



International Research News

Testing for grapes exposed to smoke

Bushfires in the vicinity of grape growing regions result in smoke drifting over the vineyards. Wine made from such smoked grapes is often downgraded or unfit for sale due to negative sensory characters. To manage or avoid the risk of producing smoke-affected wine, a new diagnostic assay has been developed for assessing the extent of smoke exposure in grapes and the resulting wines. The method relies on measuring the amount of the phenolic glycosidic grape metabolites that are formed from major volatile phenols present in smoke. On the basis of phenolic glycoside concentrations, grapes or wine can be assessed as smoke exposed or not, and the relative intensity of smoke exposure can be determined. Using high-performance liquid chromatography mass spectrometry (HPLC-MS/MS) with Atmospheric Pressure Chemical Ionization (APCI), the new method was both developed and validated. The method was confirmed to be of sufficient sensitivity and reliability to use as a diagnostic assay.

To investigate the composition of phenolic glycosides in a range of grape samples which were suspected of smoke exposure of different intensities and/or durations from bushfires in 2009, Chardonnay, Pinot noir, Cabernet Sauvignon, and Shiraz grapes were subjected to the validated phenolic glycoside analysis. The results demonstrated that the volatile phenols taken up by grapes following smoke exposure were generally metabolized in a similar fashion regardless of grape variety, and concentrations of individual phenolic glycosides were all related to the total pool of phenolic glycosides measured, further corroborating the suitability of phenolic glycoside grape metabolites as markers for smoke exposure. The new method is more suitable as a diagnostic strategy to identify smoke exposure and to assess its impact in grapes and resulting wines than the existing guaiacol (and 4-methylguaiacol) analysis. <http://dx.doi.org/10.1021/jf305025j>

Photosynthetic performance of Pinot gris grapevine leaves in response to Potato leafhopper infestation

Potato leafhoppers (*Empoasca fabae* Harris) are small (3mm long), wedge-shaped insects (right), pale green with a row of six white spots located behind the head. They have piercing and sucking mouthparts, which allow them to remove nutrients from host plants. In sensitive grape cultivars such as Pinot gris, feeding symptoms include leaf yellowing, leaf cupping, and stunted vine growth. A greenhouse study in Michigan characterized the interactions between the Potato leafhopper pest and grapevines, revealing the physiological basis of the response of a susceptible grapevine cultivar to this pest.



It was found that sufficiently dense *E. fabae* infestations reduce CO₂ assimilation rates of infested Pinot gris leaf tissue, that these reduced rates are the result of stomatal and nonstomatal limitation, and that nonstomatal limitations are due to decreased efficiency of light and CO₂ utilization. The examination of results across a range of *E. fabae* infestation levels indicates that there are levels at which the insect infestation critically damages leaf function and that this irreversible damage varies with leaf position. It was also found that photosynthetic compensation of uninfested leaf tissue can occur when a separate portion of the same leaf is infested. These results indicate that Potato leafhopper infestation causes injury through rapid effects on the capacity of leaves to produce photosynthate through effects on internal tissues and on stomata. <http://dx.doi.org/10.5344/ajev.2012.11111>

The effects of storing harvested Sauvignon blanc grapes on thiol precursor concentrations

A study provides a detailed overview of interactions related to thiol precursor formation and highlights the ability to manipulate precursor concentrations prior to grape crushing. Polyfunctional thiols such as 3-mercaptohexan-1-ol (3-MH) are aroma impact compounds which impart characteristic 'tropical', 'citrus' and 'passion fruit' aromas to wine. The term 'varietal thiols' may be used to describe such compounds, since they are frequently associated with the Sauvignon blanc grape cultivar, are of particular importance to the quality of Sauvignon blanc wines and can influence consumer appreciation. The varietal thiols arise from odourless, grape-derived precursors and their formation is a dynamic process, which can be influenced by vineyard and winery processing operations. If precursor profiles of fruit with low varietal thiol potential could be optimized, there could be considerable economic and quality implications for winemakers. The effect of storage on machine-harvested Sauvignon blanc fruit held in a temperature-controlled room at 10°C immediately after harvest, with samples taken over a 30 hour period for analysis, was evaluated on a commercial scale.

3-Mercaptohexan-1-ol (3-MH) precursors, 2-S-glutathionylcaftaric acid (grape reaction product, GRP), glutathione (GSH) and a number of C6 compounds were assessed at several time points during the experiment. The concentration of the cysteine precursor to 3-MH doubled within 8 hours and tripled after 30 hours (after which the grapes were pressed) while the GSH and cysteinylglycine precursors increased in concentration roughly 1.5 times. (E)-2-Hexenal and GSH levels decreased as thiol precursors, while GRP and C6 alcohols increased during storage. Early storage time points were associated with higher concentrations of GSH and some unsaturated C6 compounds while longer storage times were most closely associated with higher thiol precursor and GRP concentrations. <http://dx.doi.org/10.1021/jf300054h>

Influence of sulphur dioxide (SO₂) additions at harvest on aroma compounds in Sauvignon blanc

As noted in the above article, the varietal thiols 3-mercaptohexanol (3MH), derived from odourless precursors in the grape juice, and 3-mercaptohexyl acetate (3MHA), arising from 3MH during fermentation, are prominent compounds responsible for tropical fruit aromas in Sauvignon blanc wines. To examine the effect of SO₂, various concentrations of SO₂ (0, 30, 60, 120 and 300 mg/kg) were added to 3 sets of New Zealand Sauvignon blanc grapes and juice in the field, followed by transport, pressing and fermentation. The oxidation state of the juices was effectively monitored using high-performance liquid chromatography analyses of individual polyphenols, in addition to absorbance measures and SO₂ content.

Juices transported without SO₂ or with a low SO₂ addition were more oxidized and contained lower concentrations of most polyphenols. The juices fermented at a similar rate, with a delay in the onset of fermentation of up to a day with the 120 mg/kg SO₂ juices, but around 12 days for the 300 mg/kg SO₂ additions. In the more oxidised juices there were higher concentrations of C6-alcohols in the finished wines, but lower concentrations of the corresponding acetate esters. With each set, the highest concentrations of 3MH and 3MHA were found in wines produced from the juices with a 120 mg/kg addition of SO₂ at harvest. Conversely wines made from juices that were transported with low SO₂ additions had much lower concentrations of the varietal thiols. With moderate to high sulphite additions, maximum levels of 3MH and 3MHA were produced in the final wines, but very low concentrations of these varietal thiols were found in wines with low sulphite additions. These results could help winemakers to modulate the flavour profile of Sauvignon blanc wines in the future. <http://dx.doi.org/10.5344/ajev.2012.12094>

Replacing oak with vine shoots for wine aging

A study carried out in Spain has found that some vine shoot varieties are suitable as an alternative to oak barrels or oak chips for the aging of wine and spirits. Analyses of hydroalcoholic extracts of 18 vine shoot varieties and 5 varieties of oak chips were carried out. The concentrations of compounds of oenological interest were compared in the extracts, and similarity patterns for many of them were found. Vine-shoot varieties with a high similarity to those from oak wood were Garnacha Tinta, Malbec, Cabernet Sauvignon, Sauvignon blanc, Petit Verdot, Pedro-Ximénez, Chardonnay, Garnacha Tintorera, Merlot, and Montepila. The two red grape varieties, Garnacha Tintorera, Merlot and the white grape variety Montepila had extracts with the most similar composition to that from oak chips. <http://dx.doi.org/10.1021/jf205337a>

High-pressure homogenization to modify yeast performances for sparkling wine production

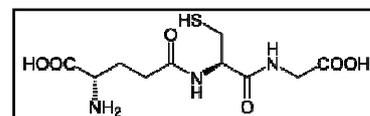
The traditional method by which Champagne is produced consists of primary fermentation and bottling, and then a second alcoholic fermentation in the bottle. This second fermentation is induced by adding several grams of yeast and sugar. Yeast autolysis then takes place, degrading the yeast cell wall and releasing several intracellular yeast compounds that modify the physico-chemical characteristics and sensory properties of the wines. This process can last a few months to years and accelerating this process is highly desirable as production costs can be significantly reduced.

Homogenization breaks apart cells to release their cytoplasm and its contents. The effects of high pressure homogenization (HPH) treatment, applied at level of 90 MPa to different yeasts, on the cell viability, fermentation and death kinetics during the second fermentation and aging of sparkling wines was studied. Scanning Electronic Microscope microphotographs of the 40 day aged samples indicated, for all the yeasts used, an acceleration of the autolysis phenomena due to the HPH treatment. Analytical data showed significant changes due to the HPH treatment, and the sparkling wines obtained from HPH treated cells, with the exception of those of one yeast strain (L951), were significantly different from the control samples. This means that HPH appears to be a versatile sustainable non-thermal technology alternative for the production of sparkling wines, and which could also be used to modulate the volatile molecule profiles of the final products, providing the opportunity of creating specific sensorial characteristics for sparkling wines. <http://dx.doi.org/10.5344/ajev.2012.12096>

Local Research News

The role of glutathione in winemaking

Glutathione (GSH) is a tri-peptide and its major functions can be summarized as being an antioxidant, immunity booster, and detoxifier. It is an important constituent of grapes, must and wine. A recent review discusses and compares the scattered literature on glutathione in wine-related systems and identifies novel topics that merit further research. The effect of glutathione on both desirable and undesirable aroma compounds is also outlined. Furthermore, the use of glutathione-enriched products in winemaking and the various analytical techniques for the quantification of glutathione in must and wine are discussed. Limitations in existing knowledge are also identified.



In wine, the role and application of glutathione has recently received significant scientific and commercial attention. The primary reason is related to the control of oxidative spoilage of wine. White and, to a lesser degree, red wines are sensitive to oxygen exposure, which can lead to a loss in characteristic aroma, the development of atypical aging characters, and undesirable colour changes. GSH plays an integral role in the oxidation of musts, where it traps o-quinones, formed during oxidation, to limit the amount of browning pigments. GSH exerts a protective effect on various aromatic compounds in wine. However, the addition of purified GSH to must is not permitted at present. <http://dx.doi.org/10.1021/jf303665z>

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