



## International Research News

### Mono- and sesquiterpenes in grapes: a review

Terpenes are a large and diverse class of organic compounds, produced by a variety of plants, particularly conifers, though also by some insects such as termites or swallowtail butterflies. They are often strong-smelling. They may protect the plants that produce them by deterring herbivores and by attracting predators and parasites of herbivores. It has been shown that monoterpenes play a key role for the typical floral and sweet notes of the aromatic grape varieties such as Muscat, Riesling and Gewürztraminer. During the last decade another group of terpenoids - the sesquiterpenes - have attracted the interest of wine researchers. This interest was certainly stimulated by the discovery of the sesquiterpene ketone rotundone as the key aroma compound for the peppery character of high quality Syrah wines grown in cold climate regions of Australia. A review integrates current knowledge on mono- and sesquiterpenes in grapes with a special focus on biochemical and physiological aspects. While monoterpenes occur as highly functionalized compounds and are stored as their corresponding glycoconjugates in berry tissues, sesquiterpenes are mainly present as unsaturated hydrocarbons and accumulate in the epicuticular wax layer of intact berries. Interestingly, both groups of terpenes appear to be involved as volatile organic compounds in plant defence and their biosynthesis is enhanced via the jasmonic acid signalling pathway. These novel aspects will help to understand how environmental cues affect the genes and enzymes of various metabolic pathways of relevant wine aroma compounds with numerous links to enology and wine flavour chemistry. <http://dx.doi.org/10.1021/acs.jafc.5b04398>

### Development of inflorescence primordia in Chardonnay

The formation of inflorescences and then flowers in the grapevine latent bud involves four progressive well-defined stages which occur over two seasons. The first three stages, floral evocation, initiation of the inflorescence primordia (IP), and differentiation then growth of the primordia, are all completed during the first season. The fourth stage, further IP growth then differentiation and growth of flowers, occurs in the second season, before budburst and then on to the post budburst inflorescence. To fill gaps in the scientific literature of grapevine physiology concerning IP formation throughout the first season a project has described, in detail, the developmental stages, initiation times and the fate of all primordia in primary buds in relation to dates and phenological stages, and has quantified IP size in secondary and tertiary buds of Chardonnay grapevines. It is the first-ever report of IP development and the contents and fate of the latent bud growing points throughout the first season, thus advancing grapevine physiology knowledge. <http://dx.doi.org/10.5344/ajev.2015.14050>



### Pesticide residues analysis in wine

Twenty-seven commercially available Cypriot wines (red/white, dry/sweet) were quantitatively tested with a cost-effective and validated method for the presence of 172 different pesticide residues. Fifteen of the 27 wines were positive for pesticide residues and in all cases these were much lower than the maximum residue levels (MRLs) permitted by EU regulations. The liquid chromatography – tandem mass spectrometry method used was not effective at detecting four pesticides, namely dodemorph, famoxadone, pymetrozine and parathion methyl. <http://dx.doi.org/10.1080/09571264.2015.1022255>

### H<sub>2</sub>S and mercaptans in wine also exist in odourless complexes

Research by Vincente Ferreira, winner of the 2015 International Oenoppia-SIVE (Italian Society of Viticulture and Oenology) award, has demonstrated for the first time that hydrogen sulphide (H<sub>2</sub>S) and mercaptans in wine are not only present in volatile (odorous) forms. They also exist as odourless complexes and are thus undetectable. This means that wine contains many sulphur compounds that may be released throughout its life span in bottles since these combinations are reversible. The complexes formed with metal cations are completely stable and soluble. No precipitation was observed and these complexes were not removed by filtration. The team has created models to forecast long-term developments in wine reduction odours and also to recommend appropriate preventive measures. At present, the only way to prevent these sulphur containing complexes from forming is micro-oxygenation over prolonged periods. <http://www.infowine.com/default.asp?scheda=14922>

### Anthocyanin copigmentation and colour of wine: the effect of naturally obtained hydroxycinnamic acids as cofactors

Colour is one of the most important organoleptic characteristics of red wine and anthocyanins in the anthocyanidin form produce the red colour. Copigmentation is a phenomenon where pigmentation due to anthocyanidins is reinforced by the presence of other colourless flavonoids, known as cofactors or copigments. This occurs by the formation of a non-covalently-linked complex. Rosmarinic acid and natural extracts rich in hydroxycinnamic acids, obtained from aromatic plants (*Origanum vulgare* and *Satureja thymbra*), were examined as cofactors to fresh Merlot wine and the effect on anthocyanin copigmentation and wine colour was studied during storage for 6 months. An increase of the copigmented anthocyanins that enhanced colour intensity by 15–50% was observed, confirming the ability of complex hydroxycinnamates to form copigments. The samples

with added cofactors retained higher percentages of copigmented anthocyanins and higher colour intensity, compared to the control wine, for up to 3 months. However, the change in the equilibrium between monomeric and copigmented anthocyanins that was induced by added cofactors, did not affect the rate of polymerization reactions during storage. <http://dx.doi.org/10.1016/j.foodchem.2015.10.095>

### Vine-shoot waste applied as foliar fertilizer to grapevines

A study has examined the effect of foliar applications of different wood aqueous extracts on the amino acid content of musts and wines of the Airén variety. The foliar treatments applied were an Airén vine-shoot aqueous extract applied either once or twice, the latter at half strength each time, and a commercial oak extract which was applied only once. Results obtained show the potential of Airén vine-shoot waste aqueous extracts to be used as foliar fertilizer, as they enhanced the wine amino acid content, especially when they were applied once. Similar results were observed with the aqueous oak extract. Regarding wine fermentative volatile compounds, there was a greater increase in the overall volatile composition of the wines for the twice applied vine-shoot extract treatment. <http://dx.doi.org/10.1016/j.foodchem.2015.10.034>

## Other News

### Wine grape flour reduces cholesterol

Boutique flours made from wine grape seeds are typically blended with other flours to make breads, cookies, or crackers. Researchers in California have shown that blood cholesterol, hepatic steatosis (better known as 'fatty liver') and weight gain were reduced in laboratory hamsters fed food spiked with flour milled from Chardonnay wine grape seeds, as compared to hamsters fed food spiked with Cabernet Sauvignon or Syrah grape seed flour. They also found that leptin, which is usually high in people who are obese, decreased. Adiponectin, which is believed to help prevent diabetes and atherosclerosis, increased. The researchers have now teamed up with a commercial maker of varietal wine grape flours so as to learn more about the potential health benefits of these unusual flours. Follow-up research now being conducted with human volunteers so as to determine whether the beneficial effects seen in hamsters also occur in humans. These studies may not only spark more interest in the flours, but may also lead to their use as a health-promoting ingredient in a broader range of foods. An added advantage would be the reduction in the amount of wine grape seeds that presently end up in cattle feed, compost or landfills. <http://www.ars.usda.gov/is/pr/2015/150917.htm>

### Wine Grenade

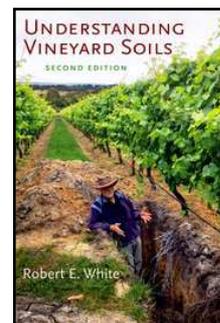
Micro-oxygenation was developed in 1990 to control the aeration of red wines. It allows the winemaker to deliver precise amounts of oxygen to wine to stimulate fermentation and to simulate the effect of oxygen on wines during barrel fermentation. The process is widely used throughout the world, although its use is mainly confined to less expensive red wines. While reducing costs in the long-term, micro-oxygenation systems carry a high up-front cost. Now a handheld micro-oxygenation device, designed by a group of students, is undergoing commercial trials at a Australian winery, with plans for further trials in Bordeaux and California. The developers are reluctant to provide too many details until the device is proven, but they explained that winemakers will be able to drop the device into their wine to produce a maturation process similar to that which happens within oak barrels, making it cheaper and quicker to get the product to market. They say that studies have shown that the cost of ageing wine in a barrel is in the dollars-per-litre range, and by comparison the Wine Grenade will cost just cents-per-litre. <http://www.stuff.co.nz/business/industries/73639332/wine-grenade-to-revolutionise-wine-industry>

### Grape seed colour is not useful for assessing wine tannins

Contrary to a long-held belief, researchers have determined that grape seed colour does not have an effect on the amount of tannin extracted into wine. The old belief was that immature grapes, with green seeds, would impart more tannins into wine, as more mature grapes, whose seeds become more brown than green, have fewer tannins. The team made wines from both immature and overripe grapes, then tested for the number of tannins in the finished product. They found that the seed colour did not impact the amount of tannin extracted into the wine. <https://news.wsu.edu/2015/11/16/grape-seed-color-not-helpful-in-assessing-wine-tannins/>

### Understanding vineyard soils: a book

The second edition of *Understanding Vineyard Soils* by Robert E. White explains to a wide audience how soils form and why they are so variable. It describes essential chemical and physical processes involving nutrients, water, oxygen and carbon dioxide, moderated by the activities of soil organisms, and it proposes remedies to alleviate adverse conditions such as soil acidity, compaction, poor drainage and salinity. This new edition provides the latest updates and developments in vineyard and soil-management practices. These include a discussion of the pros and cons of wines produced from organic, biodynamic and conventional viticulture. It also identifies a suite of soil properties for assessing soil health in the vineyard and describes the development of new tools for characterizing soil microorganisms and identifying the specific functions of taxonomic groups.



<https://global.oup.com/academic/product/understanding-vineyard-soils-9780199342068>

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