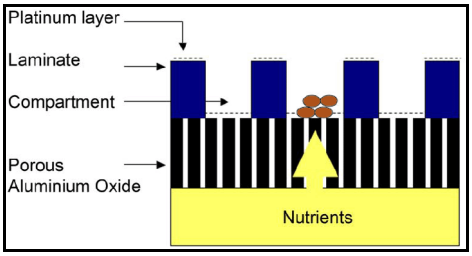
Winetech Scan

Wine Industry Network of Expertise and Technology
Netwerk van Kundigheid en Technologie vir die Wynbedryf

March 2008

Research outputs

- Researchers in The Netherlands have made a micro-Petri dish with up to a million wells (or growth compartments) for the culture and high-throughput screening of microorganisms. The disposable microbial culture chips were fabricated by microengineering a highly nanoporous ceramic. Discrete compartments as small as 7x7µm allowed the growth of segregated microbial samples at an unprecedented density. The spacing of the compartments is extremely precise, which is an important feature when other tools such as printing, inoculation, or recovery systems need to be aligned with the growth chip. The chips were tested in four complementary applications in microbiology. (*i*) As a fast viable counting system that showed a dynamic range of over 10 000, a low degree of bias, and a high culturing efficiency. (*ii*) In high-throughput screening, with the recovery of 1 fluorescent microcolony in 10 000. (*iii*) In screening for an enzyme-based, non-dominant phenotype by the targeted recovery of *Escherichia coli* transformed with the plasmid pUC18, based on expression of the *lacZ* reporter gene without antibiotic-resistance selection. The ease of rapid, successive changes in the environment of the organisms on the chip highlighted an advantageous feature that was also used to screen a metagenomic library for the same activity. (*iv*) In high-throughput screening of >200 000 isolates from river water based on metabolism of a fluorogenic organophosphate compound, resulting in the recovery of 22 microcolonies with the desired phenotype. These four applications suggest that such simple, readily manufactured chips have the potential to extensively impact microbial culture methods, and may well facilitate the full automation and multiplexing of microbial culturing, screening, counting, and selection. www.pnas.org/cgi/content/abstract/104/46/18217



- Annual losses caused by soil acidification in viticultural regions in Australia have been estimated to be as high as A$118M, equivalent to the loss of 4 tonnes of grapes per hectare. Grapevines are also known to be affected by alkaline soils as they are susceptible to zinc, iron, manganese and copper deficiency. Acidification occurs under mature vineyards after long use of high rates of nitrogen fertiliser, while in some districts, soil pH has tended toward alkalisation, presumably due to the composition of irrigation water used. In 2003-2004 a 'Calculator of Soil pH Change' to allow the risk of soil pH change to be assessed and assist in soil management was released. In a recent report (September 2007, www.gwrdc.com.au/downloads/ResearchTopics/SCH%2005-01.pdf) an updated version of this 'Calculator' is discussed. The 'Calculator' is a valuable tool available to grape growers and viticulturists across Australia. Although not absolutely accurate, it can be used to provide a reasonable estimate of the rate of soil pH change as a result of a set of particular vineyard management practices, and may be viewed as a 'learning tool' as it enables growers/viticulturists to alter management strategies to limit soil pH change. The Calculator should be used in conjunction with regular soil testing, which is the most reliable method of assessing soil pH. The 'Calculator' may be downloaded at http://www.srhs.com.au/Articles/Acidity%20calculator%202-1a.xls

- In viticultural research, researchers may have to scale down fermentation volumes to a practical and cost-effective level. Such small fermentations typically vary with respect to volume, fermentor shape, and fermentation. Anecdotal evidence indicates that these wines frequently have faults and their extraction is not representative of larger-scale fermentations. As a result, their relevance to commercial practice has been questioned. A microscale fermentation technique was developed and compared to commercial fermentations (Am. J. Enol. Vitic. 58:4:534-539, 2007 www.ajevonline.org/cgi/content/abstract/58/4/534). The fermentor design was kept as simple as possible and consisted of a 4-litre jar accommodating 3.5 kg of fruit, with a Teflon-lined cap, a fermentation airlock, and a food-grade high-density polyethylene screen with a total cost per fermentation vessel of less than $5.00. During the course of fermentation, the fermentors showed delayed extraction of phenolic components into the wine, but after eight days concentrations of skin-derived flavan-3-ols were the same as in commercial ferments. Variability in composition among fermentation replicates was very low. Analysis of proanthocyanidins revealed that the total amount and relative proportion of seed proanthocyanidin extracted during microscale fermentations was lower than in commercial fermentations. Based on wine colour and volatile acidity, oxidation and spoilage were effectively controlled. Spectral evaluation of young wines indicated that the method effectively prevented oxidation and microbial spoilage. This cost-effective method controls many variables that ultimately determine wine composition and could be reproduced easily over time and by other

research groups around the world. This would allow for comparison of research results without artefacts created by different winemaking strategies. The use of microscale fermentations would also allow researchers to investigate a much wider range of treatments that cannot be accommodated with larger fermentations.

- Although so-called 'mousy' off-flavour occurs infrequently in wine, it can be economically disastrous as it can render the wine unpalatable, or at least decrease the quality of the wine resulting in a lower sale price. In 'Mousy Off-Flavor: A Review' J. Agric. Food Chem. 54:6465-6474, 2006, http://dx.doi.org/10.1021/jf0528613, its history, sensory nature, chemical nature, microorganisms responsible and factors affecting its production during winemaking are discussed. Wines infected with either lactic acid bacteria (particularly heterofermentative strains) or Dekkera/Brettanomyces yeast can potentially produce this off-flavour. The reason as to why it forms in some wines and not in others is still not fully understood. The issue is further complicated by the fact that the compounds that have thus far been identified as necessary for the off-flavour formation are all potentially available in wine (e.g., ethanol, L-lysine, L-ornithine, and metal ions). In the case of Dekkera/Brettanomyces-induced mousy off-flavour, exposure to oxygen may play a key role.

Local research results

- Ozonation as a pre-treatment of distillery wastewater before being fed to a (laboratory) wetland was shown to increase the efficiency of the wetland system especially in terms of improving the biodegradability of the wastewater. The improved biodegradability allowed greater utilisation of the components in the wastewater by the wetland system. Ozonation contributed towards improved reductions of especially chemical oxygen demand (COD) and polyphenols. The study found that ozonation did not negatively impact the biological part of the wetland systems, and in fact the treatment had a positive effect on the visual and physical measurable increases in the plant growth. The cost of ozonation is an important factor in evaluating the feasibility of a combined treatment system and this depends on the efficiency of the ozone/waste-water contacting processes. www.sawislibrary.co.za/dbtextimages/FinalReport143.pdf

- Shiraz disease (SD) is a destructive disease of own-rooted as well as grafted grapevine cultivars such as Shiraz, Merlot, Malbec, Gamay and Viognier in South Africa. The disease affects growth, hampers budburst, and severely affects the production of fruit. Once a grapevine shows definite SD symptoms, it dies within 3–5 years. Other cultivars, although infected (SD-positive), do not exhibit symptoms. The disease is easily transmitted by grafting of infected tissue, or by mealybugs. SD-affected plants are always infected with a *Vitivirus*, *Grapevine virus A* (GVA). The virus is extensively molecularly heterogenic and divergent variants of the virus cluster into three molecular groups (I, II and III). An earlier study found evidence that variants of group II are closely associated with Shiraz disease, and that variants of group III are commonly present in SD-susceptible grapevines that consistently do not exhibit symptoms of this disease (http://dx.doi.org/10.1111/j.1365-3059.2007.01624.x). In the present study (www.sawislibrary.co.za/dbtextimages/FinalReport130.pdf) complete genomes of six South African variants of GVA from different molecular groups were sequenced. Analysis of the genomes confirmed clear divergence of molecular group II, associated with Shiraz disease, from the other variants of the virus. Analysis of GVA variants in Shiraz plants affected by Australian Shiraz disease also suggested that GVA variants of this molecular group are associated with Australian Shiraz disease. The results create a firm basis for precise analysis of pathogenicity of GVA variants to SD-susceptible grapevines.

Appropriate Technology

- In an effort to cut carbon emissions (and to gain marketing advantage) French vineyard owners from the southern Languedoc region have started shipping their wine across the English Channel by sail. The first consignment of 60 000 bottles went by barge across France to Bordeaux, and were then carried by the 51-metre barque 'Belem', built in 1896, to Dublin, saving an estimated 8 333Kg of carbon emissions. The vintners plan to exclusively ship their exports to Irish, English and Canadian ports by sail with a fleet of seven modern sailing ships that should be all working by 2013, with the first (built at a cost of $8.4 million) expected to be launched this year. The company, Compagnie de Transport Maritime a la Voile, expects its ships to make the return trip to France carrying an equivalent tonnage of crushed glass for recycling into wine bottles. http://sailing.about.com/b/2008/03/09/riddle-du-jour-whats-green-and-red-or-white-inside.htm. UK supermarket giant Tesco has started ferrying imported wine in bulk by barge from Liverpool to Manchester via the 64km Manchester Ship Canal. Tesco claims that this takes 50 lorries off the road every week and cuts carbon emissions by 80%. The barges make three journeys a week, delivering 600 000 litres of wine per trip. In Manchester, the containers are transported to a nearby plant for bottling and despatch to Tesco supermarkets across Britain. www.guardian.co.uk/environment/2008/feb/24/food.carbonemissions

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