Winetech Scan
Wine Industry Network of Expertise and Technology
Netwerk van Kundigheid en Technologie vir die Wynbedryf

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Research News

- Eutypa dieback caused by the fungus *Eutypa lata* (*E. lata*) is a major threat to the sustainability and productivity of the viticulture industry worldwide. The fungicide benomyl has been the most effective treatment for protecting pruning wounds against infection by *E. lata* and to control eutypa dieback. However, because of the withdrawal of benomyl from the market by Du Pont, due to the developed resistance of parasitic fungi to benomyl, there is a need to develop alternatives. Twenty-five compounds were evaluated in laboratory experiments, and of these, 15, which were effective at inhibiting germination and/or mycelial growth in the laboratory, were further evaluated in the field. Carbendazim was the most effective. Other fungicides, including fluazinam, pyrimethanil and pyraclostrobin, reduced colonisation of wounds by *E. lata* but require further evaluation at higher concentrations. Physical barriers such as acrylic paint (with or without fungicides) and a commercial tree wound paste formulated with fungicides (Garrison) also protected pruning wounds from infection by *E. lata*. http://dx.doi.org/10.1111/j.1755-0238.2008.00015.x

- The Division of Agricultural and Food Chemistry of the American Chemical Society recently held a symposium to celebrate its 100th anniversary, and a review paper entitled 'Wine chemistry and flavor: looking into the crystal glass' provides a brief history of wine chemistry and examines the challenges and opportunities wine chemists will encounter in the future. Whereas the focus in the 19th and early 20th centuries was on determining major components (ethanol, organic acids, sugars) and detecting fraud, more recently the emphasis has been on quantifying trace compounds including those that may be related to varietal flavours. Over the past 15 years applications of combined analytical and sensory techniques (e.g. gas chromatography-olfactometry) have improved the ability to relate chemical composition to sensory properties, whether identifying impact compounds or elucidating matrix effects. Recent research is aimed at understanding how viticultural and enological practices influence grape and wine volatiles. The challenges in linking composition to sensory properties are also reviewed, as are future advances in linking grape, yeast, and human genomics to wine chemistry and flavour. Exciting opportunities exist, particularly for the development of novel analytical approaches that can be used to link metabolic profiles to gene and protein expression in plants, microorganisms, and animals. To date, many of these metabolomic studies have focused on obtaining broad chemical profiles of the non-volatiles involved in primary metabolism, for example, sugars, amino acids, and organic acids. Few studies have focused on the secondary metabolites, particularly the volatile components, that affect fruit flavour; however, a recent gas chromatography-mass spectroscopy based metabolomic profiling study of more than 300 different volatiles in tomatoes demonstrates the exciting potential for these comprehensive analytical tools (see next two items for examples). Although not yet widely applied to grapes, it is clear that these novel '-omics' approaches can yield valuable metabolic information and increase understanding of the regulatory mechanisms involved in the biochemical production of volatiles, both in grapes during berry development and by yeast during fermentation. As a result of these many advances, combined with improved understanding of human perception of odorants and odorant mixtures, it will become increasingly possible to control viticultural and winemaking practices to optimize grape and wine flavour. http://pubs.acs.org/doi/abs/10.1021/jf9000555

- An investigation into the 'fishy' aftertaste that is sometimes perceived in wine with fish and seafood pairing has found that it is caused by iron and the ferrous ion in the wine. The intensity of fishy aftertaste was increased by the addition of ferrous ion in model wine and suppressed by the chelation of ferrous ion in red wine. The formation of potent volatile compounds of fishy aftertaste, such as hexanal, heptanal, 1-octen- 3-one, (E,Z)-2,4-heptadienal, nonanal and decanal, were investigated by gas chromatography-olfactometry and gas chromatography-mass spectrometry. Potassium sulphate and metals such as ferric ion, copper ion, manganese ion and zinc ion did not increase the intensity of fishy aftertaste. The consumer, however, will find it difficult to select an appropriate wine so as to avoid the possibility of the fishy aftertaste as the content of iron is not related to wine type or country of origin. Rather, it depends on a number of factors, such as soil type, and contamination by iron during the entire winemaking process. http://pubs.acs.org/doi/abs/10.1021/jf901656k

- Sauternes is a French dessert wine made from Sémillon, Sauvignon Blanc, and Muscadelle grapes that have been affected by Botrytis cinerea, also known as noble rot. Recent work has revealed the importance of polyfunctional thiols in aromas in young Sauternes wines, but very little is yet known about the fate of such compounds during aging in the bottle. Two vintages of Sauternes wines (2002 and 2003) were followed from bottling in September 2004/2005 until March 2009, using gas chromatography-olfactometry, aroma extract dilution analysis, gas

chromatography-mass spectrometry, and gas chromatography-pulsed flame photometric detector. Most polyfunctional thiols (3-sulfanylpropyl acetate, 2-sulfanylethyl acetate, 3-methyl-3-sulfanylbutanal, etc.) were found to be completely degraded after 2 years of bottle aging in a cellar. Only 3-sulfanylhexan-1-ol was still found in aged samples. Most other key odorants found in the young noble rot wine were still detected 5-6 years after harvest: varietal aroma (R-terpineol), sotolon, fermentation alcohols (3-methylbutan-1-ol and 2-phenylethanol) and esters (ethyl butyrate, isobutyrate, hexanoate, and isovalerate), and oak maturation-related compounds (guaiacol, vanillin, eugenol, β-damascenone, trans-non-2-enal, β-methyl-γ-octalactone, γ-nonalactone, and furaneol), as well as three newly identified aromas exhibiting interesting cake, honey-like, and dried apricot doors: homofuraneol, theaspirane, and γ-decalactone. Interestingly, abhexon, a honey/spicy compound, never mentioned in sweet wines before, was found to be synthesized during bottle aging, suggesting a key role of this strong odorant in old Sauternes wines. http://pubs.acs.org/doi/abs/10.1021/jf901429d

- If there is an excessive amount of protein particles in wine they react with tannins to create a cloudy, hazy appearance. This condition is rectified by the use of a fining agent, such as bentonite, to remove the proteins, but the treatment results in the loss of a significant portion of the wine itself, as well as aroma compounds important for the quality of white wines. Yeast cell wall mannoproteins have been shown to stabilize wine against protein haze, particularly wine yeast strains engineered by deletion of the KNR4 gene which release increased amounts of mannoproteins and produce wines showing attenuated responses in protein haze tests. This study constructed several recombinant wine yeast strains, partially or totally defective for GAS1, GPI7, or FKS1 genes involved in cell-wall biogenesis. Some of these new strains, as well as EKD-13 (defective for KNR4), allowed a 20-40% reduction in bentonite requirement for complete protein haze stabilization of the wines. The availability of multiple targets for genetically improving yeast mannoprotein release is relevant not only for genetic engineering of wine yeast but also for genetically improving this character by classical methods of strain development such as random mutagenesis or sexual hybridization. http://pubs.acs.org/doi/abs/10.1021/jf901093v

- Genome Canada and Genome British Columbia are funding a $3.4 million research project, entitled 'Grape and Wine Genomics'. The project will apply genomic and genetic techniques to the study of important wine varietals with the following objectives. Clarify how nitrogen fertilization affects hormone regulation of metabolic pathways important for berry ripening, chemical composition and wine quality. Determine the relationship between gene expression patterns and variation in amino acid composition at maturity in ripening berries. Develop biomarkers for vineyard monitoring of vine water stress. The ultimate goal of the preceding objectives is to develop a handheld device, which will help growers monitor proteins in the vine or berry at any time during any given season to determine when specific management practices should be applied and to what degree. There are two other objectives. One is to use a systems biology approach to identify functions for each of the 62 genes involved in the fermentation stress response of yeast and the regulation of molecular sugar and amino-acid transporters during wine fermentation. The other is to deliver knowledge that leads to an understanding of the complex scientific, policy, industry and public issues involved in the application of genomics to the wine industry. www.genomebc.ca/whatnew_press/press_releases/2009_press/documents/Backgrounder-GrapeandWine-FINAL.pdf

Local research results

- Yeast is used in wine production due to its potent ability to produce alcohol dehydrogenase, which is essential in converting grape sugars to ethanol. It has recently been found that some genera of the *Basidiomycetes* fungi, the so-called 'gourmet' mushrooms, also produce alcohol dehydrogenase. Gourmet mushrooms include shiitake, nameko, enoki (*Flammulina velutipes* - pictured), buna-shimeji and paddy straw mushrooms, as well as the pink, golden, tree, phoenix, abalone and king oyster mushrooms. Most of these mushrooms have medicinal properties such as lowering of cholesterol, anti-viral and anti-tumour activity. A number show high antioxidant activity. A range of imported and local mushroom species was selected for laboratory-scale trials to determine their ability to grow in and/or ferment grape juice (Chardonnay and Merlot). It was found that the mushroom species have different effects on subsequent yeast performance during fermentation i.e. no effect, inhibit or stimulate. However, in all cases the grape juice can be fermented to dryness. In some cases the wine quality was equal to or better than reference wines, with enhanced cultivar aroma. The mushroom fermented wines contained compounds transferred from the mushrooms, and which compounds have known preventative effects against cancer, thrombosis, etc. Thus medicinal mushrooms can be used in conjunction with wine yeast in the production of wines of normal grape musts (21-22°B) with acceptable aroma profiles, with, in some cases, the added benefits of medicinal value due to the contribution of the mushrooms. This was particularly so for *Flammulina velutipes*. The production of custom-made health wines is thus a possibility. www.sawislibrary.co.za/dbtextimages/SmitWA240046.pdf