

February 2016

New Winetech funded projects 2016

Objective wine grape crop estimation model using actual spatial and production data sets

Researcher: Dr C. Jarman

The objective of this project is to leverage big available data sets, as a basis for developing and researching a new, consistent and reliable wine grape yield estimation model which will provide in-season wine grape crop estimates and harvest date forecasts.

The era of data capturing on computers or tablets means more and more databases exist. A lot of databases exist for the wine industry in the Western Cape of South Africa. They contain a wealth of information related to farms, production units and vineyards in the wine growing regions. This includes (a) a field boundary dataset of all wine production units, (b) spatial biomass growth data (and other growth related parameters) calculated during the growing season and (c) detailed production records per block (production unit). Each of these datasets cover at least four production seasons. This provides a huge potential for statistical analysis to correlate spatial growth and other data with actual yield figures. This can lead to improved crop (yield) estimation in South Africa at industry, regional and winery level. Not only will it save time and money, it could pioneer crop estimation globally.

Wineries and producers will have more reliable information on production estimates which will be of great assistance for planning purposes. It can also assist in making small adjustments to management practices in a vineyard to reach the desired yield and quality goals.

Evaluation of induced mutation methods in Pinotage to increase genetic variability

Researcher: P. Burger

This project aims to develop a method to increase the genetic diversity of Pinotage. Pinotage, South Africa's locally bred cultivar is considered the country's flagship red cultivar, however very few clones are available to the industry. Pinotage was only bred in the twentieth century (1925) and can



be regarded as a “young” cultivar. This means it has had limited time to give rise to mutations compared to other cultivars that have been around for centuries.

Traditional breeding involves crossing two parent cultivars and since grapevine is a heterozygous crop, their off-spring are unique individuals with characteristics varying from both parent cultivars and from its siblings. Thus traditional cross-breeding is not suited to improve or alter single or limited characteristics of an existing cultivar. Genetic modification provides an ideal solution since specific genes can be inserted into an existing cultivar, but there is a lot of controversy and consumer resistance against this technique.

Evidence exists that spontaneous bud-mutations result in the formation of new cultivars and clones while induced mutation has been successfully used to develop new cultivars in a number of crops. Induced mutation alters characteristics at random, but allows for the generation of a large number of variations that can be used for possible selection.

Mutations in grapes have been induced by gamma irradiation of buds, after which plants are established on own roots from the buds, or by grafting single-bud cuttings onto rootstocks. Once the plants are established, potential mutants can be selected based on phenotypic differences. The sensitivity of cultivars to irradiation differ, some withstanding higher doses than others.

The current pilot study will explore irradiation-based mutagenesis of Pinotage by evaluating irradiation doses and length of exposure to mutagenic agents on different tissues (bud wood, in vitro micro buds and somatic embryos or embryogenic callus).

The study aims to optimise the most appropriate mutagenesis protocol for Pinotage with regard to procedure, plant material used and dose rate. This will help to find the method that is most effective to induce mutation, while ensuring survival and regeneration of plants. This in turn will develop and increase the genetic variability of Pinotage.

Management of aromatic thiols in South African white wines

Researcher: Wessel du Toit

In this study researchers will determine the levels of (E)-2-hexen-1-ol and (E)-2-hexenal in South African white juice. They will determine the contribution of these components to final thiol concentrations in wines. The project will also look at the stability of thiols during ageing with a



specific focus on glutathione as a result of the fact that the OIV is in the process of legalising the addition of pure glutathione to juice and wine.

Development and implementation of GC-MS/MS method for the determination of volatile sulphur compounds (VSC) related to off-flavours in wine

Researcher: Astrid Buica

Volatile sulphur compounds (VSC) may determine quality and typical characteristics, not all of them pleasant, such as off-flavours resembling onions, garlic, cooked cabbage, rubber and putrefaction. The goal of this project is to offer a sensitive and reliable tool for investigations, during which not only the already usual positive aromas are evaluated (esters, higher alcohols, terpenes, thiols), but also some of the negative ones, to obtain a more complex and complete picture of the phenomena occurring from winemaking stages up to the consumer.

Published open source articles

Effects of irrigation and rootstock on *Vitis vinifera* (L.) cv. Shiraz berry composition and shrivel, and wine composition and wine score

Drip-irrigated Shiraz vines on five rootstocks were subjected to industry standard and 30% reduced irrigation over four consecutive seasons. Fruit composition during berry shrivel and at harvest was assessed in each season and wine was made and assessed in two seasons. In two seasons, reduced irrigation affected the accumulation of anthocyanins and total soluble solids during berry shrivel. Fruit from 110 Richter had a 16% higher concentration of anthocyanins and wine a 29% higher colour density than that of fruit and wine from Ramsey. Sodium and chloride concentration in wine from 110 Richter was 27 and 50% less than in wine from Ramsey. [Read more](#)

Fate of the glutathione released from inactive dry yeast preparations during the alcoholic fermentation of white musts

The evolution of the GSH concentration of white musts treated with two types of IDYs (a glutathione-enriched IDY, g-IDY, and a fermentative nutrient n-IDY without GSH) and of a control must was determined during AF. In addition, the oxidation status of the musts and the formation of grape reaction product (GRP) derivatives were also monitored. The addition of g-IDYs had little

effect on the concentration of reduced GSH in the wines at the end of fermentation. The treatment of musts with IDY preparations, however, reduced the formation of derivatives of GRP and produced more reductive conditions during AF compared with that of control samples. [Read more](#)

Effect of Irrigation with Diluted Winery Wastewater on Cations and pH in Four Differently Textured Soils

Environmental legislation requires the South African wine industry to find solutions for winery wastewater treatment or reuse. The feasibility of irrigation with diluted winery wastewater was assessed in a pot experiment under a rain shelter over four simulated irrigation seasons. Four soils varying in clay content were irrigated with winery wastewater diluted to 3 000 mg/L chemical oxygen demand (COD), whereas the control received municipal water. The rate of K^+ increase in the soil containing 20% clay was higher than in soils containing 13% clay or less. This suggests that heavy soils will aggravate the risk of high K^+ levels. The risk of Na^+ accumulation increased linearly with clay content. Low Ca^{2+} and Mg^{2+} concentrations in the diluted wastewater had no effect on the soil, irrespective of clay content. Irrigation with diluted winery wastewater increased soil $pH_{(KCl)}$ substantially in all the soils over the four simulated seasons. The soil pH increase was attributed to the addition of organic/bicarbonate salts to the soil. [Read more](#)

Effect of oxygen exposure during fermentation on volatile sulfur compounds in Shiraz wine and a comparison of strategies for remediation of reductive character

Shiraz wines were treated with O_2 at several levels during fermentation by sparging rotary fermenters with three types of gas mixtures (40% O_2 , 21% O_2 and N_2). The controls were not sparged with any gas and were subsequently subjected to three remedial treatments (aerative racking, early- and late- Cu^{2+} addition). Wines were analysed for VSCs, fermentation products, concentration of residual metals, as well as their sensory profile. Non-oxygenated ferments and wines contained a higher concentration of VSCs and a lower concentration of fermentation products and differences in the concentration of metals. Volatile sulfur compounds responsive to O_2 treatment were identified and a relationship between O_2 dose and concentration on VSC formation was demonstrated. The 'early- Cu^{2+} addition' remediation strategy proved the most effective in reducing the impact of 'reductive' aromas in non-oxygenated wines. [Read more](#)