Winetech Scan
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Local Research News

Assessing malolactic fermentation

Malolactic fermentation (MLF) is an important process in winemaking. It is mainly conducted by the lactic acid bacterium *Oenococcus oeni* which decreases wine acidity through the biotransformation of tart-tasting malic acid, naturally present in grape must, to softer-tasting lactic acid. The biochemical reaction involves the malolactic enzyme (*mleA*), and the regulation of *mleA* remains poorly understood. Also, the adaptation of *Oenococcus oeni* to the wines in warm climates (e.g. South Africa) which have a low malic acid concentration and high ethanol content and high pH, has not been studied yet.

A study found that 53% of all lactic acid bacteria that were tested possessed the malolactic (*mleA)* gene. Four different MLF starter cultures were evaluated in industrial experimental fermentation in three different cultivars. Results showed a difference in the lag phase of the cultures at the beginning of MLF, however all the cultures finished MLF. In certain instances there were significant differences in the rate of malic acid degradation between the different starter cultures, but it seems to be dependent on the wine matrix. Expression of *mleA* for both *O. oeni* and another lactic acid bacterium, *L. plantarum*, was shown to be inducible by the presence of malic acid, with increased expression in the middle of MLF. Expression of *mleA* was also shown to be increased at low pH values and decreased in the presence of ethanol. Thus there is a link between MLF completion and high expression of the *mleA* gene. The results provide further evidence that co-inoculation for MLF in high alcohol and low malic acid wines can be used as a tool to overcome problems experienced with sequential inoculations. Wines were made with four selected *O. oeni* strains. The wines all had the ability to conduct MLF, and there were differences in the aroma profiles of the strains. www.sawislibrary.co.za/dbtextimages/duToit.pdf

Metabolic profiles of lactic acid bacteria

Malolactic fermentation (MLF) is essential for the aging of red wines and some white wines and the process is catalysed by lactic acid bacteria (LAB). While there is an indication that LAB also contribute to wine aroma composition, information on this subject is fragmented and the nature and concentrations of aroma compounds formed remain largely unknown. To investigate the contribution of industrial lactic acid bacteria (LAB) starter cultures to wine chemical composition, aroma and taste, the metabolic profiles associated with a selection of lactic acid bacteria (LAB) frequently used in the SA wine industry were established in experimentally produced Shiraz, Pinotage and Chardonnay wines. An analytical platform for the detection and quantification of MLF-related volatile and non-volatile chemical compounds was established for this evaluation.

The different LAB cultures showed significant strain-specific variations in citric acid degradation and lactic acid formation. Concentrations of compounds resulting from citric acid metabolism, diacetyl, acetic acid, acetoin, and ethyl lactate were also affected, and depended on the bacterial strain used. Bacterial metabolism resulted in increased concentrations of higher alcohols, fatty acids, and total esters, with a larger increase in ethyl esters than in acetate esters. Formation of ethyl butyrate, ethyl propionate, ethyl 2-methylbutryate, and ethyl isovalerate was related to specific bacterial strains used, indicating possible differences in esterase activity. The chemical changes impacted the sensory profiles of the wines, particularly the fruitiness, vegetative and buttery attributes. Consumer preference tests showed that these changes in sensory properties could also influence consumer liking. Thus selection of LAB starter cultures has the potential to influence the style of wine produced. www.sawislibrary.co.za/dbtextimages/NieuwoudtH3.pdf

International Research News

TCA suppresses the sense of smell

A bad, musty smell sometimes ruins a bottle of corked wine. This unpleasant odour results from 2,4,6-trichloroanisole (TCA) which forms when a fungus that infects cork comes in contact with chlorine products used for sanitation at wineries. It has now been found TCA does not have an odour, but acts by suppressing the sense of smell, and this causes us to detect a musty odour. By exposing olfactory receptor cells (ORCs) from newts (small amphibian of the salamander family) to TCA, researchers showed that TCA reduces olfactory transduction by suppressing cyclic nucleotide-gated channels, without evoking odorant responses. Surprisingly, suppression was observed even at extremely low (i.e. attomolar) TCA concentrations. The researchers also tested the effects of TCA on panellists who had been trained to detect unpleasant odours. They were able to detect the musty smell associated with TCA at concentrations of 10 parts per trillion for red wine and 15 parts per trillion for white wine. They also reported reductions in the original wine odour when tasting wine contaminated with TCA at similar concentrations. www.pnas.org/cgi/doi/10.1073/pnas.1300764110

Changes in vines in response to different photoperiods

So as to study morphological, physiological and biochemical changes in response to photoperiod, experiments were conducted under greenhouse conditions using cold-sensitive Cabernet Franc and the cold-tolerant vines Couderc 3309 and

Concord. The potted vines were exposed to short day (SD) (8 hr) or long day (LD) (16 hr) for four, six and eight weeks. Shoot growth, periderm formation, dormancy, freezing tolerance (FT) measured by LT50, the temperature at which 50% of tissues die, and soluble sugar concentrations in leaf and bud tissues were examined. Shoot growth slowed in all cultivars under SD accompanied with increased periderm formation and dormancy depth. Concord initiated these changes first, followed by Couderc then Cabernet Franc. The three cultivars did not show differences in FT under LD with LT50 ranging between −6.1 and −8.1°C. However, FT increased by 0.7, 2.0, and 2.7°C after four, six, and eight weeks under SD, respectively.

Among all sugars, raffinose (a trisaccharide composed of galactose, fructose, and glucose) showed distinctive responses associated with photoperiod, remaining low and similar under LD. Under SD, raffinose concentration was generally higher with cold-tolerant Couderc and Concord accumulating higher concentrations compared to cold-sensitive Cabernet Franc. These results suggest that raffinose accumulation might be an early step in response to photoperiod coinciding with slowed shoot growth, the induction of endodormancy and the initial acquisition of FT. This could be used as predictor of FT differences in grape cultivar evaluations. It was also concluded that grapevines responded similarly when the environmental cues (SD and low temperature) were administered separately. http://dx.doi.org/10.5344/ajev.2013.13060

Other news

Crop pests move polewards in a warming world

Crop pests and pathogens and pathogens are moving away from the equatorial region towards the poles at an average of 2.7 kilometres per year. This is the conclusion reached by a study which looked the records of 612 crop pests and pathogens from around the world that had been collected over the past 50 years. Each organism's distribution was different - some butterflies and insects are shifting quickly, at about 20km a year; other bacterium species have hardly moved. The researchers concluded that the observed positive latitudinal trends in many taxa support the hypothesis of global warming driven pest movement. Such a spread allows establishment of the pests in regions hitherto unsuitable for them, and the concern is that global food security can come under threat. http://dx.doi.org/10.1038/NCLIMATE1990

GrapeSort project

GrapeSort is a project in Germany being undertaken by the Fraunhofer Institute to produce grape sorting equipment using optical recognition. The prototype under development first separates the berries from their stems. Next, the grapes are individually placed on a conveyor belt by a newly developed conveying system without damaging them. The grapes are then carried along by the conveyor belt past a sorting module at 3 meters per second (11 km/h). A high-speed line scan camera takes images the grapes 18 000 times a second. Software immediately evaluates each image and controls compressed air jets that blow foreign objects such as insects, vine shoots, stones or twigs out of the material flow. Bad or undesirable berries are also removed by the air ejection unit. Sorting is also done based on analyses of shape and colour.

The next step will be to grade the grapes according to sugar content. This will be done by using the same camera to measure how light is refracted by each individual grape, and higher the sugar content, the more the light is refracted. Several tons of grapes already pass through the sorting facility every hour, with project partners unanimously declaring the results of the sorting to be good. An optimized functioning prototype is set to be tested for the first time in October 2013. www.fraunhofer.de/en/press/research-news/2013/september/sorting-out-top-class-wines.html

Rapid detection and identification of yeasts in must and wine

FISH (fluorescent in situ hybridization) is a cytogenetic technique used to detect and localize the presence or absence of specific DNA sequences on chromosomes. FISH uses fluorescent probes that bind to only those parts of the chromosome with which they show a high degree of sequence complementarity. Flow cytometry (FCM) is a laser-based technology employed in cell counting, cell sorting, biomarker detection and protein engineering, by suspending cells in a stream of fluid and passing them through an electronic detection apparatus. It allows simultaneous multiparametric analysis of the physical and chemical characteristics of thousands of particles per second.

Now Spanish researchers have combined the two methods to detect spoilage yeasts such as *Brettanomyces bruxellensis*, *Pichia, Kluyveromyces, Candida* or *Hanseniaspora*. Their detection is very important, for they give wine unpleasant flavours. Normally the identification of the microbiota in grapes, must or wine is laborious and requires several days. FISH is an excellent and rapid method to solve different oenological problems such as detection of species related to wine spoilage or production of toxic compounds, quality control of wines before bottling, and detection of yeast population dynamics in fermentations. The new method (FISH combined with FCM) demonstrates the potential of fluorescent probes for more rapid identification of these organisms. The new combined technique also makes it possible to study the population dynamics of the targeted species during the winemaking process. www.infowine.com/default.asp?scheda=12539&provenienza=42

Popular 'Winemaking Calculators' goes mobile

The Australian Wine Research Institute's (AWRI) Winemaking Calculators is an essential application for all oenologists and winemakers, and the site averages 19 000 hits per year. The winemaking calculators have now been made available as apps' for mobile devices. www.awri.com.au/industry_support/winemaking_resources/winemaking-calculators-app/