



Local Research News

The detection of Brett and its response to SO₂ exposure

Brett or *Dekkera/Brettanomyces bruxellensis* is a spoilage yeast species that occurs in red wine. Its metabolic products can impart 'sweaty saddle leather', 'barnyard', 'burnt plastic' or 'band-aid' aromas to wine. Some authorities consider Brett to be responsible for 90% of the spoilage problems in premium red wines. It displays an amazing ability to survive under harsh conditions such as high concentrations of ethanol and sulphites, very low concentrations of sugar and nitrogen. It is suspected that its ability to survive in wine is due to its capacity to enter into a viable but non-culturable (VBNC) state, in which its metabolism is reduced to vital functions and in which there is a temporary loss of cell division. It is therefore difficult to detect using traditional microbiological techniques such as plating.

Now a fast and accurate technique to detect *D. bruxellensis*, including cells in a VBNC state, has been developed. Quantitative real-time PCR was fully optimised and yielded excellent results in terms of reproducibility, detection accuracy and rapidity of analysis. Reliable enumeration can be achieved within one day with a detection limit of 10 cells/mL. The method is able to distinguish between dead cells and VBNC cells. The project also investigated *D. bruxellensis* cellular mechanisms of response to SO₂ exposure. It was found that SO₂ tolerance is highly strain dependent. Passive intracellular accumulation and active efflux did not correlate with SO₂ tolerance, which showed that other as yet unknown mechanisms play a role.

www.sawislibrary.co.za/dbtextimages/DivolB2.pdf

The effect of plant water status and ripeness level on Shiraz grape structure and composition

A detailed project to investigate the relationship between water treatments and physiological and developmental changes in Shiraz berries was carried out in a Stellenbosch vineyard over a period of four years. The vineyard soil, Glenrosa, is a predominantly sand-clay-loam soil and has an average field water capacity (FWC) of approximately 17% (dry mass basis). Fifteen treatments, comprising single and combined irrigations which differed in volume of water supplied and stage/s of application, were applied. Three water levels, i.e. no irrigation (0%), soil volume filled to 75% of FWC, and soil volume filled to 100% of FWC, were implemented. Each irrigation treatment comprised either a single or different combinations of irrigations at different stages (berry set, pea size berry, véraison, and post-véraison). The 75% pea size, post-véraison irrigation, and 75% pea size+post-véraison irrigation consistently resulted in high quality wines at all stages.

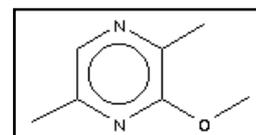
Different wine styles were, however, found at each stage and between stages. At the first harvest stage, exceptional wines were obtained by irrigating to 75% FWC at post-véraison, to 100% FWC at post-véraison, to 75% FWC at pea size + at véraison combined, and to 75% FWC at pea size + at post-véraison combined. At the second harvest stage, exceptional wines were obtained by irrigating to 75% FWC at pea size, and to 75% FWC at post-véraison. At the third harvest stage, exceptional wines were obtained by irrigating to 75% FWC at post-véraison, and to 100% FWC at post-véraison. The group of treatments that performed best seemed to be that which included post-véraison (three weeks to one month after véraison) irrigation. Although irrigation at such late stage to 100% FWC, especially when in combination with irrigation earlier during the season (up to véraison), may present a risk of too much re-growth under fertile soil conditions, slight re-growth should not be judged as detrimental to grape ripening and eventual wine quality. www.sawislibrary.co.za/dbtextimages/HunterJJ13.pdf

International Research News

A rapid method for the quantitative analysis of four methoxypyrazines in white and red wine

Alkyl-methoxypyrazines (MPs) are aroma-active compounds found in a variety of vegetables, nuts (bell pepper, beets, asparagus, peanuts) and spices (black and white pepper) They are also constituents of several grape and wine varieties; for certain varieties they can play an important and expected role in their aroma profiles at low concentrations (Sauvignon blanc, Cabernet sauvignon) while at higher concentrations they can lead to unpleasant characters such as 'green' and 'unripe'. These compounds have also been linked to 'ladybug taint', a wine fault caused by the incorporation of Coccinellidae beetles (multicoloured Asian lady-beetle and 7-spot) in the winemaking process. Recently, a new MP 2,5-dimethyl-3-methoxypyrazine (DMMP) has been reported as a possible constituent of wine (see right).

The newly developed multi-dimensional Gas Chromatography-Mass Spectrometry (MD-GC-MS) method is superior to approaches based on a single column for the separation and quantification of



MPs at trace levels in wine. It is a rapid and reliable method for quantifying DMMP, isopropyl methoxypyrazine (IPMP), secbutyl methoxypyrazine (SBMP) and isobutyl methoxypyrazine (IBMP) in wine. It is also the first analytical method developed for the quantification of DMMP. The method is able to rapidly and accurately resolve all 4 MPs in a range of wine styles, with limits of detection between 1 and 2 ng/L for IPMP, SBMP and IBMP and 5 ng/L for DMMP. Analysis of a set of 11 commercial wines agrees with previously published values for IPMP, SBMP and IBMP, and shows for the first time that DMMP may be an important and somewhat common odorant in red wines. <http://dx.doi.org/10.1016/j.foodchem.2014.03.044>

Yield estimation by cordon wire tension

An automated system was used over the course of three growing seasons to monitor the change in tension (ΔT) in the load-bearing cordon wire of a trellis so as to forecast yield in vineyards. Actual yield varied nearly four-fold among the three study years. Yield was forecast statically from ΔT at the 'lag phase' of berry growth (ΔT_L), and dynamically from continuous measurements of ΔT . Relationships between ΔT_L and yield were linear. In practice, the method requires a grower to collect multiple years of growth curves from which to build a robust linear relationship between ΔT_L and yield (static estimates), or to apply an average of multiple years' ΔT values dynamically. <http://dx.doi.org/10.5344/ajev.2014.14021>

Antimicrobial protein from snail egg gel kills downy mildew

Oomycetes are filamentous parasitic microorganisms that infect plants and animals. They can decimate crops, causing such diseases as downy mildew, one of the most important and devastating diseases of grapevine. The current methods for combating these organisms are limited to highly toxic chemicals that affect other organisms as well. Researchers have discovered that the antimicrobial protein LBP/BPI found in the protective gel of the eggs of a freshwater snail displays potent oomycete killing activity. The killing activity was observed with three species belonging to two major oomycete orders, the Peronosporales and Saprolegniales. Downy mildews belong to the order Peronosporales. This protein could thus be a very effective weapon for protecting crops and aquaculture from oomycetes and has the significant environmental advantage of being biodegradable. The researchers have filed a patent that covers the use of proteins from the same group as that produced by the freshwater snails against oomycete diseases. <http://dx.doi.org/10.1371/journal.ppat.1003792>

Strontium as a tracer for the geographical origin of the Prosecco

The traceability of foods has become a priority amongst consumers, driven by the increasing demand for food quality and safety. The geographical origin assessment of wine is of particular interest, being one of the most important factors that determine its commercial value. Glera vineyards from the Prosecco wine district in northern Italy have been characterised in terms of the Strontium (Sr) isotopic systematics which were applied to musts from different Glera vineyards in the Veneto Region of Italy. The analysis was focused on musts in order to avoid the possible influence of the vinification process (which will be investigated in further studies). $^{87}\text{Sr}/^{86}\text{Sr}$ isotope-ratio of musts from the 2010, 2011 and 2012 vintages, coupled with the isotopic analysis of Sr in the labile fraction of the soils of provenance were measured. For a single vineyard, detailed Sr isotopic analyses were carried out in sequentially extracted soil fractions at three different depths, and in the grape components (skin, seeds, must and stem), in order to verify the lack of Sr isotopic fractionation within the plant.

A large range of Sr isotopic compositions ($^{87}\text{Sr}/^{86}\text{Sr}$ between 0.70706 and 0.71215) characterized musts from the different vineyards, notwithstanding the relatively small geographic area. For each vineyard, the Sr-isotope ratio in must and that of the labile fraction in the corresponding soil were statistically correlated, showing that the isotopic composition in must can be forecast on the basis of that of soil. These observations confirm that the Sr-isotope systematics may be a potential tool in discovering fraud in wine trade. <http://dx.doi.org/10.1016/j.foodchem.2014.08.051>

Using genetic markers to trace the origin of oak wood for barrels

Researchers in France have identified new genetic markers and have developed genotyping technology that can identify species and determine if a batch of oak wood matches its stated provenance. To find the most effective genetic markers for identifying oak species and for assessing their geographic origin, a large number of DNA sequences were analysed from a wide range of samples characteristic of the genetic diversity of oak species. Once the most effective markers were identified, researchers then looked to develop genotyping technology for genetic identification using mass spectrometry as it is flexible, quick, accurate, and cost-effective. Two genetic marker kits were developed and designed to be used independently or in combination. The tests can definitively identify oak wood species and check the wood's geographic origin against its stated provenance. The technology will be made available to wine-barrel industry stakeholders such as forest managers, stave mills, coopers and winemakers. www.infowine.com/default.asp?scheda=13633

Other news

Vinitech-Sifel Innovation Awards 2014

Vinitech-Sifel is the biggest international exhibition of equipment and services for the wine industry and the fruit and vegetable sectors. 19 products, processes or technologies received awards out of the 61 entries submitted. Some of winners were a system that grades grapes, a grape harvester steering system, a device to control the transfer of liquids in the winery automatically for precision winemaking, and a system for maintaining a high humidity level in the barrel room. The Special Jury Prize was awarded to a mini-digger with pile driver, designed for trellis installation in the vineyard (see photo). The system is completely automated with GPS guidance to an accuracy of one centimetre and requires only a single operator. See www.infowine.com/default.asp?scheda=13632 Full details as PDF files at <http://vinitech.fr/en/Innovations-and-news/Innovation-Awards/Palmares-2014>



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