Winetech Scan
October 2013
Wine Industry Network of Expertise and Technology
Netwerk van Kundigheid en Technologie vir die Wynbedryf

Local Research News

Tannin extraction

An investigation into the amount of tannin extracted by four different winemaking techniques used two cultivars (Cabernet Sauvignon and Shiraz) from two different vintages and from two different climatic areas. The warmer climatic area showed higher tannin concentrations than the cooler area for both cultivars. There were significant differences in the phenolic composition of the resulting wines which depended on all the parameters already mentioned. The investigation also found that there was a good correlation between the two precipitation methods used to determine the tannin content. These were the bovine serum albumin (BSA) and the methyl cellulose precipitable (MCP) methods. The BSA method is complex and uses at least 3 times more reagents than the MCP method. The mouth feel properties of the prepared Shiraz wines were evaluated. In the warmer area, the effect of tannin concentration on mouth feel was much less than in the cooler area. The wine made of riper grapes was more grippy, bitter and numbing than the wines made from greener grapes. The addition of an enzyme during fermentation was especially associated with a dry, grippy sensation. www.sawislibrary.co.za/dbtextimages/Lamprechts.pdf

Selection, breeding, evaluation and characterisation of new wine yeasts

So as to increase the number and scope of commercial yeast strains available to South African winemakers, a project selected yeasts from nature, bred hybrid yeasts, and screened and evaluated yeasts for suitability for specific winemaking conditions and styles. Naturally occurring yeast strains were isolated from vineyards in both the cooler and warmer regions of the Western Cape. More than 350 yeasts were randomly isolated from fermenting Stellenbosch Chardonnay must. These yeasts, together with commercial yeasts, form part of a breeding and evaluation programme, and are conserved in the ARC Infruitec-Nietvoorbij yeast culture collection. Various areas of yeast development received attention. These included screening yeasts suitable for the production of aromatic white wines, varietal and/or Paarl regional Shiraz, Chardonnay regional wine, barrel fermented Chenin blanc, brandy base, Pinotage at higher temperatures from higher sugar musts, lower alcohol wines, Pinot Noir from cold macerated red grapes, and malo-lactic fermented (MLF) red wine. Other investigations included genetically different yeasts, the characterisation of wine yeasts, wine yeast biodiversity in vineyards and wineries, geographical distribution of indigenous wine yeasts, seasonal variation of indigenous wine yeasts and the geographic distribution and evaluation of wine yeasts. www.sawislibrary.co.za/dbtextimages/Hart.pdf

International Research News

The tannosome - a newly discovered organelle which forms tannin

Condensed tannins (also called proanthocyanidins) are widespread polymers of catechins and are essential for the defence mechanisms of vascular plants, *Tracheophyta*, including grapevines. They are stored in the vacuole, an organelle in the plant cell, but until now, no one has known where in the cell tannins have been made. An organelle is a specialized subunit within a cell that has a specific function. An international team has now found that the source is the tannosome, a newly discovered organelle that is found in most land plants. They used several independent methods which included light microscopy epifluorescence, confocal microscopy, transmission electron microscopy (TEM), chemical analysis of tannins following cell fractionation, and immunocytochemistry.

The finds are that tannins are polymerized in the tannosome. The tannosomes are formed by pearling of thylakoids into 30 nm spheres, which are then encapsulated in a tannosome shuttle formed by budding from the chloroplast and bound by a membrane resulting from the fusion of both chloroplast envelopes. The shuttle conveys numerous tannosomes through the cytoplasm towards the vacuole in which it is then incorporated. A complete sequence of events apparently valid in all studied *Tracheophyta* is described. http://dx.doi.org/10.1093/aob/mct168

Effect of ultrasound on wine aging on lees

Ageing on lees is a traditional wine ageing method. Lees are sediments at the bottom of a vat of wine during the fermentation process, and are mainly composed of yeasts, tartaric acid crystals, residual sugars, pulp and other parts of the grape. Heavy lees contain particles with sizes from 100 µm to 2 mm, and tend to settle within 24 hours, whereas fine lees are particles of smaller size, which remain in suspension for longer than 24 hours. As the heavy lees can lead to off aromas and flavours in wine, the use of fine lees is preferred in winemaking. During ageing on lees, yeasts undergo autolysis or self-degradation of cellular constituents by their own hydrolytic enzymes. The wine is thus enriched by released compounds, such as mannoproteins, polysaccharides, and other low molecular weight products, which reduce astringency and increase roundness, structure and mouthfeel. This autolysis is a very slow process and can last for years.

The effect of ultrasound on light lees has been evaluated by analysing the release of proteins and polysaccharides, and the viability of the yeasts contained in the lees. Ultrasound led to a high cell disruption, and after 20 hours of ultrasonic treatment,

hardly any viable yeast cells were found. Furthermore, the final cell concentration for the ultrasound-assisted yeast lysis was much lower than that for the classical autolysis. Thus the use of low-cost ultrasound technology could significantly increase the efficiency of the production of wines aged on lees by drastically reducing the yeast lysis time (from months to hours). This technology could be more effective than the use of b-glucanases. http://dx.doi.org/10.1016/j.foodchem.2013.03.081

Effect of harvest time on wine composition

A harvesting decision for 'optimal ripeness' requires adequate knowledge of grape compositional factors relevant to achieve a targeted wine style, taking into consideration the grape cultivar, climate, topography, seasonal weather conditions and vineyard management practices. Traditional measures used to determine grape ripeness are not sufficient to accurately forecast wine composition, as many key grape-derived compounds do not track with these measures, and are also highly dependent upon the grapevine genotype and its environment. During grape ripening, multiple biochemical processes occur at different rates, and are stage-specific, so that compounds which may positively or negatively influence wine chemistry and sensory properties may be in a state of increasing, decreasing or remaining constant at a given point in grape development.

A study of Cabernet Sauvignon aimed to quantify the effects of grape maturity on wine alcohol, phenolics, flavour compounds and polysaccharides. Grapes were harvested at juice soluble solids from 20 to 26ºBrix which corresponded to a range of wine ethanol concentrations between 12% and 15.5%. Grape anthocyanin and skin tannin concentration increased as ripening progressed, while seed tannin declined. In the corresponding wines, monomeric anthocyanin and wine tannin concentration increased with harvest date, consistent with an enhanced extraction of skin-derived phenolics. In wines, there was an observed increase in yeast-derived metabolites, including volatile esters, dimethyl sulphide, glycerol and mannoproteins with harvest date. Wine volatiles which were significantly influenced by harvest date were isobutyl methoxypyrazine, C_6 alcohols and hexyl acetate, all of which decreased as ripening progressed. Further implications of harvest date for wine composition are discussed in terms of both grape composition and yeast metabolism. http://dx.doi.org/10.1016/j.foodchem.2012.09.146 (and for a corrected Table 4 see http://dx.doi.org/10.1016/j.foodchem.2013.03.014)

Other news

Towards a simple spectroscopic device for use in the field

Simple spectroscopic devices to support wine growers in monitoring ripening progress of grapes and to plan harvest time are an important requirement, but currently available vis/NIR spectroscopy devices are expensive and not suitable for small scale wineries. A study has identified the three most significant wavelengths able to discriminate, in the field, grapes ready to be harvested, which could be used in a simplified handheld and low-cost optical device. Non-destructive analyses were carried out on a total of 68 samples and a total of 1360 spectral measurements were done using a portable commercial vis/NIR spectrophotometer. Chemometric analyses were performed in order to extract the maximum useful information from spectral data and to select the most significant wavelengths. Correlations between the spectral data matrix and technological (total soluble solids, TSS) and phenolic (polyphenols) parameters were carried out using partial least square regression.

The three selected wavelengths were 670 nm, corresponding to the chlorophyll absorption peak, 730 nm, equal to the maximum reflectance peak, and 780 nm, representing the third overtone of OH bond stretching. Based on the results a possible functional scheme was proposed. LED (light emitting diodes) could be used for sample illumination at the three specified wavelengths, and filtered photodiodes would generate the read-out signal. From the intensity signals sensed at the three wavebands, a microcontroller could then compute the TSS & TP values for display to the user. This would assist the grower in the field in making for a quick estimation of the ripening grape parameters and in taking decision on harvesting. http://dx.doi.org/10.5344/ajev.2013.13024

New micro water sensor can aid growers

At present water sensors are large, may cost thousands of dollars and often must be read manually. Now researchers have developed a microfluidic water sensor within a fingertip-sized silicon chip that is a hundred times more sensitive than current devices. The researchers are completing soil tests and will soon test their design in plants, embedding their 'lab on a chip' in the stems plants, such as grape vines. They hope to mass produce the sensors for about $5 each. The chip can be hooked up to a card for wireless data transmission or for connection to existing data-loggers. The sensors make use of microfluidic technology, that places a tiny cavity inside the chip. The cavity is filled with water, and then the chip may be inserted in a plant stem or in the soil where it, through a nanoporous membrane, exchanges moisture with its environment and maintains an equilibrium pressure that the chip measures. http://phys.org/news/2013-10-micro-sensor-aid-growers.html

Determination of assimilable nitrogen in grape musts

A study into determining assimilable nitrogen in grape musts has found that the measurement of [amino acids (automatic analyzer)+ammoniacal] nitrogen is the most reliable way, but it is time consuming and expensive. FTIR is also reliable, except for atypical musts. Being fast and not sample destructive, it is recommended for routine measurements. Formoltitration and [NOPA+ammoniacal] nitrogen underestimate assimilable nitrogen. http://dx.doi.org/10.1016/j.lwt.2013.05.009