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Newsletter



Project Leader Ian Pascoe points out the deep cracks and crevices in the trunk where the fungus is producing spores.

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Cooperative Research Centre *for* Viticulture

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The National Wine and Grape Industry Centre
(Charles Sturt University, NSW Agriculture)

The Australian Wine Research Institute

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CRCV discovery sheds new light on trunk diseases

In a world first, CRCV researchers have found the source of spore production of the fungus responsible for two common grapevine trunk diseases and believe insects could be responsible for their spread.

Researchers have known for a long time that the fungus common to both Esca and Black goo decline (*Phaeoconiella chlamydospora*) produces spores that can infect other vines if transmitted, but what hasn't been clear is where the spores are produced and precisely how they are dispersed.

Ian Pascoe, leader of Project 2.2 'Managing grapevine trunk diseases Black goo decline, Esca, and Eutypa dieback' said his team's latest findings shed a totally new light on understanding these diseases.

"We are the first research team to not only identify where these fungal spores are being produced in the trunk but to also witness this in field conditions," Ian said.

Ian and his team, **Jacky Edwards** and

Natalie Laukart, based at the Department of Natural Resources and Environment Victoria, found the fungus was producing spores in deep cracks and crevices in the trunk. These cracks, most typically at the base or top of the trunk, can be caused by poorly adjusted machinery catching and damaging the trunk.

"What is especially interesting is that we found springtails (which are small insects) and mites inside these cracks and crevices where the spores are being produced," Ian said.

"Because the cracks are quite deep it seems highly unlikely that the spores could be dispersed by rain or wind alone and the presence of these insects suggests they might be involved in spreading the spores."

Ian said it was a common belief that fungal spores were produced on pruning wounds close to the surface, and were consequently spread by rain and water.

"Most research projects and management

continued on page 2

CEO's Report

The Australian viticulture industry should feel confident that grower and winemaker funded research is returning significant benefits to it. If you needed convincing then this edition of the newsletter will do that for you.

Growers and winemakers contribute to research, education and training through levies collected by the Grape and Wine Research and Development Corporation (GWRDC) and invested in the Cooperative Research Centre for Viticulture (CRCV) – the promoter of national cooperation between industry and Australia's leading viticultural research and education organisations. The CRCV is striving to ensure that growers and winemakers have better scientifically based knowledge, technology and access to information and advice about operating sustainably and profitably.

This edition of the newsletter highlights how rapidly we're progressing and how we are taking the lead in so many areas. Page one reveals our world first in relation to trunk disease research and page three looks at the tools being developed to enable growers to more effectively measure the impact of their management practices on winegrape quality.

Across all programs we are forging ahead and you can find out what's happening by reading the progress reports on pages 5-7.

Our industry-led research program, high-level of industry participation, history of collaboration and top-class research personnel are delivering quality products and services to the Australian viticulture industry. These outcomes will boost its international competitiveness, ensure the prosperity of many regional communities and secure employment for thousands of people.

While research by its very nature is painstaking and takes time to yield results, the industry is now reaping the rewards of long-term investment in its future.

We look forward to your ongoing support.

Jim Hardie CEO

Research Update:

Powdery Mildew Project

CRCV research aiming to develop a rapid and simple test for detecting and quantifying infection levels of powdery mildew in grapes, juice and must has moved into its second year.

Project 1.5.2 aims to assess the impact contaminated fruit has on wine and Drs **Belinda Stummer**, **Andrew Markides** and **Eileen Scott** from Adelaide University have just finished making wine containing powdery mildew infection.

Commercially-grown grapes from Hickinbotham at Clarendon were used to produce 16 batches of Chardonnay with four different powdery mildew infection levels and grapes from Rosemount Estate at Clarendon were used to make eight batches of Cabernet Sauvignon with two infection levels.

Belinda said this year the team had greater control of these levels in the field by omitting fungicide sprays after flowering and careful monitoring.

"It has been noticeable that the grapes with high infection levels did not develop as quickly as healthy grapes and this will effect the wine quality when we measure attributes including pH, titratable acidity, volatile acidity, soluble solids, colour and alcohol levels," she said.

Belinda has been using DNA analysis to quantify powdery mildew levels in grapes, juice and must, while Dr Vicki Taylor from CSIRO Plant Industry in Canberra, has been using immunological assays for detecting powdery mildew and Botrytis.

For the past six months, project researchers in Adelaide have been joined by visiting PhD student **Teresa Girbau** from Barcelona University. Teresa has also spent time with CRCV Program One Manager Dr **Elizabeth Waters** at The Australian Wine Research Institute. She is particularly interested in sparkling wine and her stay in Australia has given her the chance to take a closer look at how fungal infection affects grape proteins, especially those involved in the foaming properties of sparkling wine.

Newsletter

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

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Trunk disease *from page 1*

strategies have been focusing on pruning wounds as the entry and exit points for the diseases but because we haven't been able to locate the point where the spores are produced we haven't been able to prove this theory," Ian said.

Although Ian said the latest findings were only preliminary, they gave scientists a new insight into Esca and Black goo decline and had the potential to change the focus of future research projects and alter the way the disease was managed.

A sweet sampling method

Growers and wineries can now be more confident about testing grape berry sugar levels in vineyards thanks to Cooperative Research Centre for Viticulture researchers who have developed an accurate sampling method.

A berry's sugar concentration, commonly measured as Brix, is the main quality attribute for which payment is made from wineries to growers.

Research team Project Leader **Keith Leamon**, from the Victorian Department of Natural Resources and Environment, said to obtain an accurate maturity sample from a vineyard block, the sample should consist of five bunches per vine collected from at least four vines from within the vineyard, that is 20 bunches in total. The five bunches should be collected across the vine. In vineyards with high variability more samples would be needed.

He said developing a standardised and reliable sampling method for Brix would give growers and wineries more confidence in the results being obtained from the vineyard.

"Some wineries are requiring growers to do sampling and testing themselves and that's put a lot more of an onus on growers to get it right," he said.

Keith said further work was needed on a sampling method for colour as it

appeared more variation existed within a vineyard than with Brix. The team has developed a draft sampling method, with the help of a biometrician, and will test it next vintage.

Keith said the research, Project I.I.2 'Compendium of Winegrape Specifications and Measurement', had also looked at the impact of handling and processing of grapes on quality attributes.

"We found there was little impact on sugar levels from how the sample was handled. The way people handled the sample had a big impact on the final colour result for Cabernet," he said. Freezing samples prior to measurement was also found to reduce colour by 10-16 per cent. This will be investigated further in the coming season.

Keith said the research has also shown that how samples are processed can have a significant effect on final Brix levels.

"There is a marked difference between macerating and the berry crushing methods with a significant difference noted for Brix, pH and titratable acidity. This indicates there is a need to use a consistent method between winery and grower," he said.

"We've also been trying to correlate vineyard results with weighbridge results and are not getting enough consistency yet.

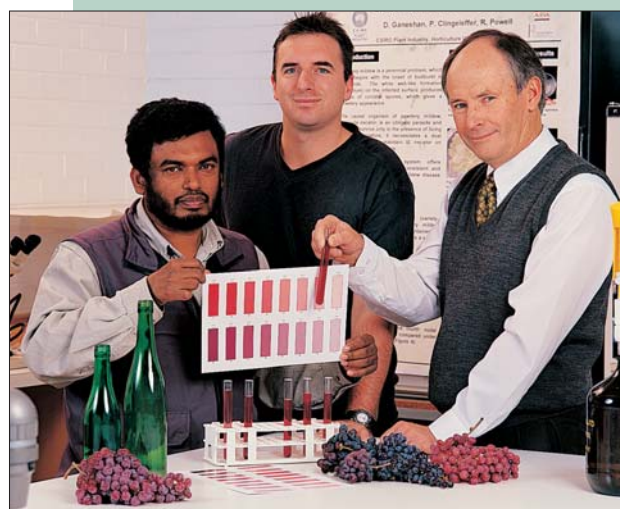
We'll be looking more critically at the causes of variation at the weighbridge in the future."

Keith said the research team hoped to be able to determine the level and source of variation for specific grape varieties in bins. This will enable standardised reliable sampling systems to be designed.

For further information contact Project Leader Keith Leamon on 03 5051 4522 or email keith.leamon@nre.vic.gov.au

Colour chart may help reveal winegrape quality

A simple colour chart, similar to that used to choose colours for the walls of a home, may be the latest tool to help grapegrowers determine the quality of their winegrapes. Cooperative Research Centre for Viticulture researcher **Keith Leamon** said while it was early days there was a "good relationship between people's assessment of winegrape colour using the chart and the results from laboratory tests".



L to R: Mababubur Mollab, agricultural engineer; Mark Krstic, viticulturist, and Keith Leamon, project leader, with the newly developed colour chart.

He said because the research looked promising, researchers would work on developing a standard colour chart and do further evaluation.

If successful "this would give growers a tool to check colour variation within their own vineyard and help them determine whether management techniques are having an effect on colour," he said. The chart and method used to do the assessment is being refined to ensure it can be easily used by growers and will cover the range of colour expected in both warm and cool climates.

Guide for growers

Australian grapegrowers will have access to a comprehensive, easy-to-read guide to producing quality winegrapes in the near future.

Due to be published at the end of 2002, the *Guide to Producing Quality Winegrapes* will detail what growers can do to influence major quality attributes such as Brix, colour, pH and acidity.

Two-pronged attack to solving bunch rot

A Cooperative Research Centre for Viticulture project is attempting to remedy the high incidence and severity of a major fungal problem, Botrytis bunch rot, by focusing on grape bunch structure.

Project leader Dr Ian Dry, from CSIRO Plant Industry, said studies have shown there is a strong correlation between tight bunches, with their closely crowded berries, and suscepti-

bility to Botrytis.

The fungal pathogen strikes with a vengeance in cool climate regions, where rain prior to harvest is most prevalent. Cultivars such as Riesling and Chardonnay are particularly prone because they are often grown in these premium regions and also have tight bunches.

“A tight bunch appears to retain more moisture between the berries than a

loose bunch which is critical in terms of the development of Botrytis,” said Ian.

“Also, grape skins do not fully develop in bunches where berries are pressed tightly together and these areas seem to be more susceptible to infection than those not pressed together.”

Tight bunches also make it difficult for growers to achieve effective penetration of fungicide sprays.

Ian said experiments over the last 20-30 years reveal that increasing

air-flow around bunches and between berries allows them to dry more quickly and significantly reduces the incidence and severity of Botrytis rot.

Most methods are time consuming, so Ian’s team is taking a genetic approach to finding a solution.

The aim of the project is to determine which gene or genes are responsible for controlling bunch architecture. While Ian describes the undertaking as “difficult and ambitious” he is reasonably confident it can be done.

“There is already a lot of genetic variation in bunch or cluster architecture in

the Vitis species,” he said.

“You only have to walk through a varietal collection to see there are different shapes and sizes of bunches and that cultivars like Riesling and Chardonnay have bunches at one extreme end of the spectrum and there are others that have bunches that are big and open,” he said.

The research is two-pronged and includes a:

Grapevine Approach

Cultivars with tight bunches like Riesling have been crossed with open bunch cultivars such as Exotic.

“If we can determine that there is a single gene controlling bunch architecture and identify that gene then we could use it in a transgenic strategy to manipulate it in Riesling or Chardonnay to produce modified plants with altered bunch structures, without changing the character of the berries,” said Ian.

Model Plant Approach

This involves trying to find the gene(s) responsible for bunch or inflorescence architecture in a model plant Arabidopsis. Although Arabidopsis does not produce fruit, it does produce an inflorescence or floral structure similar to grapevine and is therefore a useful model plant system for this research.

Ian said if the gene responsible for inflorescence architecture could be identified in the model Arabidopsis it would first be modified and tested in other Arabidopsis plants. If this was successful in altering inflorescence architecture it would then be trialed in grapevines to ascertain whether it has the same function.



Yuri Shavrukov and Ian Dry examining grape bunch structure on vines grown in glasshouses at CSIRO Plant Industry, Waite Research Precinct.

New appointment

Dr Yuri Shavrukov, a senior research scientist from the Institute of Cytology and Genetics at the Russian Academy of Sciences, Novosibirsk, has been appointed as a postdoctoral fellow to work on the project for the next three years.

Yuri’s main research focus has been with genes involved in the development of inflorescence structures of different crops using classical genetic and molecular genetic methods.

The CRCV forges ahead

Program 1: Vineyard Management to Meet Grape Quality Specifications

Program Manager: Dr Elizabeth Waters



Significant progress has been made in Program 1 in particular with major developments in the wine tannin project.

Rapid methods to quantify the levels of tannin in seed extracts and in wine have been developed, representing a significant advance on what is currently available because the tannins are clearly separated from other compounds in wine.

We are also rapidly advancing our understanding of the sensory impact tannins have on mouthfeel and astringency. Findings are yet to be published from this project but indications are that the greater the size of the molecules the higher astringency is likely to be and that this is the most important factor in determining the difference between tannin classes.

Another project has discovered that tannins have two distinct periods of development in grape seeds. Tannins are present from the beginning a seed forms in the grape berry and continue to accumulate up until near veraison. Then, post-veraison they decline. We believe the post-veraison compositional changes that occur in the tannins are consistent with oxidation, but how the seed becomes oxidised is still unknown.

A comprehensive suite of accurate and precise calibrations has been developed for the measurement of colour, pH and TSS in red grapes on three distinctly different types of Near Infrared Spectroscopy (NIRS) instruments.

Rapid progress is being made across the Cooperative Research Centre for Viticulture's five programs.

The following reports highlight the key achievements in each over the past year.

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[NIRS measures the amount of light, at certain wavelengths in the near infrared range, which is absorbed or reflected by homogenised, or blended, grape berries.]

A further 2500 samples have been collected this vintage by collaborating companies and some of these have been delivered and analysis has commenced. The technology has been used extensively by one winery for determination of grape quality variables for subsequent grower payment purposes and demonstrates the ability of the technology for broad industry adoption.

Our industry collaborators have been involved in reviewing testing procedures for measuring key attributes of wine quality and a series of experiments were designed to examine various testing methods. Results this harvest indicated that the handling, storage and processing of a sample can all have a very significant impact on the actual 'result' and these findings will influence future research.

In terms of Precision Viticulture, a protocol for yield map production has been produced and will be available on the CRCV website soon. The final report on the Precision Viticulture workshop held in August 2000 has been completed and is available on the website.

Program 2: Sustainable Vineyard Systems

Program Manager: Dr Rob Walker



Collaboration with industry and international research facilities has been the key to progress this year for

Program 2.

A major achievement has been the signing of an agreement between the CRCV and the American Vineyard Foundation (AVF) to maximise Eutypa dieback research efficiencies. It is the first time two international research organisations have reached agreement on this field of research and it allows both parties to discuss future collaborations without threatening existing proprietary research efforts.

Earlier this year our Esca researchers had the chance to work with visiting scholar Guido Marchi from Florence University who spent three months here. It is hoped this joint research will accelerate research outcomes.

And of course there has been a world first in the trunk diseases project which you can read about in this edition of the newsletter. The team is to be congratulated.

As a result of the valuable feedback we received from the VineLOGIC focus

groups we ran in June, a number of changes have been incorporated into the grapevine software simulation package. A more detailed report on VineLOGIC will appear in the newsletter soon.

Our investigation continues of the relative water use efficiency of different grapevine varieties, rootstock and variety-rootstock combinations and how water use efficiency changes as a result of drought or salinity stress.

Initial vineyard and glasshouse trials have shown marked differences in the way grapevines use water. Chardonnay leaves for example use less water per unit of dry matter produced than Shiraz. Rootstocks are also known to affect water use efficiency of winegrape varieties. The research is attempting to better understand the processes contributing to these differences. Our work aimed at optimising the application of partial rootzone drying is progressing on several fronts. The initial season of regional trials on both commercial and research station vineyards produced some expected and unexpected results. Planning is well advanced for next season which will build on the observations made during the first season.

The project focusing on nematode parasites is on schedule to develop impact risk strategies and evaluate management options. Similarly, we have been looking at a range of possible new methods for early detection of phylloxera infestations and alternative systemic chemicals as possible control agents.

Finally, our market segmentation approach to understanding the needs of grape growers contemplating changes to their irrigation practices is well advanced with over 6000 growers asked to participate in a survey. Responses are currently being collated.

Program 3: Molecular Improvement of Grapevines

Program Manager: Dr Simon Robinson



Results from Program 3 research could have major implications for a number of CRCV projects.

Evidence of this is already happening in the grapevine gene discovery project. New genes discovered in this project are being investigated in Project 3.1 (Improved resistance to fungal pathogens), Project 3.3 (Grape Quality), Project 3.4.1 (Fruitfulness) as well as GWRDC projects.

The past year has seen progress made in mapping genes, working with markers and improving knowledge of biological processes involved in the grapevine-root pest interaction. A collaboration has been initiated with Professor Carole Meredith from the Department of Viticulture and Enology, University of California, Davis (UCD), developing a *Vitis vinifera* genetic map from the progeny of a Riesling X Cabernet Sauvignon cross.

Two postdoctoral appointments have been made, with Dr John Harvey joining Project 3.3.1 (Flavonoid pathway genes in grapes) in March 2000 and Dr Yuri Shavrukov appointed to work on Project 3.1.4 (Modification of grape cluster architecture for control of fungal diseases).

The way the wine industry and consumers react to genetically modified grapevines will be influenced by the ability to demonstrate that GM foods are safe and that there are clear benefits in using this technology. Following on from the publication "The Australian Wine Industry's Position on

CRCV programs

Gene Technology", a PowerPoint presentation has been developed and is being used to inform growers and winemakers about the research and how it fits into the overall CRCV program.

Program 4: Education, Training and Professional Development for a Sustainable Industry

Program Manager: Ms Libby Boschen



A major achievement for Program 4 has been the completion of the report into the training and assessment needs of the wine and grape

industries which was accepted by the CRCV Board in December. The report outlined 17 high and medium priority recommendations that will form the basis for ongoing Program 4 activities. This year further tools have been implemented to assist the CRCV's PhD students to develop communication and team skills and industry knowledge. A student network was established; all students attended a 2-day workshop and a designated 'chat room' and bulletin board will soon be on the CRCV website.

A substantial national consultation process has resulted in recommendations for change and improvements to the Training Package. A report of this review was sent to the Australian National Training Authority last September.

Additional units have been added to the Training Package representing a 45 per cent increase in the unit options. Some are to meet specific needs of particular sectors like warehouse and dis-

CRCV programs

tribution and wine grape nurseries and others have been included in response to an industry need for a broader scope of training options, particularly to assist smaller operators.

In the past year the assessor database has grown from 55 to well over 300 and assessor development workshops have been well attended. Two regional networks (Clare/Barossa and Riverland) have been established with their own development plan. All assessors receive quarterly updates, advance notice of meetings and a checklist for assessing their own abilities.

Research to Practice™

The success of Research to Practice™ continues, with workshops throughout Australia attracting strong attendance figures.

The current program has been reviewed and options developed to ensure information is accessible to a wider spread of the industry. Examples of this are the sub-licencing of Water and Integrated Pest Management workshops to Agriculture WA to organise and run the workshops in that State. Pilot courses were also run by River Murray Training in 2000 to suit the specific needs of the region.

Possible research opportunities are progressively documented and submitted to **Noel Ainsworth** and **David Shearer** for appraisal. As Viticare and On Farm Trials progress, Research to Practice™ will be a valuable tool for disseminating results and information from these initiatives.

Program 5: Viticare – A National Approach to Delivering Regional Outcomes

Program Manager: Mr Noel Ainsworth



The Viticare project has focused heavily on increasing participation rates in the past year. More than 50 groups have

been directly contacted by Viticare, with over half requesting further details about the Network and expressing an interest in joining. The target of eight groups was reached by March this year, representing more than 100 growers. All Viticare member groups have been receiving monthly newsletters since October 2000 to keep them briefed on group and industry activities.

A discussion paper, outlining a potential national framework for environmental management for the wine and grape industry, was distributed to industry for comment in February. It was accompanied by a short survey to key industry individuals and openly distributed through the website. A press release was sent to media outlets in Australian grapegrowing regions to raise awareness of this paper. Valuable feedback has been obtained from these responses and will be used to further develop an environmental framework. The past year has been used by the Environmental Management Systems team to develop valuable collaborations with a number of related organisations and to identify the essential components for effective and practical environmental management. A pilot trial with growers who wanted to

implement EMS was established in the Adelaide Hills with workshops run in September and November. The review revealed that it will be necessary to have a more formal structure to the workshops, have tools to aid assessment and administration and greater guidelines on appropriate practices. The On Farm Trials have involved 37 growers across 8 regions (Hunter Valley, Murrumbidgee Irrigation Area, South West Slopes of NSW, NE Victoria, Yarra Valley, Heathcote and the Adelaide Hills) who are conducting trials in their own vineyards. The trials are both research and grower-initiated and address regional issues such as irrigation, nutrition, canopy management



L to R: Phillip Englefield (Robinvale grower), Hugh Armstrong (Southcorp Wines), Christina Sickert (PIRSA Rural Solutions) and Noel Ainsworth (Viticare Coordinator).

and pest management. Measurement tools have been implemented by growers addressing issues of fruit quality and quantity, vine growth, natural resource impacts and pest and disease occurrence. The trial results from 2000-01 were used to validate trials and measurement techniques and in some cases growers have already reaped benefits from their involvement in the trials with some management changes already being considered.

Viticare: A national approach to delivering regional outcomes

The Langhorne Creek Grapegrowers' Association, South Australia, joined the Viticare Network at the start of the year. Member **Andrew Bengler** gives his initial impressions of the Network and what the Association, which contains about 80 growers, hopes to achieve through this membership.

Q: What have been the initial benefits of joining the Viticare Network?

Andrew: It has provided an instant means of distributing information and the initial response from the growers to the Viticare newsletter has been very positive.



Members of the Langhorne Creek Grapegrowers' Association.

Q: How receptive are the growers in your region to change?

Andrew: When I came here eight years ago there were 300 hectares of wine-grapes, mostly operated by families. Today there are 4700 hectares of winegrapes and viticulture has become a significant industry. The rapid amount of change means the growers are comfortable with it and expect it in the future. There is also a general realisation that we have to keep working and changing to stay ahead of our competitors. If the CRCV's Viticare Network can assist us to make better quality grapes, ensure sustainability and profits or reduce water and chemical use, then we want to be part of it.

Q: How important is it for growers to be aware of the latest research and technology?

Andrew: The industry is only getting more competitive so from a regional perspective it is imperative for us to become involved and know what is going on. The potential the Viticare Network has to distribute information and the latest R&D findings is one of the reasons we decided to join.

Q: Do you think there is a possibility for growers to be inundated with too much information?

Andrew: I don't think so. At the moment the growers in the region get the Viticare newsletter, the Langhorne Creek regional newsletter as well as Australian Viticulture, which contains the CRCV newsletter. These all give different information and keep growers informed.

Q: Are growers keen to learn more about new vineyard management?

Andrew: Growers in this area have shown they are keen to learn the latest in vineyard management. The CRCV's Research to Practice™ workshops have been held here for about 4 years and have been well supported. We also conduct our own irrigation survey and production survey and the growers are keen to be involved. I am sure there will be the same level of enthusiasm for the Viticare Network.

Q: What role do you see the Viticare Network performing in the future?

Andrew: At the moment the network is perhaps more about opening up communication channels. In the future, especially as research findings filter through, I think the network will become more involved in assisting in the uptake of new technologies. Having a network like Viticare to assist that function will be a huge help, especially to a lot of smaller growers.

For further information about Viticare contact Noel Ainsworth at the CRCV on 08 8303 9304 or mobile 0408 924544.

Recent CRCV Publications

Scientific reports

Grape quality

Innovations and technology – Managing and monitoring spatial variability in vineyard productivity
Lamb,D.W. and Bramley,R.G.V.
Natural Resource Management 4, 25-30, 2001

The influence of winemaking and viticultural practices on colour and tannins in red wine
Francis,L., Gawel,R., Iland,P., Oberholster,A.,Peng,Z., Ristic,R. and Waters,E.
The Lincoln University Annual Grape and Wine School, Lincoln, New Zealand, 22-23 July, 2000.

Sustainability

Pycnidial state of *Phaeoaniella chlamyospora* found on 'Pinot Noir' grapevines in the field
Edwards,J. and Pascoe,I.
Australasian Plant Pathology, 30:67, 2001.

In situ sporulation of *Phaeoaniella chlamyospora* in the vineyard
Edwards,J., Laukart,N. and Pascoe,I.
Phytopathologia Mediterranea 40, April 2001.

Genetic transformation of major wine grape cultivars of *Vitis vinifera* L.
Franks, T., Iocco, P. and Thomas,M.R.
Transgenic Research 10: 105-112, 2001.

The molecular regulation of stilbene phytoalexin biosynthesis in *Vitis vinifera* L. during grape berry development
Bais,A.J., Dry, I.B. and Murphy,P.
Australian Journal of Plant Physiology 27: 425-433, 2000.

Tendrils, inflorescences and fruitfulness
Boss,P.K. and Thomas,M.R.
Australian Journal of Grape Wine Research 6: 168-174, 2000.

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 wine-makers are key stakeholders in the CRCV, contributing levies matched by the Commonwealth Government and invested by the Grape and Wine Research and Development Corporation in the Centre.