



Winetech Scan

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

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Research News

- One of the most well-known characteristics of the yeast *Saccharomyces cerevisiae* is its ability to ferment sugar to 2-carbon components, in particular ethanol, without completely oxidising it to carbon dioxide. This characteristic is called the Crabtree. A molecular genetics research group have been reconstructing the evolutionary history of ethanol production to find out why. They compared two wine yeasts, *S. cerevisiae* and *Dekkera bruxellensis*, which in nature often occupy a similar niche, using a variety of approaches including comparative genomics which enabled them to add the time dimension to their molecular reconstructions. The two lineages separated more than 200 million years ago. However, approximately 100-150 million years ago, both yeasts experienced very similar environmental conditions, with the sudden appearance of modern fruits containing high amounts of available sugars, and environmental pressures, such as fierce competition from other microbes. Analysis of promoter sequences indicates that both lineages independently underwent a massive loss of a specific *cis*-regulatory (regulating the expression of genes on the same chromosome) element from dozens of genes associated with respiration. Both lineages, independently and in parallel, developed the ability to make and accumulate ethanol in the presence of oxygen, as well as resistance to high ethanol concentrations, and have been using this ability as a weapon to outcompete other microbes which are very sensitive to ethanol. Surprisingly, both yeasts used the same molecular tool, global promoter rewiring, to change the regulation pattern of the expression of hundreds of genes involved in sugar degradation. This knowledge could be used in developing useful new yeast strains. <http://dx.doi.org/10.1038/ncomms1305>
- Botrytis bunch rot, a disease caused by the fungal pathogen *Botrytis cinerea*, can devastate grape vineyards. Yet other plants can protect themselves by mounting a form of chemical warfare against the fungus through the production of antimicrobial substances, called phytoalexins. Studies involving the mustard plant *Arabidopsis* have shown that when it detects the fungus *Botrytis cinerea*, it produces a phytoalexin, called camalexin, in response. Camalexin acts as an antibiotic against the specific fungus, allowing the plant to successfully defend itself. A signalling pathway, known as MAPK cascade, triggers the transcription activation of genes that make the camalexin. A new study shows that the target of this signalling cascade is the WRKY33 transcription factor, as *Arabidopsis* plants lacking the gene are unable to synthesize camalexin and are more susceptible to the *Botrytis cinerea* fungus. Understanding how plants regulate this defence response may in future allow natural enhancement of pathogen tolerance in plants. <http://dx.doi.org/10.1105/tpc.111.084996>
- Low-molecular-weight organic sulphur (S) compounds contribute important aromas and flavours to wines. The analysis of sulphur volatiles is generally challenging. Further difficulties are that the S-containing volatiles are usually present at low concentrations in wine and are prone to oxidation during the several stages of sample preparation and analysis. A new procedure to quantify such compounds in wines was developed using solid-phase microextraction to preconcentrate the analytes, followed by gas chromatography and detection with a sulphur chemiluminescence detector. The compounds studied (hydrogen sulphide, carbon disulphide, methanethiol, ethanethiol, dimethyl sulphide, diethyl sulphide, dimethyl disulphide, and diethyl disulphide) have low sensory thresholds and contribute aromas ranging from rotten egg to cabbage-like in wines. Oxidation of S-containing compounds was minimized, but it could not be completely avoided, particularly for the thiols studied. The optimal strategy was to use the method of standard addition (whereby a solution of known concentration of analyte is added) for quantification of these analytes in the wine samples. For the 8 previously mentioned S-compounds in wine samples the new method was shown to be reproducible with excellent recovery and limits of detection similar to or below sensory threshold levels. The method offers the opportunity to further understand the effects of fermentation conditions on the production of sulphur aromas, and to relate wine composition information to sensory properties. www.ajevonline.org/cgi/content/abstract/62/1/1
- Nanoparticles are the miniscule building blocks for new commercial products and materials in the emerging field of nanotechnology. One promising application is a technology for cleaning up pollution that uses nanoparticles of zero valent iron (NZVI) to promote the breakdown of contaminants in ground water. A team of researchers has made NZVI from tea mixed with ferric nitrate. The process did not use any hazardous chemicals, such as sodium borohydride, which is commonly used to make nanoparticles www.epa.gov/research/sciencenews/scinews_tea-nano.htm. The researchers then used white and red wine to make nanoparticles, finding superior results with red wine. They reported that high-quality nanocrystals of gold, silver, palladium, and platinum were easily produced. Red grape pomace (the remains after pressing) was very effective. The nanoparticles were formed within a few seconds when exposed to microwave irradiation at low power levels. Particles could be formed at room temperature, but they tend to be amorphous in nature, except for gold. <http://dx.doi.org/10.1002/cssc.200900220>

Local Research News

- Ten species of *Margarodes* (ground pearls, right) occur in South Africa, five of which infest vines. It is a subterranean insect pest that attacks vine roots, and vines can die within four years after being planted in infested soil. As it is an underground plague, it is not always evident that poor growth and death of vines is caused by this insect, and there are no known control measures for dealing with it. *Margarodes prieskaensis* is one of the main vine-infesting species and occurs in all the vine-growing areas along the Orange River. A field trial was conducted to evaluate various insecticides and nematicides for possible control of the different instars (developmental stages) in the life cycle of *M. prieskaensis*. Ten products at different dosage rates and application times were evaluated over three seasons. Good control was obtained against the pre-pupae and female stages with a preplant soil fumigant (D-D) as well as with two systemic insecticides, Actara and Confidor. One contact nematicide (Rugby) gave good control against pre-pupae. Various aspects of the life cycle were determined which supplied essential information for accurate timing of application of chemicals. The camel thorn tree was identified as a host plant of *M. prieskaensis*. www.sawislibrary.co.za/dbtextimages/Winetech2010_09.pdf
- The evidence that consuming wine, and particularly red wine, is beneficial for health, comes mainly from large epidemiological studies. Physiological studies would throw more light on this beneficial effect. A study of the antioxidant effects of red wine found that consumption of red wine increased the concentration of flavonoids from 0.27 to 0.41 $\mu\text{mol/L}$ (a 52% increase) in the blood plasma of human subjects. It also increased the diameter of the brachial artery, an advantage in coronary artery disease. Marinating red meat in red wine protected the meat from undergoing lipid peroxidation during cooking, thereby lessening the consumption of possible toxic products from the thermally-stressed lipids in the meat. Red wine acted as a potent antioxidant during the heating of polyunsaturated fatty acid containing edible oils. www.sawislibrary.co.za/dbtextimages/Winetech2010_18.pdf



Other News

- A contact sensor that measures the polyphenol concentration in leaves based on fluorescence has been developed. Under UV excitation leaves display fluorescence in two broad spectral bands. Red fluorescence is emitted only by chlorophyll a, while blue-green fluorescence has a highly heterogeneous origin with a large number of candidate fluorophores, e.g. hydroxycinnamic acids (caffeic, ferulic), chromones, stilbenes (resveratrol), coumarins, isoflavones, nicotinamides, flavins, pteridines, and alkaloids. The sensor measurement is unaffected by variable fluorescence and is independent of the chlorophyll concentration of the leaf. The procedure is not destructive and is quick and simple. It requires no calibration or adjustment of the light source. No preparation of the plant is required and the measurement can be taken outside, in the open field, or under ambient light. Three versions are available depending on the type of polyphenols to be measured (flavonols, anthocyanins, or hydroxycinnamic acids). www.force-a.eu/an/dualex.html
- The WSTA is the UK organisation for the wine and spirit industry, representing over 340 companies producing, importing, transporting and selling wines and spirits. It is launching a fraud prevention unit to lead industry efforts to crackdown on fraud in the wine and spirits sectors. The unit will work with police and customs in combating a range of issues affecting consumers and the trade, from identity theft and counterfeiting to wine investment fraud. www.wsta.co.uk/Press/WSTA-launches-fraud-prevention-unit.html
- Egg-shaped vats made of chemical-free concrete are gaining in popularity among wine makers. They are unlined and before use must be treated with tartaric acid which forms a protective layer inside. Available in 6 and 16 hectolitre sizes, about 800 have been sold worldwide. The claimed benefits include no dead corners, so there is a better uniformity of the composition of the liquid, and so that temperature variations of the wine are significantly reduced. Another stated advantage is that of micro-oxygenation akin to that seen with oak, without imparting oak flavour, and avoiding the reductive conditions of stainless steel. There is little or no loss of wine by evaporation. A tasting comparison of Sankt Laurent (similar to Pinot Noir) in stainless steel, oak and concrete, found that concrete had the best texture and mouth feeling; it was fuller, rounder, and with more complex, darker fruit. Wood gave more tannin structure; stainless steel was the lightest. A Californian winemaker found that the vats preserve the natural character of Sauvignon Blanc while also adding richness and body, and that they act like oak barrels in creating texture, but without imparting vanillin, spice, etc, while preserving fruit flavours and aromas as does stainless steel. www.thedrinksbusiness.com/index.php?option=com_content&task=view&id=12748



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