



Local Research News

Effect of soil surface management practices and soil parameters on soil microbiology and grapevine performance

A very detailed study has investigated the effects of common soil surface management practices on the microbial populations of bulk soil, at the root/soil interface, and on physical and chemical parameters within the soil, all at an experimental vineyard near Robertson, South Africa. The objective was to identify practices which will promote diversity and balance amongst favourable soil microorganisms, increase soil organic matter contents, and facilitate consistent growth, yield and disease resistance in grapevines. Five different land management treatments were applied and soil samples were collected over a two-year period.

Bacterial and fungal community structure differed significantly over the two year period with dissimilarities between seasons. The most profound dissimilarities in bacterial community structure were observed between mulch, clean cultivation and chemical weed control treatments. The soil surface treatments applied to the vineyard caused significant shifts in microbial community structure, highlighting the effect of land management practices on agricultural soil. In terms of soil quality, none of the physical conditions created by the treatments resulted in unfavourable soil conditions or poor quality for crop growth. Overall, the treatment that can be rated most sustainable in terms of yielding the most desired soil quality is the straw mulch treatment. www.sawislibrary.co.za/dbtextimages/MulidziR2.pdf

The development of technologies for cell wall profiling and analysis

Despite the obvious importance associated with cell wall properties in the grape and wine industries, very little is known regarding the fundamental scientific processes that relate to quality parameters such as aroma, storage (browning) and texture. Accurate and high-throughput analytical and profiling methods for cell walls are lacking. What is greatly needed is a set of methodologies to dissect and monitor wall processes under defined conditions, from the vineyard, through the storage and processing steps, during winemaking, and on to the shelf or into the glass.

A project with the ultimate aim of developing cell wall platform analytical technologies and capacity has been undertaken. Significant progress towards this aim has been achieved, and all of these newly developed accurate reference methods for cell wall samples are now being implemented in plant and microbial projects by research groups at the Institute for Wine Biotechnology. www.sawislibrary.co.za/dbtextimages/VivierM2.pdf

International Research News

Microbial terroir

On their journey from the vineyard to the wine bottle, grapes are transformed into wine through microbial activity, with indisputable consequences for wine quality parameters. Wine grapes harbour a wide range of microbes originating from the surrounding environment, many of which are recognized for their role in grapevine health and wine quality. However, determinants of regional wine characteristics have not been identified, but are frequently assumed to stem from viticultural or geological factors alone. A recent study in California used a high-throughput, short-amplicon sequencing approach to demonstrate that regional, site-specific, and grape-variety factors shape the fungal and bacterial consortia inhabiting wine-grape surfaces. Furthermore, these microbial assemblages are correlated to specific climatic features, suggesting a link between vineyard environmental conditions and microbial inhabitation patterns. Taken together, these factors shape the unique microbial inputs to regional wine fermentations, posing the existence of non-random 'microbial terroir' as a determining factor in regional variation among wine grapes.

The study results represents a real paradigm shift in the understanding of grape and wine production, as well as other food and agricultural systems in which microbial communities impact the qualities of the fresh or processed products. Further studies are needed to determine whether these variations in the microbial communities that inhabit the surface of the grapes eventually produce detectable differences in the flavour, aroma and other chemically linked sensory properties of wines. www.pnas.org/content/early/2013/11/20/1317377110

Microwave your grapes for controlled extraction of phenolics

Researchers in Tasmania are investigating the controlled release of Pinot noir phenolics by microwave. The microwaves penetrate the grape skin cells and compromise the membranes inside the grape. Microwaving grape must produced Pinot noir wines with richer colour and a higher tannin concentration, compared with wines made using a standard submerged cap fermentation process. The microwaved wine was darker in colour, had a more pronounced varietal fruit nose, and in the mouth it was plush and soft with lovely mouth-coating tannins. The microwave wines were around three times higher in tannin and had double the anthocyanin concentration of the control.

The researchers have established how to 'dial up' a desired tannin concentration in Pinot noir grape musts, only limited by what tannin is available in the fruit, thus potentially giving the wine makers more control over such an important wine parameter as tannin concentration. The microwave wine making to-date has been done at a very small scale, with most trials producing around 1.5L of wine. Microwaving could also provide some important potential savings in fermentation time and tank space. <http://ecite.utas.edu.au/86601>

Controlled bubble-free oxygenation

Appropriate oxygen availability is one of the keys to improving fermentation kinetics during alcoholic fermentation. Indeed, addition of oxygen at the end of the yeast growth phase, coupled with the addition of assimilable nitrogen, greatly decreases the risk of stuck fermentation. The amount of oxygen needed for the whole cycle of fermentation has been estimated to be in the range of 10–20 mg/L. However, an important limitation of standard oxygenation systems is that it is difficult to determine the exact quantity of oxygen transferred to wine or must. Now a bubble-free oxygenation system, enabling precise and reproducible oxygen addition has been developed and validated at laboratory and pilot scale. In this system, oxygen is added by diffusion through a silicone membrane tube. Parameters with the biggest influence on the OTR_m (maximum oxygen transfer rate (mg/L h)) were the liquid flow rate and the temperature. These data were used to construct a mathematical model that calculates the OTR as a function of the operating parameters. New options for the management of fermentation are now possible by both one-off and continuous tightly controlled additions of oxygen. <http://dx.doi.org/10.1016/j.procbio.2013.06.033>

Origins of Grape and Wine Aroma – a review in 2 parts

Wine flavour arises from a mixture of hundreds of chemical components interacting with our sense organs, producing a neural response that is processed in the brain, and resulting in a psychophysical percept that we readily describe as wine. The chemical components of wine are derived from multiple sources; during fermentation grape flavour components are extracted into the wine and new compounds are formed by numerous chemical and biochemical processes. Part 1 of a review on the origins of grape and wine aroma discusses the various classes of chemical compounds in grapes and wines and the chemical and biochemical processes that influence their formation and concentrations. The overall aim is to highlight the current state of knowledge in the area of grape and wine aroma chemistry.

Despite the great volume of research on wine composition, summarized in this review, there is much still to be learned about the biochemical and chemical origins of wine volatiles, and the effects of climate and viticultural practices on the concentrations of these compounds. Understanding the source of wine volatile compounds and the mechanisms that influence their formation through grape growing, winemaking, and storage is essential to developing strategies for the production of wines with specific sensory attributes that appeal to target markets. <http://dx.doi.org/10.5344/ajev.2013.12070>

Part 2 provides an overview of the chemical and sensory analysis approaches that have been used to deconstruct wine flavour into its component parts with the aim of relating the chemical composition to the unique sensory properties that are associated with different wine varieties and styles. The review concludes that advances in analytical, sensory, and statistical analysis have been critical for understanding the relationships between grape and wine composition and sensory perception. However, it is still not possible to fully predict aroma quality based on chemical composition alone, due, in part, to the potential presence of trace compounds that may be difficult to quantify and identify and to the complex interactions of aroma compounds with each other and with the wine matrix that impact aroma volatility, release, and perception.

Future discoveries will continue to be driven by development of improved and high-throughput analytical methods that will allow monitoring of a large number of volatiles, including those present at low concentrations. Ultimately, multidisciplinary studies using genomic, proteomic, metabolomics, and sensory techniques to understand flavor and aroma formation in the grape and during fermentation will generate essential knowledge about the role that production processes—from the vineyard to the cellar—have on the final product presented to a consumer. <http://dx.doi.org/10.5344/ajev.2013.13106>

Other news

The Global Vineyard Index

The attraction of a vineyard home has not escaped the world's top property developers. New estates set around vineyards are being built in many countries. These developments allow buyers to purchase a property on a turnkey basis with owners determining the level of input and involvement in the winemaking process they want, without the hassle of maintaining a fully operational vineyard and winery. The Global Vineyard Index provides a country comparison. It may be downloaded at <http://my.knightfrank.com/research-reports/global-vineyard-index.aspx>

Digital Writing on Wine

The Burgundy Business School in Dijon has released the conclusions of a research study into wine blogs and digital writing worldwide. Entitled 'World Wide Wines: Digital Writing on Wine', the 57 page study found that the realm of wine blogging goes much beyond tasting notes and wine appreciation. It is about education, history, marketing and many other topics. The typical international wine blogger is male, aged 26 to 40, blogs by passion or for educating his fellow consumers. The full report is available at <http://goo.gl/iBPZnW>

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