Winetech Scan

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Netwerk van Kundigheid en Technologie vir die Wynbedryf

Local Research News

A site-selection model for Sauvignon blanc

Site selection influences grapevine vigour, production, wine style and quality. An investigation has been conducted into the relationship between vine phenology and climate at the vineyard-scale level using the great deal of data pertaining to the interaction of Sauvignon blanc with its growing environment in various regions of South Africa that have been collected in various Winetech research projects. Data relating to growth, yield and production of Sauvignon blanc for three seasons, namely 2005/2006, 2006/2007 and 2007/2008, was used to forecast parameters of interest by using forward stepwise regression as a model building tool. It appeared as if clay and silt content, as well as depth weighted soil pH and potassium content, were the most important soil input variables. There was greater variability of climatic input variables. However, it would seem that rainfall in the season, as well as several January climatic parameters are the most important in forecasting grapevine growth, yield and quality up until approximately one week before the onset of a given stage. At that point, the mean temperature of the week prior to each phenological stage was found to be the most influential parameter driving the timing of these stages. http://www.sawislibrary.co.za/dbtextimages/CareyV4.pdf

Bioprocess monitoring of fermentations with infrared spectroscopy

Real-time monitoring of alcoholic fermentation (AF) and malolactic fermentation (MLF) is of the utmost importance because of logistic considerations that include tank space availability at the earliest opportunity during the harvest season, and also because of the inherent risks of microbial spoilage and problematic fermentations. A project has developed strategies to carry out rapid, low cost monitoring of alcoholic and malolactic fermentation using infrared spectroscopy and chemometric modelling techniques. Technologies for three different infrared spectrometers, two in the mid-infrared and one in the near-infrared region, were developed as these technologies are all used in the South African wine industry. A portfolio of calibration models for quantification of important quality parameters in grape juice and fermenting must during AF and MLF was established.

Three approaches were used: a quantitative approach where exact chemical values can be quantified based on the spectra; a qualitative approach where the spectra obtained from an actively fermenting must are modelled to obtain the metabolic status of the bioprocess and to establish trends characteristic of the juice or in the case of MLF, of the inoculation strategy followed. A third strategy combined quantitative and qualitative models to interpret the fermentation trends or abnormalities with respect to the major chemical compounds involved. http://www.sawislibrary.co.za/dbtextimages/NieuwoudtH4.pdf

International Research News

Vineyard cover crop water use

In the last decade cover crops have largely been used as a vineyard floor management practice in cool climates due to their advantages over other more traditional weed control techniques such as soil tillage or herbicide sprays. However, recent apprehension over excessive vine water stress has limited the introduction of cover crops as a viable floor management strategy.

A study compared soil evaporation (*Es*) versus cover crop evapotranspiration (*Ecc*) within a vineyard ecosystem and investigated the effect of mowing in reducing *Ecc* and hence its belowground competitiveness. The study was carried out in a 2-year-old Sangiovese vineyard in Bologna, Italy. The cover crop was *Festuca arundinacea*, a bunchgrass commonly known as tall fescue. Mini-lysimeters (below right) (devices used to measure the amount of actual evapotranspiration which is released by plants) and a portable gas-exchange chamber system (above right) were used to investigate cover crop *Ecc* in relation to mowing and bare soil management practices. The results showed that, immediately after mowing, *Ecc* markedly decreased, with the percentage of reduction ranging between 35–49%, depending on the amount of clipped biomass. The extent of the *Ecc* reduction decreased over time as the cover crop regrew. Over the 28-day period following the mowing, *Es* was 35% and 48% lower than mowed and un-mowed cover crop *Ecc*, respectively. The study shows that mowing can be used as a water management strategy to decrease vine-cover crop competition over a short time period. http://dx.doi.org/10.5344/ajev.2013.13025

Kinetics of oxygen ingress into wine bottles closed with natural cork stoppers

The contact between wine and oxygen is of critical importance for bottle ageing processes during which wine characteristics evolve. Post-bottling development is complex: red wines benefit from some oxygenation as it contributes to colour stabilization, astringency reduction and aroma improvement; white wines are less resistant to oxygen, leading to oxidative off-flavours and browning that reduces wine quality. However, tight sealing and lack of oxygen can also lead to negative sensory attributes.

The kinetics of oxygen ingress into bottles closed with natural cork stoppers was investigated by a non-destructive colorimetric measurement method using the oxidation of an indigo carmine solution which filled 600 bottles, so no wine was involved. Natural cork stoppers from three different quality classes and produced from corkboards of two different thicknesses closed the bottles. The maximum limit of oxygen ingress that could be measured was 4.2 mg of oxygen. 21% of the stoppers reached this limit before 12 months. The kinetics of oxygen transfer could be represented as logarithmic models, which showed that most of the oxygen ingress took place in the first few months. A considerable variability of oxygen ingress into the bottles was found: at 12 months, ranging between 0.3 mg and 4.8 mg [sic]. It seems that this variation is a consequence of the natural and differing features in the cell dimensions and air volume within the cork's structure. http://dx.doi.org/10.5344/ajev.2013.13009

Reactions involving iron in mediating catechol oxidation in a model wine

Iron is an essential catalyst that mediates the reaction of polyphenols with oxygen in wine. An investigation of how this reaction occurs using a model (artificial) wine has proposed a new mechanism for this oxidation. Oxygen cannot react directly with polyphenols to oxidize them because of its electronic configuration, consequently the iron and copper occurring in wine are essential catalysts in wine oxidation. In wine which has been long protected from air, iron is in the ferrous state Fe(II). Introduction of oxygen initiates the oxidative process by first rapidly oxidizing Fe(II) to the ferric state Fe(III), a process which is accelerated by copper. It is proposed that the Fe(III) which is produced then coordinates with catechols and oxidizes them first to semiquinones and then to quinones. This study found that 'oxidation promoting nucleophiles', such as sulphites or benzenesulphinic acid, which react rapidly with quinones, then allow the oxidation of catechols to proceed. http://dx.doi.org/10.5344/ajev.2013.12137

Effectiveness of ozone against the main wine spoilage microorganisms

In the wine industry, the use of some antimicrobials, such as sulphur dioxide and lysozyme, has been restricted, with a significant impact on the microbiological stability of wines and the control of microbial contamination in the wine cellar. Ozone (O_3) is able to reduce spoilage microflora in grapes, barrels and tanks and has been recognised as an effective alternative to traditional approaches for sanitising bottling plants and bottles. Despite this practical experience, a detailed study of the effectiveness of ozone against wine microflora and the possible risks associated with its use is still lacking. Now a study has evaluated ozone as a sanitising agent in order to assess its potential in preventing microbial spoilage occurring during ageing of wine in barrels, using a model system based on barrel wood.

Fifty microorganisms of oenological significance were evaluated for their spoilage potential in the barrel. Ethanol resistance, biofilm formation and production of volatile phenols were studied using physiological tests. The effectiveness of ozone in eliminating these microorganisms was evaluated in aqueous solution at several cell (i.e. microorganism) and ozone concentrations. At a high cell concentrations, the presence of organic matter reduced the effectiveness of ozone. CFU or colony-forming unit is an estimate of viable bacterial or fungal numbers. At a cell concentration of under 103 CFU/mL, typical of wine cellars, ozone was able to eliminate microorganisms. Resistance to ozone was observed in diverse microorganisms, and this resistance is linked to their ability to produce a biofilm.

The reduction in simple phenols obtained from oak wood was tested by treating oak chips, routinely used in the wine industry, with increasing doses of ozone. There was no statistical difference in the phenolic composition of wine exposed to these chips which had been cleaned with ozone or left untreated. Only a long and unrealistic exposure to ozone caused a reduction of 30% in gentisic acid, one of the most effective antioxidants naturally present in wine, although at low concentration.

The environmental conditions typical of a winery did not significantly reduce ozone effectiveness. Ozone was shown to be a highly effective sanitising agent without interfering with the profile of the phenolic substances extracted from oak under reasonable treatment conditions. The use of ozone for the sanitisation of oenological wood materials may thus be a feasible solution for the prevention of wine spoilage during ageing in oak barrels. http://dx.doi.org/10.1111/ajgw.12018

Other news

Beginning of viniculture in France

Chemical analyses of ancient organic compounds absorbed into the pottery fabrics of imported Etruscan amphoras (ca. 500–475 B.C.) and into a limestone pressing platform (ca. 425–400 B.C.) (right - note the spout for drawing off a liquid.) at the ancient coastal port site of Lattara near the modern town of Lattes in southern France have provided the earliest biomolecular archaeological evidence for grape wine and viniculture in France. The researchers conclude that the Etruscan amphoras arriving in ports of Mediterranean France contained was pine-resinated wine to which additional botanicals, probably including rosemary, basil and/or thyme, had been added. They believe that the importation of the Etruscan wine eventually led in a relatively short period to the transplantation of the domesticated Eurasian grapevine and to local wine production in southern France, probably in its initial stages under Etruscan tutelage. These findings bear importantly on the subsequent course of the wine culture in Europe and ultimately the New World. http://phys.org/news/2013-06-biomolecular-archaeological-evidence-viniculture-france.html The science paper may be downloaded from this link www.penn.museum/sites/biomolecula rarchaeology/wp-content/uploads/2010/03/FranceWinepdf1.pdf