Winetech Scan
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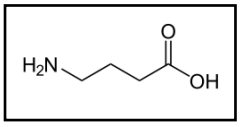
Research News

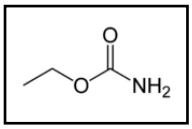
- The duration of fermentation is related to the availability of assimilable nitrogen. Insufficient levels of nitrogen in the must limit both biomass yield and sugar catabolism kinetics, and may cause sluggish fermentation. Yeast *(Saccharomyces cerevisiae)* can make use of the nonproteinogenic gamma-aminobutyric acid (right) (GABA), one of the various nitrogen sources present in grape juice. The effect of this amino acid on yeast fermentation kinetics and by-product formation in winemaking was investigated. In 39 samples of French grape juice from 21 different grape varieties, the GABA content of musts ranged from 2 to 580 mg/L, depending on variety, year, and geographic origin of the grapes. The GABA content could account for up to 20% of the assimilable nitrogen in grape juice. The assimilation of GABA increased yeast growth, fermentation rate, and glycerol production during wine fermentation. The possibility of converting GABA into succinate or succinic acid (also known butanedioic acid) is of great interest in enology because succinate, which provides a combination of saltiness, bitterness, and acidity, contributes to the sensory characteristics and microbiological stability of wines. The results showed that GABA can act as a source of succinate in wine, regardless of the total nitrogen content of the must. The yield of succinate from GABA ranged from 0.75 to 1 mol succinate/mol GABA as a function of yeast genetic background. Up to 50% of succinate in wine may be derived from GABA, depending on the initial concentration in grape juice. The results highlight the importance of taking into account the GABA content of musts for the optimal control of fermentation and wine acidity. www.ajevonline.org/cgi/content/abstract/60/4/508



- The Second International Symposium on Wine Microbiology and Safety, which focused on the theme 'Wine Microbiology and Quality of Wine' was held in Taranto, Italy in November 2009. The event, held under the aegis of the International Organisation of Vine and Wine and of the International Society of Mycotoxicology, had as its topics the following: Microbial control in the vineyard, Starter selection and microbial control in the cellar, Yeast activity on wine quality, and Methods for detection of micro-organisms affecting wine safety and quality. Abstracts of all papers presented are available at www.mycotox-society.org/?page=news&id_art=23%20

- Colour is a key characteristic used to evaluate the sensory quality of red wine, and anthocyanins are the main contributors to colour. The presence of monomeric anthocyanins and CIELAB colour values were investigated during the fermentation of Cabernet Sauvignon red wine. The concentrations of anthocyanins and the CIELAB colour values in all wine samples were measured by using high performance liquid chromatography and by spectrophotometry. Principal component regression (PCR), a statistical tool, was used to establish a correlation between the detected anthocyanins and wine colouring. The results showed that 14 monomeric anthocyanins could be identified in wine samples, and all of these anthocyanins were negatively correlated with the L*, b* and H*ab CIELAB colour values, but positively correlated with a* and C*ab values. On an equal concentration basis for each detected anthocyanin, cyanidin-3-*O*-glucoside had the most influence on CIELAB colour value, while malvidin 3-*O*-glucoside had the least. The colour values of various monomeric anthocyanins were influenced by their various aspects of their molecular structures. This work develops a statistical method for evaluating correlation between wine colour and monomeric anthocyanins, and also provides a basis for elucidating the effect of intramolecular co-pigmentation on wine colouring. http://dx.doi.org/10.3390/molecules13112859

- Ethyl carbamate (EC) (right) is an ester of carbamic acid. It is known to induce mutations and tumours in test animals and is considered a probable human carcinogen by the World Health Organization. Urea and ethanol are the main precursors for the formation of EC in wine. Urea can be metabolized (degraded) by wine yeasts, however, the presence of good nitrogen sources in the grape must suppresses the genes involved in urea metabolism. Thus urea is exported out of the cell where it reacts with ethanol to form EC. Modification of the yeast to reduce the export of urea led to a reduction in the EC content of Chardonnay wine. To further reduce EC in wine, the study created functionally enhanced urea-importing yeast cells. The urea-importing yeast strain reduced EC by 81% in Chardonnay wine and was shown to be approximately four times as effective as the urea-degrading strain at reducing EC in Chardonnay wine. This latter approach thus is an important alternative strategy for EC reduction in wines. All the functionally enhanced urea-importing yeast cells were substantially equivalent to parental strains in terms of fermentation rate and ethanol production. As these can be created without the use of antibiotic resistance markers, such strains are not considered to be transgenic. www.ajevonline.org/cgi/content/abstract/60/4/537



- Phenolics are an essential component of red wine quality. They contribute to astringency, one of the key sensory attributes influencing consumer acceptability of red wine. A study examined storage conditions that may

influence the chemical and sensory properties of young bottled Cabernet Sauvignon and Merlot wines. For each of the two wine types, low tannin (≤400 mg/L catechin equivalents) and high tannin (≥800 mg/L catechin equivalents) wines were stored at either 27ºC or 32ºC for 40, 55, and 70 days. The temperatures were chosen so as to minimize precipitation. Chemical and sensory analyses were conducted after each storage period. It was found that the aging reactions in Merlot and Cabernet Sauvignon wines, which increased the level of small polymeric pigment (SPP) while decreasing anthocyanins, were primarily due to the higher temperature of storage. Increase in large polymeric pigment LPP was influenced more by tannin concentration than by storage time or temperature. In Cabernet Sauvignon, the sensory perception of bitterness increased with storage time at 32ºC. Perceived astringency was not affected by storage time or temperature. The results support earlier studies that found tannin concentration can forecast perceived astringency. www.ajevonline.org/cgi/content/abstract/60/4/442

- A short review article discusses the bacterial spoilage of wine and approaches to minimize it. Lactic acid and acetic acid bacteria are the only families of bacteria found in grape must and in wine. They are part of the natural microbial ecosystem of wine and play an important role in winemaking by reducing wine acidity and contributing to aroma and flavour. However, they can cause many wine spoilage problems. *Lactobacillus* and *Pediococcus* can produce undesirable volatile compounds. Consequences of bacterial wine spoilage include mousy taint, bitterness, geranium notes, volatile acidity, oily and slimy-texture, and overt buttery characters. Management of wine spoilage bacteria can be as simple as adding sulphur dioxide or manipulating wine acidity. However, addition of acid to grape must and wine is subject to regulations in many countries and for some wines it can impact on wine style. To control the more recalcitrant bacteria, several other technologies have been tried. These include pulsed electric fields, ultrahigh pressure, ultrasound or ultra-violet (UV) irradiation, and the use of natural products, including bacteriocins and lysozyme. Health concerns and changing regulatory requirements provide further motivation for the winemaking community to seek alternative ways to limit the proliferation of wine spoilage bacteria http://dx.doi.org/10.1111/j.1472-765X.2008.02505.x

Local research results

- It is widely accepted that acetic and lactic acid bacteria (LAB) are the primary culprits responsible for wine spoilage. Control of these spoilage microorganisms during wine fermentation is currently carried out using chemical preservatives, such as sulphur dioxide. However, such chemical preservatives can be deleterious to the quality of wine and there is mounting consumer resistance to their use. A project to investigate use of bacteriocins and lysozyme to combat spoilage LAB was undertaken. The aim was to express the specific bacteriocins and lysozyme in yeast so that it will have the ability to produce these antimicrobial agents while fermenting grape sugars. The expression of pediocin, leucocin and lysozyme was successful in laboratory strains of yeast. The project is investigating increasing the levels of production of the bacteriocins via strategies such as cell wall anchoring proteins or changes to the signal sequence. In addition, the production of hydrogen peroxide from glucose oxidase was used as antimicrobial metabolite in laboratory yeast strains. Together with the antimicrobial peptides and enzymes, the glucose oxidase-producing yeast might offer a viable way to meet consumer's demands for decreased levels of sulphites. These constructs are being introduced into commercial wine yeast starter cultures and evaluated under winemaking conditions for their effectiveness. www.sawislibrary.co.za/dbtextimages/DuToitM3.pdf

- *Grapevine fanleaf virus* (GFLV) is responsible for severe fanleaf degeneration in grapevines of all major wine producing regions of the world. It is caused by a member of the nepovirus family and transmitted by the soil nematode, Xiphinema index (a roundworm). In South Africa the disease is most prevalent in the Breede river valley region. In order to successfully control the spread of the virus, specific and reliable diagnostic assays are necessary. The objective of this study was to produce a reliable and sensitive diagnostic assay specific for the South African strains of GFLV. Attempts to develop an enzyme-linked immunosorbent assay (ELISA), sensitive and reliable for the South African strains of the GFLV, were unsuccessful. However, an alternative assay based on the rapid-direct-one-tube-RT-PCR (reverse transcription polymerase chain reaction) was successfully developed and proved to be the most sensitive and reliable technique for GFLV detection. Twelve GFLV isolates were sequenced from different geographical regions in SA. Phylogenetic analysis showed the isolates form two distinct clades or sub-populations in SA. The developed rapid-direct-one-tube-RT-PCR was compared to GFLV specific ELISA and ImmunoStrips, both sourced from the Agdia company in the US. Of the 23 samples from both clades tested with all three tests, 21 tested positive with rapid-direct-one-tube-RT-PCR, 19 with the ImmunoStrips and 17 with the ELISA assay. Samples collected from symptomless vines in a GFLV-infected vineyard tested negative in all three assays, thus validating the integrity of the assays. A standard operating procedure for applying the new diagnostic assay was prepared. www.sawislibrary.co.za/dbtextimages/BurgerJT2.pdf