Metschnikowia pulcherrima* AWRI1149 followed by an *S. cerevisiae* wine strain was best able to produce wines with a lower ethanol concentration. This produced wines with 0.9% (vol/vol) and 1.6% (vol/vol) lower ethanol concentrations in Chardonnay and Shiraz wines, respectively, than with the *S. cerevisiae* control. <http://dx.doi.org/10.1128/AEM.03780-13>

### Irradiation as a phytosanitary treatment

There are several methods that can be used to treat grapes for phytosanitary purposes. Currently, the most widely used treatment is methyl bromide fumigation. However, methyl bromide is being phased out because it is an environmental pollutant that is depleting the ozone layer. Carbon dioxide in conjunction with cold storage is effective against common table grape insect pests. Irradiation with gamma rays can be an alternative these treatments and is gaining use all over the world as a phytosanitary treatment for various fruit due to its efficacy on insects and maintenance of fruit quality, as it prevents immature pests from developing into maturity and causes sterility in adults that may be present in the fruit. However, there is limited information available on the effect of irradiation of grapes. The international Radura logo (right) shows that a food has been irradiated.



Cases of Sugaone and Crimson Seedless table grapes were subjected to irradiation dose levels of 400, 600, and 800 Gray using a Cobalt 60 source. Irradiation affected each variety of grapes differently. The main effect on the grape quality was softening in texture, with Sugaone grapes affected more than the Crimson Seedless. Sensory attributes that were affected for both varieties were berry softening and rachis browning. The negative effects observed in Sugaone grapes were an increase in bruising and decrease in bloom, and the positive effects were an increase in sweetness, flavour, and juiciness with irradiation. Consumer acceptance was significantly lower only in the texture of Sugaone treated grapes. Consumers could not tell irradiated Crimson Seedless grapes from the control. It was concluded that the irradiation levels used maintain grape quality during 3 weeks of storage. <http://dx.doi.org/10.1111/1750-3841.12307>

### Periodic aeration of red wine compared to microoxygenation

Micro-oxygenation (MOX) is a winemaking technique that enhances certain chemical and sensory wine features. It is believed that by infusing small volumes of oxygen in a continuous way, the quality of the product may improve, and the hazards of oxygen build-up and uncontrolled oxidation are avoided. A trial evaluated the chemical effects of an alternative oxygenation protocol, based on weekly wine aerations, where a small volume of wine from each batch was splashed-racked into a stainless-steel tub comprising a screen that helped aerating the wine, and was then added back to the batch.

For most of the variables analyzed, the periodic aeration treatment produced effects equivalent to the conventional MOX (such as a reduction in the concentration of free anthocyanins, and an enhancement in polymeric pigments). The alternative aeration treatment tested was effective in producing changes in the colour and phenolic composition of the treated wines, most notably with regards to accelerating the formation of polymeric pigments. The study concluded that well-managed periodic aeration treatments could be used as an alternative to MOX. It was also noted that combining MOX and oak-wood resulted in a rise in the concentration of protocatechuic acid and a reduction of methoxypyrazines, a result that should be further studied. <http://dx.doi.org/10.5344/ajev.2014.13105>

### Berry phenolics of grapevine under challenging environments: a review

Climate change has already caused significant warming in most grape-growing areas of the world, and the climatic conditions determine, to a large degree, the grape varieties that can be cultivated as well as wine quality. Grape berry phenolics contribute to organoleptic properties, colour and protection against environmental challenges. In particular, heat, drought and light/UV intensity severely affect phenolic metabolism and, thus, grape composition and development. Also, polyphenolic profile is greatly dependent on genotype and environmental interactions. The full understanding of how and when specific phenolic compounds accumulate in the berry, and how the varietal grape berry metabolism responds to the environment is of the utmost importance. A review deals with the diversity and biosynthesis of phenolic compounds in the grape berry, from a general overview to a more detailed level in which the influence of environmental challenges on key phenolic metabolism pathways is discussed. <http://dx.doi.org/10.3390/ijms140918711>

### The browning of champagne-type wines

Browning is a natural process that occurs in white wines, including sparkling wines. It is a key quality indicator because consumers notice it and thus wineries make every effort to prevent it. It is due to oxidation and polymerization of the phenolics present in wines. Absorbance at 420nm ( $A_{420}$ ) is usually used by wineries to determine the degree of browning. However, this method has a low sensitivity. A study analyzed  $A_{420}$ , phenolics, and 5-hydroxymethylfurfural (5-HMF) content in six wines from a Catalan winery, kept at 4, 16, and 20°C for 2 years. Caffeic acid, transcoumaric acid, p-coumaric acid, and 5-HMF were the compounds with the greatest correlation with browning. The study proposes that 5-HMF is a better time–temperature marker than  $A_{420}$  or phenolics, because it shows higher linearity with time at all temperatures, is more sensitive to temperature changes, and has lower variability. A simple mathematical model that wineries can use to forecast the browning shelf life of their sparkling wines is presented. <http://dx.doi.org/10.1021/jf403281y>

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