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

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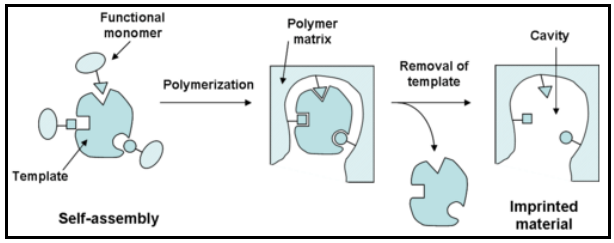
Research outputs

- 2,4,6-trichloroanisole (TCA), 4-ethylphenol, and 4-ethylguaiacol are compounds associated with detrimental aspects of wine quality. A study investigated how the application of molecularly imprinted polymers (MIP) and nonimprinted polymers (NIP) could eliminate TCA and ethylphenols from aged red wines. An MIP is a polymer that is formed in the presence of a molecule that is extracted afterwards, thus leaving complementary cavities behind. These polymers show a certain chemical affinity for molecules similar to the original molecule. An MIP and NIP was synthesised using 4-vinylpyridine as the functional monomer and divinylbenzene-80 as a cross-linker. In the case of the MIP, pentachlorophenol was used as the template. 99% of TCA was retained within the NIP, whereas 4-ethylphenol and 4-ethylguaiacol showed lower retention percentages of 55% and 62% respectively. For the MIP, the retention of TCA was 99.6% and that of 4-ethylphenol and 4-ethylguaiacol increased to 92.3% and 89.4% respectively. The behaviour of other volatile wine compounds, such as oak lactones, eugenol, and 2-phenylethanol, was also examined, and the MIP consistently showed the highest retention values. If only TCA, 4-ethyphenol, and 4-ethylguaiacol are to be removed, then the molecularly imprinted polymer (MIP) is the best option, as these off-flavours are retained in the polymer within ranges of 90%. But special attention should be paid to other volatiles which are positive for wine quality, as their range of retention within the MIP ranges from 31 to 95.3%. The MIP could be used in wineries when young wines are subject to clean-up. Future research on MIP could centre on the development of more selective matrixes for TCA, 4-ethylphenol, and 4-ethylguaiacol without the retention of positive wine aroma compounds. www.ajevonline.org/cgi/content/abstract/59/4/396



- Carbon dioxide (CO_2) is the most significant greenhouse gas, and its concentration continues to increase. If no climate-driven policy measures are implemented, it is expected that CO_2 concentration will exceed 550 ppm by the middle of the 21st century. The impact of elevated CO_2 concentration on the quality of berries, must, and red wine (with special reference to volatile composition, phenolic content, and antioxidant activity) made from Touriga Franca, a native grape variety of *Vitis vinifera* L. grown in the Douro region in Portugal for Port and Douro wine, was investigated. Grapevines were grown either in open-top chambers (OTC) with ambient (365 ppm) or elevated (500ppm) CO_2 or in an outside plot. In general, the increase of CO_2 did not affect berry characteristics, especially the total anthocyan and tannin concentrations. However, the total anthocyan and polyphenol concentrations of the red wine were inhibited under elevated CO_2, but the elevated CO_2 did not significantly change the total antioxidant capacity of the red wines. The effect of elevated CO_2 was significant because it led to an increase in ethyl 2-methylbutyrate, isoamyl acetate, ethyl hexanoate, ethyl octanoate, butyric acid, and isovaleric acid concentrations and a decrease in ethyl acetate concentration when compared to wines produced in ambient CO_2 in 2005. In elevated CO_2, wines from 2006 had lower methionol, 1-octanol, and 4-ethylguaiacol and higher ethyl lactate and linalool concentrations. The increase in CO_2 did not significantly affect C_6 alcohols, citronellol, carbonyl compounds, and β-damascenone concentrations. This study showed that the expected rise in CO_2 would not produce negative effects on the quality of grapes and red wine. http://pubs.acs.org/doi/abs/10.1021/jf8020199

- The polymerase chain reaction (PCR) is a technique widely used in molecular biology. With PCR it is possible to amplify a single or few copies of a piece of DNA across several orders of magnitude, generating millions or more copies of the DNA piece. Quantitative PCR (qPCR) is becoming a common tool for detection and quantification of plant pathogens and is particularly useful for pathogens with long latent phases or quiescent interactions. qPCR was used to study infection of grape berries by *Botrytis cinerea* (a fungus), which causes Botrytis bunch rot, affecting fruit quality and yield. The disease can be difficult to manage, partly because of nonsymptomatic, quiescent infection early in berry development, which occurs primarily by deposition of the fungus spores onto inflorescences. An improved understanding of the biology of quiescence and identification of resistant germplasm could result in improved disease management. In the study, two qPCR assays were developed for the detection of *B. cinerea* DNA. While the SYBR Green assay was able to detect and quantify *B. cinerea* with linear response to a dilution series, the assay was not specific enough to prevent signal amplification in the grape DNA-only negative control. The qPCR assay based on Taqman chemistry overcame this limitation and allowed linear detection down to 3.2 picograms *B. cinerea* DNA, with a detection limit of 100 femtograms. This latter method and the standard assay for early detection of *B. cinerea*, based on tissue freezing and incubation, were applied to monitor quiescence and activation of natural *B. cinerea* infections on 32 genotypes of *Vitis* spp. and interspecific hybrids.

The qPCR and freezing assays detected infection levels of *B. cinerea* in two consecutive seasons appropriate to the actual observed disease severity. qPCR was not as effective as the freezing assay for detecting infection at early stages of development, but was able to quantify fungal colonization, resulting in a new capability for monitoring *B. cinerea* pathogenesis over time. The combined ability of the two assays to detect *B. cinerea* early in berry development and monitor colonization provides a resource for identifying mechanisms of disease resistance, as well for application in commercial vineyards as an Integrated Pest Management (IPM) scouting tool for informing management decisions. www.ajevonline.org/cgi/content/abstract/59/4/387

- The effect of glycerol on the perceived viscosity of dry white wines was investigated using direct paired comparison sensory methods. Before tasters assessed wines for viscosity, the natural sweetness of glycerol was masked by two novel methods; that of prior oral exposure to the anti-sweetness agent Gymnema sylvestre, and by sweetness equalisation using a non-viscous high potency artificial sweetener. After masking its sweetness, the addition of 6 g/L of glycerol did not increase the perceived oral viscosity of dry white wine, suggesting that glycerol does not play a role in the perception of dry white wine viscosity. Thus it appears that palate viscosity in dry white wine cannot be enhanced by employing traditional winemaking approaches that elevate glycerol levels. http://dx.doi.org/10.1080/09571260802622191

- Australian researchers have found that grape seed and red wine polyphenol extracts may be useful in inhibiting 5-lipoxygenase (5-LOX), a known specific target of the inflammatory process, and, thus inhibiting proinflammatory conditions including the progression of cancer. They also found that the same extracts inhibited cholesterol uptake by up to 66%. The inhibition of cholesterol uptake was independent of the sample's potent antioxidative capacity, and further investigation to identify the active component is warranted. Inhibition of cholesterol uptake and proinflammatory 5-LOX activity may be beneficial in preventing the development of chronic degenerative diseases such as cardiovascular disease and cancer. http://dx.doi.org/10.1016/j.nutres.2008.09.001

Local research results

- Bacteriocins are proteinaceous toxins produced by bacteria to inhibit the growth of similar or closely related bacterial strains. The possibility of controlling bacterial growth during vinification and preservation by bacteriocins is a promising alternative to using chemical preservatives such as sulphur dioxide. However, in red wine the phenolic compounds might have negative effects on the activity and stability of bacteriocins and may consequently limit the application of this method. A study investigated the influence of phenolic compounds and polyphenols on the activity of the bacteriocins nisin and pediocin PA-1. Six phenolic compounds of grapes and wine were tested individually and in combination in a model wine medium, with the concentration of each component used in the synthetic wine medium being similar to the concentration found in red wine. No negative effect of phenolic compounds and polyphenols on nisin and pediocin activity was found. Furthermore, synergistic effects between phenolic compounds and bacteriocins showed a strong inhibitory effect on the survival of the bacteria *Pediococcus pentosaceus* NCDO 813. The combination of bacteriocin with phenolic compounds or polyphenols decreased bacterial cell numbers by factors of between 10^3 and 10^6. It appears that bacteriocins could present a more ecologically friendly alternative, or might replace some sulphur dioxide, once their interactions with wine are understood. www.ajevonline.org/cgi/content/abstract/59/4/418

Appropriate technology

- In 2005, a vineyard in California had a 10 acre infestation by vine mealybugs (VMB), and 10% of the crop was not harvested as a result. A University of California at Berkeley team chose this infested area as one of the many sites throughout the state where they have conducted research into the use of insects as sustainable tools to manage VMB populations. Their tools include the release of beneficial insects (biological control), mating disruption using pheromone dispensers, and the judicious application of more target-specific insecticides (such as insect growth regulators, neo-nicotenoids, and lipid biosynthesis inhibitors. By the end of the 2006 season, they had released into this vineyard 1 765 Anagyrus, 94 650 Coccidoxenoides, 35 000 Cryptolaemus, 670 000 ladybugs, 10 000 minute pirate bugs, and 350 000 lacewings. In addition, 2 500 pheromone card-dispensers, each slowly releasing the equivalent scent of 10 000 female mealybugs were employed. A similar insect-release protocol was repeated in 2007. In 2006, 81% of the inspected clusters were free of damage, 18% had sustained minimal damage (an average of less than 10 mealybugs per damaged cluster) and 1% sustained major damage. In 2007, 95% of clusters were free of mealybug damage and 5% sustained minimal damage. There were no clusters in either year which were rated as ‘unharvestable’. The vineyard manager advised that anyone with a large mealybug infestation should first knock it back with an insecticide, then deploy bait to target Argentine ants (which disrupt the activity of beneficial insects), and only then release insects to control the VMB. http://practicalwinery.com/mayjun08/page1.htm