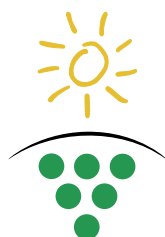


Volume 11 no 4  
July-August 2005



COOPERATIVE  
RESEARCH CENTRE  
*for*  
VITICULTURE

**Inside**

CEO's Report 2  
Biodiversity no gimmick 3-4  
The challenges of wine quality 5  
Fungal contaminants 6-7  
Briefs, Diary Dates 8

**Cooperative Research  
Centre for Viticulture**

- The University of Adelaide
- The National Wine and Grape Industry Centre  
(Charles Sturt University, NSW Agriculture)
- The Australian Wine Research Institute
- CSIRO
- Department of Primary Industries, Victoria
- Primary Industries & Resources, SA
- The Australian Dried Fruits Association Inc.
- Winemakers' Federation of Australia Inc.
- Grape and Wine Research  
and Development Corporation
- Horticulture Australia Limited
- Wine Industry National Education  
& Training Advisory Council Inc.
- Wine Grape Growers' Australia

# Newsletter

## Dreaming of easy quality measures



The CRCV Symposium in Mildura attracted almost 200 researchers and industry delegates to discuss CRCV progress and future research direction.

Quality has been important since the wine industry first started in Australia, according to **Michael DePalma** from the MCWGA. "I'm not alone in the dream that we will one day wander through the vineyard with a hand-held device that provides us with an accurate measure of quality," he said.

"And while I think it's still a dream, we are getting closer."

However, he says the industry has to be careful about the measurement of quality.

"Before we get carried away we need to understand what the measurements mean, work out who is going to take them and know how they are going to be used."

### *Why should we measure quality?*

- Measuring grape quality is important because it allows good growers to be rewarded for their efforts, allows grape 'gradings' to be improved and allows for differentiation in the winemaking process.
- Customer satisfaction is the major imperative. Quality is really about meeting the customers needs and their expectations of the product.
- Any measure of 'quality' has to be relevant, affordable and robust.
- No measurement of quality will be 100% accurate and all systems have error rates. This needs to be factored into the analysis of the results.

### *Importance of pre-harvest assessment*

With more than \$50m spent annually on grapes, it makes good financial and business sense that Orlando Wyndham want to know about the quality of this major purchase.

According to **Russell Johnstone**, Group Technical Manager of Viticulture and Winemaking, while the assessment of the pre-harvest material is of great importance, any measures need to be practical, given the logistics of the task. "We harvest 150,000t of grapes from three major regions and 500 growers. This represents 3000 harvest units and is a serious undertaking. What cannot be done quickly and efficiently simply can't be done."

Russell said Orlando employed a range of techniques when testing for quality, including analytical measures such as TSS, pH, TA and anthocyanins, visual inspection for damage and disease and



*Continued on Page 3*

## CEO's Report

## CEO column

As part of the Australian Government's Cooperative Research Centre's Program, the close interaction with industry is a key feature.

The recent two-day CRCV Symposium in Mildura provided an important opportunity for the CRCV research community to meet with the leaders of industry. The event was invaluable on many levels. It provided the opportunity to review the progress that has been made over the past six years and take a look at opportunities where research can help meet future challenges.



Jim Hardie

For two days, almost 200 delegates from all over Australia and representing research, industry, extension and education, heard about some of the highlights of the CRCV program. Many times over during the course of the seminar I was asked why various projects had not featured. This not only indicates the depth of our program but the enthusiasm and commitment of our researchers. And while we did not have the time to highlight all of our success stories, during the next 18 months we will be collating a major document to capture the outcomes of each and every project. What was very clear during the Symposium was that the CRCV's 7-year strategic R&D agenda was and remains spot on. This comes down to the intensive involvement by industry

through the Viticulture 2000 group who developed the successful application for the Centre.

This group of people and the broader group of respondents from industry across Australia showed great vision in the development of the program. Important industry issues related to, grape quality and sustainable management of water and vine trunk diseases have rightly formed the nucleus of our programs.

The initiative shown in placing on the agenda additional areas of research such as genetic technologies and environmental management has in hindsight proven equally astute. Initially treated with a degree of scepticism by some in the industry, the importance of these areas of research has only heightened, and without six years of research, the Australian industry would now be in a very different situation as it looks to the future.

Symposium sessions were chaired by industry leaders, who provided providing invaluable perspectives and insights. It was reassuring to hear **Richard Hamilton**, Fosters Wine Estates, note in relation to precision viticulture that the price of the equipment was quickly recouped though the ability to maximise vineyard returns and modify inputs to meet vine needs.

He said although the industry was currently experiencing tough times, spending money on a technology such as precision viticulture provided an increased return on investment and seemed like something everyone should be doing.

The emphasis on water use efficiency remains strong, with Australian growers experiencing one of the driest Autumn periods on record. With long-term climatic forecasts predicting less rainfall and less reliability in rainfall patterns, increased competition for water between urban and agricultural users and more expensive and sophisticated water trading set to become the norm, we are in for challenging times ahead.

While we have made excellent progress in understanding vine water requirements, the impact of Partial Rootzone Drying and Regulated Deficit Irrigation technology on grape yield and quality, soil structure and salinity,

indicate that we cannot afford to let up on the research effort to underpin sustainable management practices.

This newsletter provides a glimpse of some of the success stories presented at the Symposium. A full CD-Rom of the presentations in Powerpoint format is available as a valuable resource.

The Symposium was in every aspect a great success. However, it is worth remembering that the CRCV has just more than 12 months of its term remaining.

Perhaps it was **Peter Hayes**, Fosters Wine Estates, who provided most food for thought at the conclusion of the Symposium. As an industry leader and long-term supporter of the collaborative R&D model, Peter urged the delegates to consider how the collaboration that has been built from two CRCV terms spanning more than 12 years will continue when the CRCV finishes in mid-2006.

He said the achievements of the CRCV were powerful and had seen more rapid development of technologies, a great improvement in the industry's intellectual capacity, particularly through the PhD program. Product innovation was being helped by understanding of wine flavour and aroma and the public interest was being served by the Centre's environmental endeavours.

Avoiding duplication, working together and combining a pool of talent and resources had made these outcomes possible. Peter said the additional funding from the Australian Government had been a great benefit, but not the only one.

Peter's closing words should be seen as a challenge to everyone working in the industry.

"We've had this Centre for more than a decade and perhaps we take it for granted and won't appreciate it until it's gone. I would urge the industry to show some energy and innovation and think very carefully about how our R&D needs will be fulfilled in the future."

Collaborative R&D has worked for the grape and wine industries and we must do everything in our power to ensure this continues long after the CRCV has closed its doors.

**Jim Hardie**  
CEO

## Newsletter

The Cooperative Research Centre for Viticulture Newsletter is produced bi-monthly. All contributions are welcome, especially reports from conferences, seminars and international trips.

Editorial: **Sally Raphael**

Fuller Communications

58 Rundle Street, Kent Town SA 5067

Phone: (08) 8363 6811

Fax: (08) 8363 6822

Email: [sally.raaphael@fuller.com.au](mailto:sally.raaphael@fuller.com.au)

Published by: The Cooperative

Research Centre for Viticulture,

Plant Research Centre,

Hartley Grove, URRBRAE SA

Phone: (08) 8303 9405

Fax: (08) 8303 9449

*Continued from Page 1*

## Dreaming of easy quality measures

sensory analysis with growers and staff tasting the berries.

He believes it is important to understand which quality parameters are important, to ensure time and energy is not wasted on measuring something that is not important in the wine.

“We have also spent some effort on working out our error rates for sampling. We generally get a very accurate result for TSS and pH, but see about a 7.5% error in TA measurements and 10% for bunch weight.”

Orlando Wyndham have worked with the CRCV’s Mark Krstic on developing a best practice sampling approach for their measurements and are now assisting the CRCV and Integrated Spectronics on the development of a bench-top NIR machine.

“The important element of NIR equipment is developing a calibration to ensure your results are accurate. We are working with the CRCV at the moment to help them build this calibration.”

“With all of our quality measurements we need to be careful about what we’re testing and how we’re using the results. We have a legal obligation in terms of grower contracts and we also want to ensure we are being fair and honest with our growers.”

## Biodiversity no gimmick



The future of the Australian grape and wine industry will depend on the rate at which environmentally sustainable practices are adopted. The adoption of such practices (in all aspects of the industry) will help to ensure ongoing demand for Australian wine and continued investment in the industry.

**Doug Young**, Policy Director at the Winemakers’ Federation of Australia (WFA), believes that the accelerated adoption of environmentally sustainable practices is of fundamental importance. “As an industry we need to do more than just be committed to the principles. Saying that we’re clean and green is one thing, but we need to have the ability to measure and demonstrate our environmental performance to consumers, governments and local communities.

WFA have recently commenced one of the largest wine industry environmental programs - Australian Wine Industry Stewardship (AWIS) – with funding from the Australian Department of Agriculture, Fisheries and Forestry.

The AWIS project aims to achieve and demonstrate environmental stewardship to enhance wine brand Australia.

Doug said while the Australian industry had made good progress in recent years, there was still much to be done.

“Our competitors in New Zealand, California and South Africa have developed extensive programmes.

We need to understand that we risk missing out.

## Focus shifts from problem pests to beneficials

Problem pests have long been a topic of concern for grape growers. According to **Professor Ary Hoffmann who manages the project with Dr Linda Thompson**, when the CRCV started looking at beneficial vineyard insects and other small animals, it was a move into ‘unchartered territory’.

“It is very interesting to take a broad view of animal research across the world. The majority of resources are provided for big animals such as pandas and elephants and the kinds of animals that tug on the heart strings,” Ary said. “Small animals like invertebrates have less charisma but are no less important from an ecological perspective. And there are lots of these types of animals endangered as well.

“In viticulture we’ve looked extensively at problem pests, but not so much on beneficial insects, which in this era of environmental concern, has to be a priority.”

Ary said rather than simply providing a catalogue of vineyard pests, the research project had taken a broader approach in trying to determine the insects that are beneficial in the vineyard and what practices are supportive of these species. “Our task in assessing beneficial species was made easier by the fact there are

only a small group of vineyard pests, so the first thing we did was find out the natural predators of this group.”

On the pest side are light brown apple moth, mealy bug, mites and scale, while their natural predators include lacewings, spiders, earwigs, slugs and staphylinids.

“We looked at a variety of monitoring methods, keeping in mind the practicalities of commercial vineyards as well as research methodologies. We used a combination of visual inspection and sticky traps and focused on species groups.”

“We found that practices like straw and mulch application increased numbers of insects like spiders and beetles, but the vineyard practice we were most interested in was application of chemical sprays.”

Pesticide trials at 20 sites in the Yarra Valley assessed three levels of pesticide use across a range of commonly used sprays. According to Ary, the results were dramatic.

“We found that one of the most toxic chemicals for beneficials is sulphur. Low levels of usage saw an improvement in the number of vineyard spiders, while high levels of sulphur saw a huge decrease in the number of spiders. There was a very large variability in the intermediate levels of sulphur use which is where we need to look next.”

Ary said sulphur was a useful vineyard chemical and his team are currently assessing the middle ground of this chemical use to see if they can find a management solution that allows for effective sulphur application that doesn't harm the beneficials.

However, he said all species are not effected in the same manner by chemical application.

“We found that the adult brown lacewing has no signature of chemical use because adults are highly mobile. Ary said the team had also looked at the impact of remnant vegetation on vineyard beneficials.

“We found more spiders and beetles closer to remnant vegetation as well as a higher level of light brown apple moth

egg predation (where predators eat the eggs) near the native vegetation.”

## PhD project assesses soil and land health

CRCV PhD researcher David Sharley is helping make sense of the impact of viticulture on the health of the ecosystem.

The aim is to preserve soil quality for industry sustainability, protect the environment and look at effective monitoring to track changes.

Based in Sunraysia, David has been looking at the impact of cultivation on arthropods, how native vegetation and woodlots affect native invertebrate populations and the impact of agrochemicals on aquatic invertebrates. David said the practice of cultivation had a negative impact on arthropod populations, including a reduction in ant numbers.

“We found that numbers of ants, centipedes and millipedes were all negatively affected by cultivation. This is an issue because ants are important for vineyard soil health in the Murray Mallee area.”

Monitoring at a Fosters Wine Estates vineyard at Karadoc, which contained both a woodlot and native vegetation, found both types of vegetation had an effect on the dispersal of beneficial insects.

“We found that while the native vegetation had an impact on the dispersal of insects about 15 metres into the vineyard, the impact of the woodlot stretched further into the vineyard at about 50 metres.”

“The findings are going to improve our knowledge of insect beneficials and give us the ability to make recommendations about the best form of native vegetation or woodlots for vineyards,” David said. The other significant aspect of David's project is looking at aquatic sediments in grapegrowing regions to see if vineyard management practices have an

impact on macro invertebrate fauna. Taking both cleaner and more polluted sites, David took chemical analysis of sediments and conducted an experiment to determine how many insects can survive and reproduce in the different types of sediment.

“We want to know how sensitive the insect populations are to vineyard chemicals. Some insects have a high tolerance and others are more readily affected.

“We've found that land use in the Mallee is affecting sediment quality and freshwater biota and our chemical analysis indicates that heavy metal contamination is probably not the primary contaminant. “

David is currently in the process of trying to find the cause of what is primarily affecting sediment quality.

*The drainage site where sediment was collected for experiments.*



## The challenges of wine quality

While our winemaking processes and technologies have rapidly advanced, there is still only so much a winemaker can do according to **Peter Stephens** of McGuigan Simeon Wines. “Good wine is still made in the vineyard. The quality of the wine is heavily dependent on the grapes and there is still much we don’t know about the relationship between the raw material and the end result of the wine,” Peter said.

According to the CRCV’s **Mark Sefton**, this very question has been the driver of a major CRCV research projects.

“We’re trying to find out what happens beyond the vineyard between the grape and the bottle,” Mark said.

“We’re looking at a range of volatile compounds that influence aroma and flavour and trying to see what survives vinification because some of these compounds are converted to odourless products by the yeast.”

The work is complex, with researchers looking for relationships between grape composition and the resulting wine.

“Some of the flavours and aromas are in the grapes, more are added during alcoholic fermentation, oakaging can add further complexity and the packaging can have further effects.

“There are a lot of complex processes involved in winemaking which makes it a major challenge to find out what we need to know about grape-derived flavour and what happens to this during these processes.”

The research project has focused on gaining information on the impact of grape-derived volatiles on wine flavour, the identity and chemical nature of compound(s) responsible for black pepper aroma in Shiraz wines and developing a precise, relatively simple analytical method for key grape derived wine flavour compounds developed and communicated to enable future research on viticultural and oenological controls



*Mark Sefton (far right) is pictured with Bob Damberg and Heather Smyth.*

of flavour formation.

Using GC-MS technology, the research team has developed precise and accurate analytical methods for 72 flavour compounds of which 53 are grape derived.

“We want to know what the important compounds are and how much is needed in the wine to have a desirable effect. Some compounds become more intense as the concentration increases in a linear pattern, but some plateau at a certain point of concentration. Most of these compounds don’t work in isolation either so we need to understand this as well.”

Some of the areas where research has made progress include greater understanding of ethyl phenol compounds responsible for “Brett” in wine, and the sulphur compounds which are important for the tropical and passionfruit characters in some varieties such as Sauvignon Blanc.

The peppery character for Shiraz is also being investigated, with the research team believing this flavour could be the result of a single potent compound.

According to Mark, there is still plenty of work to be done.

“We have more compounds to discover and we don’t yet completely understand secondary metabolites and how they are affected in the winemaking process.”

“The role of amino acids and specific impacts of fermentation on different grape varieties could be areas for future research.”

## PhD researcher discovers new compound

*Glycoconjugated flavour precursors from grapes.*

Finding new wine flavour compounds is no easy task, but PhD researcher **Aggie Cox** achieved this during her studies which looked at flavour precursors from grapes.

According to Aggie there are hundreds of volatile compounds in wine from a range of chemical families and derived from many sources.

“We investigated the grape-derived flavour compounds, looking at their chemical and sensory properties. This led to the identification of a new, potent grape-derived compound called TPB,” Aggie said.

Aggie and the team then completed a six-step synthesis of a deuterium-labelled analogue of TPB that has been used to develop a new, accurate and sensitive stable isotope dilution analysis (SIDA) method to determine TPB in wine.

“This basically allowed us to check



*Continued from Page 5*

## The challenges of wine quality

for TPB in a range of commercial wines. We purchased 100 wines from various regions and ranging in price and analysed them for TPB.”

TPB was not found in the red wines, but was found in many of the white wines, at the levels needed for detection.

“We found that aroma threshold for TPB in dry white wine is 40ng/L in dry white wine which makes it quite a potent kind of compound, and the white varieties with concentrations above this threshold were primarily Semillon and Chardonnay.”

At low concentrations TPB exhibits aroma described as ‘floral’, ‘geranium’ and ‘tobacco’, whereas at higher levels of concentration it shows ‘pungent’, ‘unpleasant’ and ‘insecticide’ aromas. Aggie also looked at the stability of the compound in wine to see if it degrades according to temperature or pH levels. She also looked at reasons why the compound was only found in white wine.

“We found that both red and white wine have TPB precursors so we thought that perhaps the higher levels of polyphenols in red wine might be a contributor to reduced concentrations in red wine.”

TPB decomposes relatively slowly in model wine, white wine, or phenolic-stripped red wine but much more rapidly in red wine or in model wines to which grape skin or seed tannins had been added.

“The data explains why TPB is found only in white wines despite the presence of precursors in both red and white grapes. These experiments also illustrate that an understanding of grape quality does not depend on understanding the composition of grapes alone, but also the processes that take place during wine making and wine maturation.”

## PhD presenters a highlight



*Su-lin crushing Shiraz for the winemaking trial*

The CRCV’s PhD student program has been one of the Centre’s success stories and many of the presentations at the Symposium featured current PhD researchers as well as those that have completed their studies.

### Ochratoxin A not a problem for Australian wine

CRCV researcher **Su-lin Leong** has found that Australian wines are well below the Ochratoxin A (OA) levels set by the European Union. OA is found in very low amounts in a range of foods and beverages. It is a nephrotoxin that affects the kidneys and in large amounts can be carcinogenic. To ensure food and drinks are safe for human consumption, the European Union has set limits on the amount of OA at two micrograms per litre of wine.

A fungus living in the soil, called *Aspergillus carbonarius*, is the source of OA contamination, which occurs when this fungus spreads to bunches, and, in certain conditions, infects berries. While the Australian wine industry has not experienced the same kinds of problems with OA as some European and North African producers, researchers wanted to understand how the fungus survives in vineyard soils to develop management practices to minimise the incidence.

The first step was to learn more about *Aspergillus carbonarius* in Australian vineyards. Taking samples from vineyards all around Australia, Su-lin isolated a number of strains of these fungi.

“We looked at all our samples and found a related species called *Aspergillus niger* in all regions, but only three from more than a hundred of the strains of this fungus cause OA.”

“However, we also found a species called *A.carbonarius*, and although this was only found in a few Australian regions, all of the strains produced OA.”

Su-lin also found that the rot develops quickly, generally at about 20 days pre-harvest and that the distribution of the rot in the vineyard and even within the bunches is not even.

“An infected bunch might have only about 15% of the berries severely affected by the mould, but those visibly mouldy berries will be the source of nearly all the OA in the bunch. We also looked at the conditions that promoted growth and wonder if hot days may

favour growth, whereas cool nights may favour toxin production.”

Collaboration with another CRCV project conducted at DPI Victoria by **Bob Emmett** and **Benozir Kazi** suggested some things growers could do to reduce incidence of the fungus in the soil, including minimal tillage, incorporation of selected cover crop materials, moisture management and reducing the amount of vine remnants in the soil.

“However, the most important practice is to minimise damage to berries close to harvesting.”

Small-scale wine trials have also been held to see if winemaking practices could reduce OA.

“We found that more than 80% of OA is removed during the must to wine phase due to OA binding to solids which are then eliminated. Certain fining agents are also useful in the removal of OA as it binds to lees and protein.”

“The concentration remaining in the wine is slightly higher for red wines than white, perhaps due to fermentation differences. But when we compared rotary and static fermentation we saw no difference in the results.”

Su-lin said it was good news for the industry that all the wines they looked at were well within the standard set by the European Union.

## Genes and disease

**P**hD researcher **Matt Hayes** started his presentation with the plea ‘don’t be scared of genes’.

Matt is using advances in genomics and the ability to pinpoint various genes to approach the problem of powdery mildew infection.

“All commercially-important winegrape cultivars are susceptible to powdery mildew infection which can cause negative impact on weight, yield and quality of grapes and the resultant wine,” Matt said.

“As growers look to “greener” production, chemical sprays become less attractive and we are looking for new ways to solve the problem.”

A potential alternative is stopping infection through resistance genes that confer a natural barrier to the disease. Another option is to look for the susceptibility genes that allow the disease to develop. These genes might then in theory be bred out of the cultivar.

Matt’s research project is focusing on identifying the genes that are switched on or up-regulated during powdery mildew infection.

“This information will allow us to better understand how the fungus derives nutrition from the grapevine, allowing it to grow and spread.”

There are two approaches that are being taken. The first involves microarray analysis to screen 1300 genes to see if they are induced by powdery mildew. The other approach is more targeted, selecting genes suspected of being involved in powdery mildew infection, and testing to see if they are up-regulated when exposed to powdery mildew.

“A number of genes were up-regulated, with some found to be involved in cell wall modification which is vital for the disease to invade the berries defence.”

Expression analysis of biochemical transporters and metabolic proteins shows one hexose transporter, a cell wall invertase and an iron transporter up-regulated in powdery mildew infected tissue. A vacuolar invertase is strongly down regulated. The expression of these responsive genes has been studied in a powdery mildew infection time course, downy mildew infected leaves and various chemical elicitor leaf treatments. A number of genes were also found associated with the transport of sugar,

phosphates and amino acids.

Matt has studied these sugar transporters to see if the demand for sugar increases when powdery mildew infection is present.

According to Matt, the question that had to be answered is whether the genes are induced by powdery mildew or if these genes are involved in other processes as well during the growth stages.

Using RT-PCR, Matt studied the genes and created a model of how sugar is getting to the powdery mildew infection site and thus allowing the disease to progress.

However, the genes identified were not found to be specific only to powdery mildew infection.

“We also found these genes leaves, roots and ripening berries that suggests although they play a role in powdery mildew growing, they also are responsible for other functions.”

Although the genes are not necessarily great targets to reduce the susceptibility to powdery mildew, Matt says the project has so far provided more information about the disease and that more genes will be screened as part of the project.

**Brief News****Book now  
for CRCV Grape  
and Wine Quality  
Seminar**

The objective measurement of grape and wine quality is one of the most complex tasks for winery owners, winemakers and grapegrowers. The CRCV has assembled a diverse group of speakers from industry and CRCV research programs to look at the many elements of measuring grape and wine quality.

The CRCV Talking Technology Seminar 'Objective measurement of grape and wine quality' will be held at the Stamford Plaza Adelaide on Tuesday 19th of July. The full-day seminar has been timed to coincide with WineTech 2005 which commences the following day at the Royal Adelaide Showgrounds. The seminar will cover everything from consumer preferences and the impact of region on price and quality perceptions, through to commercial wine grading techniques, the use of colour as a commercial quality factor and the development of a quality index for vineyards.

The one-day seminar, including lunch and afternoon tea costs \$110. A special offer is also available for anyone who would like to stay in Adelaide for the night, with registration for the seminar and accommodation at the Stamford Plaza costing \$220.

A registration form is available on the CRCV website at [www.crcv.com.au/seminar](http://www.crcv.com.au/seminar) or please call Sally Raphael, Fuller Communication, on (08) 8363 6811 for more information.

**Updates  
available  
for AusVit  
chemical database**

A number of updates are now available for the AusVit Chemical Database, in particular related to two chemicals – Flint and Prosper. A patch is available for AusVit versions 3.0, 3.1 and 3.2 and can be downloaded for no cost from the CRCV website.

Users of PAM-AusVit will also be supplied with the new patch directly from Fairport Technologies.

A full upgrade of the Chemical Database and Spray Records was released in February this year and is also available on the website. For more information contact **Bridget Ransome** on (08) 8303 9663 or email [ransome](mailto:bridget@saugov.sa.gov.au).

[bridget@saugov.sa.gov.au](mailto:bridget@saugov.sa.gov.au).

**Congratulations to  
Poster Winners**

A CRCV poster competition was recently held during the CRCV Symposium in Mildura, showcasing the diversity of research within the Centre.

Symposium delegates voted for their favourites, with the following researchers awarded for their efforts:

- First prize went to Mandy Walker for her poster 'The White Wine Genes'.
- Second prize was won by Nicole Cordon for her poster 'Flavonoid Composition of Shiraz Grapes in Warm & Cool Climate Vineyards'.
- Third prize was taken out by Louigi Renzullo for his poster 'Discriminant analysis: a tool for the spectral fingerprinting of grape vines stress including phyloxera'.

**Diary Dates****19 July**

10am – 5.30pm

CRCV Talking Technology Objective measurement of grape and wine quality seminar

Stamford Plaza, North Terrace, Adelaide

Contact: Sally Raphael

Email: [sally.raaphael@fuller.com.au](mailto:sally.raaphael@fuller.com.au)

Web: [www.crcv.com.au/seminar](http://www.crcv.com.au/seminar)

Phone: (08) 8363 6811

**20-22 July**

WineTech 2005

Royal Adelaide Showgrounds

Contact: Exhibition Management

Email: [info@exhibitionmanagement.com](mailto:info@exhibitionmanagement.com)

Web: [www.winetechtradeshows.com](http://www.winetechtradeshows.com)

Phone: (03) 9699 4699

**Your CRCV**

The Cooperative Research Centre for Viticulture is a joint venture between Australia's viticulture industry and leading research and education organisations.

It promotes cooperative scientific research to accelerate quality viticultural management from vine to palate. Australian grapegrowers and winemakers are key stakeholders in the CRCV, contributing levies matched by the Australian Government and invested by the Grape and Wine Research and Development Corporation in the Centre.

**Newsletter Disclaimer**

While every effort has been made to ensure the accuracy of the information in this newsletter, the Cooperative Research Centre for Viticulture cannot accept responsibility for the consequences of the use of this information. The document provides you with an explanation of research in progress and is a guide only.