Winetech Scan
November 2012
Wine Industry Network of Expertise and Technology
Netwerk van Kundigheid en Technologie vir die Wynbedryf

Local Research News

The contribution of soil water status and selected atmospheric variables on water constraints in grapevines

Due to the development of excessive water constraints in grapevines, some localities are not suitable for all cultivars in terms of premium quality wine production. Since soil water content, e.g. expressed in terms of gravimetric or volumetric percentage, does not provide an indication of the energy required for the absorption of water from the soil, it would be more realistic to relate grapevine water constraints to soil water matric potential (ΨM). So as to determine (i) the extent of soil water depletion in terms of soil water matric potential (ΨM), particularly during berry ripening, (ii) the combined effect of ΨM and atmospheric conditions on maximum water constraints in Cabernet Sauvignon grapevines, and (iii) the combined effects of ΨM and atmospheric conditions on growth and yield responses, as well as on juice and sensorial wine quality characteristics of Cabernet Sauvignon, soil and grapevine measurements were carried out in the Stellenbosch, Swartland, Lower Olifants River and Lower Orange River regions in 54 experimental plots. With the exception of the Stellenbosch region, the field work was repeated over two seasons.

The evolution of water constraints not only depended on soil water status, but also on soil texture. The effect of soil water status seemed to have dominated the effect of atmospheric conditions on grapevine water constraints. According to the water constraint classification based on midday stem water potential, high to severe constraints during berry ripening reduced yield slightly and improved wine quality in heavier soils in all the regions. In sandy soils, mild to moderate water constraints prevented severe yield losses and produced high quality wine, particularly in warmer climates. Although the climate varied between the regions, it did not have specific effects on sensorial wine quality characteristics. Wines of comparable high quality were produced in all the regions. Similarly, poor wines were produced, irrespective of differences in climate. Where atmospheric condition differences occurred within a region, they also did not seem to have a pronounced effect on the sensorial wine characteristics evaluated within the scope of the project. This all indicated that grapevine water constraints dominated the effect of atmospheric conditions. However, other management practices such as trellis and pruning systems, canopy management and fertilization could have contributed to the variation in sensorial wine quality. www.sawislibrary.co.za/dbtextimages/MyburghPA10.pdf

International Research News

Black dead arm symptoms are actually the initial stages of esca

Esca or grapevine decline is a disease that affects both young and old vines. Young vines often show stunted growth, small trunk size and reduced foliage. On older vines, yellowish or reddish patches may appear between leaf veins in mid- to late season, eventually leading to marginal and interveinal burning (right). Berries may show poor maturation and purplish gray flecks or ‘measles’ (right below) The entire vine or part of it may die suddenly, usually during hot periods. Sometimes shelf-like mushrooms can be found on the trunk. Black dead arm (BDA) is a disease of grapes caused by the plant pathogen *Botryosphaeria obtusa* resulting in a deep-seated wood rot of the arms or trunk of the grapevine. As the disease progresses over several years, one or more arms may die, hence the name ‘dead arm’. Eventually the whole vine will die. The symptoms produced by esca and BDA in vine leaves are reminiscent of those of drought.

Scientists in Spain and France have now come to the conclusion that the alleged symptoms of ‘black dead arm’ (BDA) on grapevine leaves are, in fact, those of esca disease in its initial phase. The researchers undertook a fortnightly monitoring of affected vines over a period of three years, at a number of vineyards in the Rioja Alavesa (Spain), Bordeaux (France), the Rhine area (Germany) and the Bekaa Valley (Lebanon). They observed that the leaves progressed from the so-called BDA symptoms to those of esca, and even that both symptoms could be detected at the same time in many of the plants studied. If two different, independent diseases were involved, most of the vines would show external signs of either BDA or esca; but not of both successively. Thus, the specialists concluded, both the leaves showing red markings and yellow ones beside the green tissue, as well as the ones showing red markings only, were affected by esca. Moreover, researchers have undertaken glasshouse trials in which they have inoculated *Botryosphaeria obtusa* into vines and have never managed to reproduce the alleged foliar BDA symptoms. http://dx.doi.org/10.1094/PDIS-09-11-0776-RE

A metabolomic analysis of wine micro-oxygenation

The metabolome represents the collection of all metabolites in a biological cell, tissue, organ or organism, which are the end products of cellular processes. Thus, while mRNA gene expression data and proteomic analyses do not tell the whole story of what might be happening in a cell, metabolic profiling can give an instantaneous snapshot of the physiology of that cell. The first study applying metabolomic analysis to wine micro-oxygenation used UPLC-QTOF MS (ultra performance liquid chromatography-quadrupole time of flight-mass spectrometry) to produce a detailed, untargeted picture of the changes caused

by the addition of oxygen and metal to the metabolic fingerprint of a Sangiovese wine following micro-oxygenation. The doses of oxygen added with micro-oxygenation were those typically used in wineries and the levels of metals were within the limits usually present in wines.

The results confirmed most of the known wine micro-oxygenation biomarkers reported in the literature, these mostly being red pigments and tannins. Furthermore, new chemical changes in the Sangiovese wine profile were revealed, when subjected to various oxygen levels in the presence of two different levels of iron. A number of additional primary and secondary metabolites, not considered in previous studies, appear to be candidate biomarkers. These new candidate biomarkers, and especially those showing a biphasic effect in presence of variable levels of oxygen, should be further studied and validated for a comprehensive understanding of the changes occurring in the wine metabolite fingerprint during the micro-oxygenation process, so as to develop analytical tools to assist winemakers with more appropriate control of the micro-oxygenation process. www.infowine.com/default.asp?scheda=11329

Fermentation of Cabernet Sauvignon grapes with and without skins

The effect of different skin contact times on changes in concentrations of volatile aroma compounds during the fermentation of Cabernet Sauvignon grapes has been studied. Headspace solid-phase microextraction coupled to gas chromatography-mass spectrometry was used to monitor the volatile compounds. Results demonstrated that the duration and timing of skin contact during fermentation can have a significant effect on the volatile composition of Cabernet Sauvignon wine. In some cases, the presence of skins tended to result in higher maximum concentrations of some volatile compounds after the completion of fermentation, as was observed for many, but not all, fermentation-derived alcohols and esters. However, by monitoring the volatile composition throughout the fermentation, it was found that skins had a significant effect on sorbing or delaying the release and/or formation of other compounds such as β-damascenone. Overall, there is a complex interplay among extraction, formation, volatilization, and sorption of volatiles during grape fermentations, and more studies are needed to fully understand how these variables influence final wine composition. http://dx.doi.org/10.5344/ajev.2012.12009

Acoustic and mechanical properties of Cabernet Sauvignon seeds

The quality of red wine depends greatly upon the phenolic maturity of grape seeds at harvest because astringency, bitterness, and colour stability are all wine sensory properties that are influenced by the phenolic composition of the seeds. Grape tasting directly in the vineyard has increasingly been used and appears to be a good tool to facilitate harvesting decisions. Common descriptors used for sensory evaluation of berry seeds are sourness, astringency, hardness, and cracking. The first two characteristics decrease during grape ripening, whereas the latter two increase. To assess the influence of developmental changes on the texture properties of grape seed to provide useful indicators of maturity, instrumental mechanical and acoustic variables were determined for berry seeds of Cabernet Sauvignon grapes harvested at different ripening stages.

Although most of the instrumental texture properties were characterized by a large intra-sample variability, the following indices could be considered indicative of maturity: deformation index, acoustic energy, and average sound pressure. A correlation study between the instrumental mechanical and acoustic variables showed that the Young's modulus of elasticity proved to have the strongest positive correlation with the acoustic variables. The results obtained are evidence that these instrumental texture variables could be effective, simple, rapid, and economic indices to estimate grape maturity, but further research and an increase in the number of ripening weeks studied are necessary. http://dx.doi.org/10.5344/ajev.2012.11054

Other News

Malic acid biosensor

The Malic Acid Biosensor from Biolan Microbiosensores S.L. (Spain) monitors the progress of malo-lactic fermentation so as to determine when the process begins and ends. Results can be obtained within three minutes in the winery. It measures in a range of concentrations from 0 to 1 g/l with a margin of error of 0.05 g/l for red wines and 0.10g/l for white and sparkling wines, which makes it the most precise machine for detecting malic acid in low concentrations. There is also the possibility of measuring malic acid in the concentration range of 2 to 6 g/l with a margin of error of 0,3 g/l. www.infowine.com/default.asp?scheda=11274

Mould-like deposits of quercetin in red wine

Flavonol deposits in wine have been relatively rare, but some modern viticultural practices such as increased sun exposure of fruit, machine harvesting and amount of leaf matter in grape harvests can contribute to elevated levels of these compounds in wine, with Sangiovese particularly susceptible. Quercetin is a plant-derived flavonoid found in fruits (including grapes), vegetables, leaves and grains. It also may be used as an ingredient in supplements, beverages or foods. The AWRI (Australian Wine Research Institute) Winemaking Services has recently been receiving many samples of red wines bottled early, showing quercetin deposits. The deposit has also appeared in a few 2009 red wines. Quercetin deposits appear as clumps of yellow-green mould-like material in the bottom of the bottle or wine glass, but are actually crystalline material. Quercetin normally precipitates out of the wine and usually ends up in the wine lees. But if bottled early, the quercetin can remain in solution, and then precipitate later in the bottle. Once precipitated, the wine can be refiltered to remove the crystals. www.awri.com.au/information_services/enews/2012/09/03/enews-sept-2012/#title1