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Local Research News

The influence of maceration practices on biogenic amine formation

In wine, the non-volatile biogenic amines (histamine, putrescine, cadaverine, spermine, spermidine, agmatine, tyramine, and tryptamine) and the volatile amine phenylethylamine are formed by microbial decarboxylation of the corresponding amino acids, mainly by lactic acid bacteria during malolactic fermentation (MLF). Possible control of biogenic amines is of importance to the wine industry because of the toxicity implications of these compounds for humans, as well as the potential to use biogenic amines as indicators of spoilage or authenticity.

A study has investigated the influence of compounds extracted from the grape skins by different winemaking maceration practices on the formation of biogenic amines. Wines were made on a small scale with two red grape cultivars. Treatments consisted of free-run juice (no skin contact), skin contact during alcoholic fermentation, cold maceration and extended maceration; followed by MLF in all treatments. The results showed that higher levels of precursor amino acids and biogenic amines were detected in the absence of skin contact, extended maceration and to a lesser extent in conventional maceration. Cold maceration before fermentation initially increased the extraction of amino acids and formation of biogenic amines, but resulted in the lowest concentrations of these harmful compounds in the final wines. Thus cold maceration seems to have a protective effect against biogenic amine accumulation during MLF. http://dx.doi.org/10.1016/j.lwt.2013.01.006

Genes from lactic acid bacteria relevant to wine production

Lactic acid bacteria (LAB) possess a wide range of potential enzymes with interesting traits from an oenological point of view. However, their performance in the wine matrix and their potential impact on the final product is not well understood, especially as regards their contribution to wine aroma. An investigation genetically screened LAB strains isolated from South African grape and wine samples for the presence of genes encoding enzymes of oenological relevance using gene-specific primers, and coding for enzymes involved in proteolytic and amino acid catabolic pathways. PCR detection results showed that most strains possessed different combinations of enzyme encoding genes. Phylogenetic analysis also showed different patterns of clustering amongst different species. The presence of genes in the tested strains thus showed the genetic potential of wine LAB to influence wine aromatic profile. In addition, a total of 30 strains isolated from South African grape and wine samples were identified as *Lactobacillus florum*. This is the first association of this species with grapes or wine. The study also yielded species-specific primers that could be used to identify this microbe. http://www.sawislibrary.co.za/dbtextimages/duToitM5.pdf

International Research News

Estimation of grapevine Leaf Area Index

In viticulture, leaf area is a crucial indicator of water use, whole-plant-assimilation, light interception and impact on bunch exposure, and hence fruit quality. Therefore reliable, rapid and non-destructive measurements of leaf area and leaf area index (LAI) are of importance in commercial winemaking as well as in viticultural field studies. LAI is defined as the one-sided green leaf area per unit ground surface area in broadleaf canopies, while the gap fraction of a canopy is the fraction of view that is unobstructed by canopy in any particular direction. A problem with measurements of canopy gap fractions is that it is not possible to distinguish between photosynthetically active plant tissue and other plant elements or trellis structures. Thus the term Plant Area Index (PAI) is used to indicated the area of active plant tissue.

A study has now for the first time compared directly measured LAI and estimated PAI for Vertical Shoot Positioning (VSP) trained grapevines with respect to the influence of trellis structures and other plant elements on gap fraction analysis. Measurements were performed using the Plant Canopy Analyzer LAI-2200 (right), which calculates LAI and other canopy structure attributes from solar radiation measurements made with a wide-angle optical sensor. Measurements made above and below the canopy were used to determine canopy light interception at five angles, from which LAI and thus PAI were computed using a model of radiative transfer in vegetative canopies. The day after the indirect measurements of PAI the four central vines of each row within the transect were defoliated and the direct LAI was measured. The correlation between directly measured LAI and estimated PAI was very high. Eight measurements below the canopy were enough to accurately estimate LAI. Using local calibration, application of the empirical calibration equation provided accurate LAI estimates,. The method presented provides a useful tool for rapid and precise LAI estimation in VSP training systems and for supporting canopy or management decisions based on LAI. http://dx.doi.org/10.5344/ajev.2013.13073

Application of urea spray to enhance grape juice YAN

In the Okanagan Valley, B.C., Canada, and in many other grape-growing regions of the world, vineyard soils are naturally nutrient-poor, and nitrogen addition rates are kept low to prevent disease, excessive vine growth and adverse changes in berry

and juice composition. As a result, grape juice yeast assimilable nitrogen (YAN) concentrations at harvest are often below the level considered sufficient to complete fermentation during wine-making, and require augmentation with additional nitrogen.

Over a three year period at seven study sites planted with five winegrape varieties, late-season foliar applications of urea were investigated as a method for enhancing grape juice composition. The use of 1% or 2% (w/v) urea, applied to the foliage around the time of veraison, showed considerable promise as a supplement to more traditional soil fertilization programs. The applications caused significant improvements in grape juice YAN concentrations in six out of seven of the study sites each year, but there was no consistent pattern among years as to which study sites were most amenable to treatment. Little of the nitrogen applied in these foliar spray treatments appeared to be retained by the vine, which usually showed no difference in vine growth or nutrient status the year after treatment application. Further work should determine the ideal application rate, frequency and timing to optimize treatment efficacy. http://dx.doi.org/10.5344/ajev.2013.13092

The effect of cover crops and tillage in a mature Merlot vineyard

Permanent cover crops are commonly used in vineyard floor management because of their beneficial effects on soil and vine health, but studies evaluating their competitive effects on vines have been conducted primarily in non-irrigated vineyards. The combined effects of cover crop type (oats alone or oats grown with legumes) and tillage on soil nutrient availability, vine nutrition, growth, and yield characteristics of Merlot grown under regulated deficit irrigation in a commercial vineyard from 2008 to 2010 in California's Central Valley was evaluated. Five treatments were used: Resident Vegetation (RV) + Till, Oats + Till, Oats/Legumes +Till, Oats + NoTill, and Oats/Legumes + NoTill.

No differences in soil nutrient availability were found among the treatments. Of the many nutritional constituents analyzed in leaf petioles and blades, only NO_3-$N_{petiole}$ was affected by floor management. At nearly all growth stages among all years, NO_3-$N_{petiole}$ of tilled treatments was twice the no-till treatments. At harvest, yield, mean cluster weight, cluster number per vine, and aboveground cover crop biomass differed among treatments, however, responses were not consistent among treatments within each respective year. Importantly, yields were similar from all four cover crop treatments compared to the typical management (RV + Till), suggesting that use of cover crops and/or no-till practices may be implemented in an irrigated vineyard with little immediate effect on grape productivity in mature vineyards. http://dx.doi.org/10.5344/ajev.2013.12119

Other news

How to reduce the alcohol content of wine in the context of climate change?

A major challenge for the viticulture and oenology sector is the increase of the alcohol level in wine related to climate change. Grapes ripen more and earlier because of global warming. Some climatologists foresee that, within 50 years, the sensorial quality of wine could be fundamentally different. A symposium in Bordeaux dealt with the reduction of alcohol level in wine, so as to preserve wine quality. It addressed different possibilities for reducing the alcohol level of wine in terms of viticulture, oenology (microorganisms and chemistry), potential strategies and rules, technological practices and processes, sensorial impact and consumers' preferences regarding wines with a reduced alcohol level. The proceedings of the symposium may be downloaded here: http://www.oenoviti.univ-bordeauxsegalen.fr/images/oenoviti2013-2.pdf

Controlling heat stress in the vineyard

A new high pressure nebulizing system that keeps the temperature between rows in the vineyard below 30ºC, thus reducing the risk of heat stress, is available. Characteristics include low operating costs, minimal amount of water (2.5 litres / hectare to lower the temperature in less than 30 seconds) and no moisture to the leaf mass and grape cluster. It is claimed the system permits control of the progression of the grape phenological stages and allows scheduling of the harvest date. http://www.coolingdew.com/tecnologia/

Cues that lead wine drinkers to unintentionally overpour

Wine drinkers often pour their own wine, but is the amount they pour influenced by the shape of the glass, the colour of the wine, or how they pour? Building on research involving visual illusions and haptic cues, an exploratory field study shows that while wine drinkers typically poured 117ml of wine into a standard baseline (300ml) glass, they poured 11.9% more into a wider glass, 9.2% more when the wine was white (the low contrast with the glass makes it difficult to see), and 12.2% more when the wine glass was held in their hand rather than sitting on the table. Using narrower wine glasses and not pouring while holding one's glass may be steps toward modestly reducing the amount of wine a social drinker pours and drinks. http://dx.doi.org/10.3109/10826084.2013.832327

Your personal winery

The WinePod, a fully automated teaching winery, is the world's first personal winery. It is a computer controlled 75 litre all-in-one fermenting, pressing and aging tank. It has heating and cooling controls, Brix (sugar) and temperature sensors, and an automatic wine press with pressure control. Wireless monitoring and control via provided software provides step-by-step instruction, calculates doses, logs winemaking history automatically and charts vital wine statistics. Up to 4 cases of wine can be produced per batch. The price is $4 500. www.winepod.net