Murray Valley Winegrowers' Inc

Australian Government
Grape and Wine Research and Development Corporation

Field walks to demonstrate good irrigation practices in the Murray – Darling

FINAL REPORT to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: **RT 03/06-2**

Principal Investigator: **Susan Byrne and Liz M^{c}Guire**

Research Organisation: **Murray Valley Winegrowers' Inc.**

Date: **10/2/2006**

PART ONE

Executive Summary

The concept for the irrigation field walks was for growers to come together and to learn from each other. A consultant was present at the field walks to fill in the gaps and to get the questions and discussions progressing.

The field walk was organised by Winegrape Industry Development Officer, Susan Byrne; viticulture consultant was, Ross Polglase. Ross began the field walk with a formal presentation, which set the scene for the day. After the presentation we visited two local vineyards. Only a loose agenda was set for the field walk, the idea being that growers would choose the topic direction based on the questions and discussion that arose on the day. Growers were encouraged to actively participate in information sharing rather than relying totally on Ross. This approach fostered co-learning between the growers.

Topics discussed included:

- Soil moisture monitoring equipment
- Interpreting and using soil moisture monitoring data
- Correct interpretation of the visual symptoms of water stress
- Using historical records of the vineyard
- Knowledge of the soil type and RAW (Readily Available Water) values
- An understanding of the different water requirements of vine at different growth stages
- Being able to amalgamate data from numerous sources (ie dig stick, visual symptoms, moisture monitoring equipment, feedback from winery)

The project aimed to help growers in their irrigation practices, ensuring an improvement in water use efficiency. If growers were able to improve their water use efficiency through applying the right amount of water at the right time, reduced water use may result. This may mean a reduction in pumping costs, water charges as well as reduced drainage. Improved irrigation efficiency may result in surplus irrigation water, which may be used for further development or sale. Crop productivity may also be increased by irrigating the vines with the right amount at the right time, which could result in better payment for fruit.

Background

When the RITA application was written the catchments suppling water to the Murray Valley were historically low, with restrictions as of August 2003, 58% of licence allocation. This restriction was reviewed monthly and by November 2003 restrictions were completely lifted. Consequently the original RITA application needed to change its focus slightly. The original application aimed to bring growers together by means of field walks, to discuss how they were going to manage possible water restrictions. With restrictions lifted the irrigation field walks became a forum for discussions on what resources and skills growers could use to make good irrigation decisions.

Rather than provide a learning event in which an ‘expert’ delivered information and growers passively took on board the messages, it was thought a more effective learning event would be one that requires growers to actively participate and to share information. To achieve this, an informal and relaxed field walk and BBQ was organised, which encouraged grower initiated discussions and questions. The BBQ

also allowed time for growers to reflect on what they saw and heard during the day and how it fits in with problems and opportunities on their own vineyard.

Objectives

- To organise for the Murray Darling two sets of irrigation field walks four times over the growing season, budburst, flowering, fruit set and verasion.
- Provide an opportunity for growers to learn from each other.
- Provide extension activities in which growers are able to add to their irrigation knowledge and skills.

These were the objectives in the funding application. They were achieved however only one field walk at veraison was organised, this was due to the late notification of project funding approval. The time of approval, middle of November, did not allow time to organise all the proposed field walks.

Outputs:

1. Liaison meetings with viticulture consultants and key growers to choose topics to be covered at the field days and to reflect on ways to improve the field walks.
2. Minutes from meeting with viticulture consultants and key growers.
3. Handouts for field walks.
4. Flyer advertising the event.
5. Radio announcements advertising the event.
6. Use of selected vineyards for observation and demonstrations of good irrigation practices.
7. An evaluation report to ascertain the level of impact the field days have had on changes in irrigation practice and subsequent water use efficiency.
8. Article in the Murray Valley Winegrape Growers' Grapevine (see Appendix 1).

All the outputs were achieved except for numbers 1, 2, & 7. Outputs 1 and 2 were not undertaken as project organisation began in January 2004, due to late notification of funding approval, not allowing time for such meetings. Output 7 was a report that examined practice change due to the project. This did not occur, as there was not enough time to track grower progress.

Method

The field walk began with viticulture consultant Ross Polgalse going over the factors affecting water use, in a formal setting with overheads and handouts (see Appendix 2).

Next we visited local vineyards to hear and observe growers' irrigation practices. To set the scene and get growers thinking, Ross led participants through a visual assessment sheet similar to that used by wineries. Assessing the vines and hearing from the vineyard manager the irrigation history of the vineyard helped to put into context the quality aims of the vineyard and how irrigation was used to achieve these aims.

The field walks were informal and participants were encouraged and given plenty of time for discussion and to ask each other and the consultant questions.

The field walk was advertised via a flyer (see Appendix 3) and media release (see Appendix 4)

Results/Discussion

Seventy people attended the field walk but only 17 people filled in the evaluation sheet (see Appendix 5).

1. What new information about the progressive signs of water stress did you learn today?

1.1	Leaf rolling	2
1.2	Tendril movement	2
1.3	Feeling for leaf temperature	2
1.4	Limp petioles	2
1.5	Shoot tip growth	2
1.6	Irrigation	1
1.7	Canopy size/ratio	1
1.8	None	4
1.9	No answer	6

2. What new information about irrigation scheduling did you learnt today?

2.1	More irrigation necessary early in growing season	1
2.2	Total confusion from what the grower had learnt	1
2.3	The cyclic use of irrigation at night to cool vines after hot days	1
2.4	To use all available methods of scheduling including visual symptoms	2
2.5	Frequency required when using drip irrigation	1
2.6	Wetting up pre veraison for PRD/RDI	1
2.7	Range of products available	1
2.8	Short/medium effects of RDI on red grapes	1
2.9	Water requirements at post veraison	1
2.9.1	None	5
2.9.2	No answer	3

3. The information content of the irrigation field walk was worthwhile (1=strongly disagree 10=strongly agree)

Rating 1-10	**Number of people who chose this rating**
1	1
2	1
3	0
4	0
5	0
6	1
7	0
8	7
9	2
10	5

4. I enjoyed today
(1=strongly disagree 10=strongly agree)

Rating 1-10	Number of people who chose this rating
1	0
2	1
3	1
4	0
5	0
6	1
7	0
8	3
9	2
10	9

5. I would like to continue being involved in irrigation extension activities
(1=strongly disagree 10=strongly agree)

Rating 1-10	Number of people who chose this rating
1	0
2	2
3	0
4	0
5	0
6	0
7	1
8	5
9	1
10	8

The evaluation tells us that growers did learn new information about the progressive signs of water stress, and they found out more about irrigation scheduling. Most people found the field walk worthwhile and enjoyable and would like to be involved in further irrigation field days.

For the questions that required people to rate their answer from one to ten a few people circled the low numbers. It is disappointing people ranked a few of the answers to the questions with a low result however I am concerned some people may have misunderstood that 1 was a low rating and ten a high rating.

Outcome/Conclusion
The field walk attracted 70 growers, which indicated irrigation was a topic of interest. Grower participation was evident by the number of questions asked and discussion generated. Feedback from the evaluation survey tells us growers did take on-board new ideas, knowledge and skills from the day.

One flaw with the field walk was that too many people attended! Managing seventy people to 'actively participate' is difficult. Another recommended change would be to visit the same vineyards over the course of a season. To achieve this would require a September start.

The benefits to growers from this project are an improvement in irrigation practices, possibly leading to increased water use efficiency.

PART TWO

Executive Summary

A two stage field walk exercise was developed visiting a number of different vineyards with different varieties and different irrigation management strategies.
The concept of having a two stage field walk at different vineyard growth stages is a good way for growers' to obtain on going information that may be useful to their own vineyard. The first session of this irrigation field walk was well received by growers interacting and discussing the three properties and four varieties observed. Unfortunately the second session of the irrigation field walk was cancelled due to the absence of an Industry Development Officer.

Background

The aims of the original RITA application for this project were to help growers make the best irrigation management decisions to cope with potential water restrictions in 2003/2004. Murray Valley winegrape growers were lucky in this season with water restrictions being lifted and little change in irrigation management strategies being needed.

While water restrictions were lifted in this season, growers' were still very interested in improving their irrigation management strategies. An irrigation field walk was organised to observe different irrigation techniques and technologies in the field prompting discussion and questions amongst participants. This workshop was positively received by growers and can be seen in part one of this report compiled by Susan Byrne.

With funding still available, GWRDC was approached to expand the life of the project to allow another field event to be held. The request was granted and the following activities were developed.

Objectives

1. To organise a series of on farm irrigation field walks in the Murray Darling region to examine irrigation issues facing winegrape growers'.
2. To provide an opportunity for growers' to learn from viticultural consultants.
3. To provide an opportunity for growers' to interact and learn from each other.

Method

A two part field walk was developed visiting three local properties twice through the season to monitor vineyard development. The varieties targeted on the three properties included Cabernet Sauvignon, Merlot, Chardonnay and Shiraz.
Topics to be discussed during the field walks included:

- Irrigation requirements of grapevines at different growth stages
- Irrigating different varieties
- Affect climate has on the irrigation requirements of grapevines
- Preparing your vineyard for hot weather
- Soil characteristics
- Vine balance
- Soil moisture monitoring
- Fruit quality

The following consultants were approached to attend the field walks and contribute to the above discussion topics:

- Garth Swinburn from Scholefield Robinson,
- Jeff Mitchell from Vine Science,
- Peter Ryan from Yandilla Park Services and,
- Brendon Goullet from Yandilla Park Services.

An invitation was sent to growers' inviting them to attend the two part field walk (see Appendix 6). Numbers able to attend the field walk were restricted to ensure group sizes were small enough to allow participants to learn, interact and properly discuss the irrigation issues facing them.

Results / Discussion

The first field walk session was a success with 49 people attending. Feed back given verbally to the different group leaders on the day indicated that the session was very well run, provided good information that was relevant to the vineyard surrounds, the consultants communicated their messages very clearly and the discussion between growers allowed common problems to be shared and experienced by all participants.

Unfortunately the second part of this field walk that due to be run in January of 2005 was cancelled due to the absence of an Industry Development Officer.

Outcome / Conclusion

The concept of having a two stage field walk at different vineyard growth stages is a good way for grower to obtain on going information that may be useful to their own vineyard. The small group environment was instrumental in allowing participants to maximise their experience in the vineyard and to making the participants feel comfortable enough to share their own vineyard experiences.

The presence of skilled consultants during the sessions developed practical and relevant discussions, providing some valuable information for growers' to take home. Acknowledgements are made to all the consultants involved in the field walk session and to the growers' who hosted the sessions on their properties.

Acknowledgements are made to GWRDC for providing funding for this project.

PART THREE

Executive summary

Irrigation is a vineyard management strategy that can influence winegrape growth and quality. For this reason Winegrape growers' in the Murray Valley nominate irrigation as an area for continuous learning. This project aimed to demonstrate good irrigation practices through field walk and presentations from industry personnel who work closely with irrigation technology and practice.

Two irrigation events have been previously organised and held as part of this project. 2004. The details for these events can be found in part one and part two of this report compiled by Susan Byrne.

This report contains the information pertaining to the third irrigation field exercise for the project to demonstrate good irrigation practices in the Murray Valley. This field walk allowed growers' to view two local vineyards and hear presentations from speakers representing Yandilla Park, CSIRO, Co-operative Research Centre for Viticulture (CRCV) and the CRCV Viticare trials.

Information presented on the day was well received by the participants.

Background

Murray Valley Winegrowers' Inc applied for the RITA funding for this project to assist winegrape growers learn and cope in increasingly difficult times with potential water shortages in the 2003/04 season. Water shortages were not experienced in this season, however the irrigation information provided in the first two parts of this project indicated that growers were looking to improve their irrigation efficiency and effectiveness.

With funding still available, GWRDC was approached to expand the life of the project to allow another field event to be held. The request was granted and the following activities were developed.

Objectives

4. To organise an irrigation field walk in the Murray Darling region.
5. To provide an opportunity for growers' to learn from irrigation researchers and consultants.
6. To provide an opportunity for growers' to interact and learn from each other.

Method

An irrigation field session was organised to be held on two local properties with different irrigation technologies. The program for the day was compiled as follows:

1. Brendon Goullet - Yandilla Park Services – What volumes of water are vines using now?
2. Dr Chris Soar – CSIRO – How does rootstock type affect vine water uptake and how can you manipulate your irrigation to suit the variety's reaction to water stress?
3. Dougal Currie – CRCV – What effect is drip irrigation having on soil structure in your vineyard?
4. Nicole Dimos – CRCV Viticare Trials – What can mulching do for your vineyard?

A flyer was sent by mail to all Murray-Darling winegrape growers' inviting them to the event (see Appendix 7). An email was sent to industry personnel inviting them to the event.

Results / Discussion

Fifty people were confirmed to come to the field event. Unfortunately weather events forced some participants to cancel in order to ensure preventative disease control was applied. Thirty five people participated in the field event, with information on the day being well received.

Presentations were held either in the field or in the host's shed. Presentations were of a relaxed nature with growers having a handout (see Appendix 8) and presenters talking to handout. Growers seem to react well to the field / shed setting for the presentations as was reported by Susan Byrne in part one of this report.

The field component allowed interaction and discussion amongst participants and the property owners who were very informative and happy to answer questions.

The topics presented on the day were not mainstream irrigation management topics which gave participants the opportunity to hear and think laterally about aspects of vineyard production that can indirectly impact irrigation efficiency and effectiveness.

Participants were asked to fill in an evaluation sheet (See Appendix 9) to rate the effectiveness of the field event. Responses were largely positive with 95% of participants feeling that the field session was worth while attending. Participants' expectations of the field session included:

- To learn new knowledge,
- To learn about research related to irrigation and winegrapes,
- To learn about vine water use in spring,
- To learn about rootstock effects on water uptake,
- To learn about soil degradation,
- To learn about possible uses of mulches in the vineyard,
- To interact with other irrigators.

86% of participants believed that their expectations were met during the session. New information learnt by participants during the session included information on:

- Soil sodicity,
- Soil structure,
- Dripper degradation on soils,
- Mulches,
- Vine water use at different growth stages,
- Fertigating after rainfall,
- Rootstock effects on water uptake,
- Soil / salt relationship.

Participant indicated that they would like to learn more irrigation management information on:

- Sub-surface drip,
- How much water to apply and how often to irrigate,
- Interactions between nutrition and irrigation management,
- Soil health,

- How irrigation affects cropping levels and fruit quality.

The feed back from the participants will give direction to future irrigation extension projects.

Outcome / Conclusion

The feed back from participants supports the notion that irrigation technology is continually advancing and has the potential for large changes in production efficiency and effectiveness. With the potential for changes in production efficiency winegrape growers' are interested in learning and adopting as much new information on irrigation technology as they can.

Speakers on the day presented information that challenged growers' to think about their own practices and how they could be changed or improved to ensure efficient irrigation management. The presenters were very knowledgeable in their fields and they delivered their information in easily understood terms. Acknowledgements are made to all presenters and to the growers' who hosted the day.

Acknowledgements are made to GWRDC for providing funding for this project.

APPENDIX 1

Walking for water

Learning more about irrigation

Susan Byrne
Industry Development Officer

Winegrape growers in the Murray Valley had the opportunity to attend a series of Irrigation Field Walks in January and February. They were organised by Industry Development Officer Susan Byrne, CRCV Viticare Trials co-ordinator Sarah Hession and viticulture consultant Ross Polglase. Two field walks were held in Mildura and Robinvale during veraison, while Swan Hill hosted one during veraison and another just pre-harvest.

Each walk began with a presentation by Ross Polglase on irrigation strategies, focusing on areas such as vine growth patterns, soil management and differentiating irrigation strategies for white and red varieties. Ross noted that it was important for growers to understand which wine market(s) their grapes were meant for so that specific quality parameters could be observed throughout the season.

He placed great emphasis on monitoring vines throughout the season for factors such as tendril health, lignification and lateral growth. Visual assessments were an essential component of irrigation scheduling, rather than relying solely on expensive soil moisture monitoring equipment.

Observing irrigation impacts

Each group then progressed to various vineyards to observe the results of different irrigation strategies on Shiraz, Chardonnay and Merlot. The visits ranged from winery-run vineyards to privately owned vineyards where each vineyard manager discussed their current irrigation program. A visual assessment of each patch was completed, covering both canopy and fruit characteristics. Ross then guided the growers through some visual symptoms of water stress, evident on some blocks that had been moderately stressed from fruit set to veraison in order to control berry size. The growers learnt to spot tendril shrivel, degree of shoot tip growth and leaf condition. Ross pointed out that methods as simple as feeling for leaf temperature were effective in determining stress, as warm leaves indicated transpiration problems.

Winemaker's view

Swan Hill growers also heard from winemaker Bill Small, who spoke about fruit quality; the importance of flavour and tannin ripeness in the berries and the impact of over-stressing vines.

The field walks concluded with a BBQ, which gave growers further opportunity to talk with Ross and other growers. Growers evaluated that the field walks helped to reinforce and broaden their knowledge of progressive signs of water stress.

The relaxed atmosphere and enthusiasm from the growers made all the irrigation field days successful. Further information can be obtained from Susan Byrne on 5021 3911, or information about the CRCV Viticare Trials from Sarah Hession at the DPI on 5051 4500.

From L-R: Bill Small, Alan McTavish, Ross Polgare and Stuart Brumby examining shiraz on the field walk

APPENDIX 2

IRRIGATION STRATEGIES FOR WINEGRAPES

(and a bit on grape quality)

By Ross Polglase,

Factors affecting the rate of water use

- Leaf area
- Crop load
- Stage of development of crop
- Degree of water stress
- *Temperature*
- *Humidity*
- *Wind*
- *Sunlight*

Seasonal patterns of vine growth

- Bud burst to flowering: shoot growth dominates; root activity strong from 4 weeks post bud burst to shortly after berry set
- Set to veraison: berry growth occurs through cell division
- Veraison: berry growth pauses; seed development commences, berries soften and colour development begins
- Veraison to harvest: sugar and flavour accumulation occur; colour development in red varieties; berry growth occurs through cell expansion
- Post harvest: may be a small flush of shoot growth; second largest flush of root growth

Water availability and soil types

Factors influencing water availability include:

- Soil texture: the proportion of sand, silt and clay
- Soil structure: the way in which the primary particles are arranged in the soil
- Physical barriers to root growth: compaction; soil fissures
- Chemical barriers to root growth: carbonate layers; soil acidification (aluminium toxicity)
- Irrigation system and scheduling
- Rainfall amount and timing

The most important question when devising a strategy:

What kind of vines do want to grow?

The answer is influenced by:

- soil type
- irrigation system
- approach to irrigation scheduling
- market for the crop

Canopy characteristics of white varieties

White varieties

- generally need more shade than red varieties (except for viognier)
- aromatic varieties usually lose flavour if their bunches are over exposed
- fail to develop flavour in full shade
- lose acid in full shade

Canopy characteristics of red varieties

- Depends on market for the fruit
- Develop good colour, phenolics and flavonol levels with moderate to high degree of exposure
- Small berries *usually* develop better colour, phenolics and flavonols than larger berries
- Vines may produce good colour with careful use of RDI
- Vines produce poor quality with excessive levels of stress

RAW values

RAW = Readily Available Water:

- the amount of water that plants can potentially extract from the soil
- does not take into the influence of soil-borne pests
- varies on the same soil according to root stock

The value of RAW values

RAW values provide an indication of:

- the vigour potential of a site
- how to match varieties with soil types before planting
- then sensitivity of a site to drought
- the ease of vine vigour management
- best soil management practices for a site
- sometimes used with evapotranspiration data for irrigation scheduling

RAWs and vigour potential

- Low vigour potential sites: RAWs of less than 25 mm
- Moderate vigour potential: RAWs of 25-45 mm
- High vigour potential sites: RAWs of greater than 45 mm

Choosing sites for individual varieties in a block should take RAWs into account

Scheduling tools and systems

- Evapotranspiration, crop coefficients and RAW values
- Tensiometers
- Gypsum blocks
- Capacitance probes
- others exist, but are less commonly used
- Shovel, auger or dig stick

No one system is perfect

An approach to assessing vineyards

There are two fundamental questions to ask yourself when you walk into a vineyard:

1. *What do I see?*
2. *How do I interpret what I see?*

You can systematically record what you see at different times of the season to assess how your vines are performing

Some factors that are important

- when tendrils fall
- tip condition
- leaf condition
- extent of cane and seed lignification
- cane length
- lateral growth
- fruit exposure
- fruit distribution
- berry size
- flavour

APPENDIX 3

FIELD WALK—IRRIGATING FOR QUALITY WINEGRAPES

When: Monday 2nd February 2004
Time: Starting at 1:30pm, expect to finish at 6pm (excluding BBQ)
Location: Sunraysia Horticulture Centre, corner of 11th street and Koorlong Ave

HIGHLIGHTS!!

- Ross Poglase, will speak on irrigation strategies for different winegrape varieties on different soils.
- Bus trip to growers' properties - to discuss irrigation scheduling and upcoming quality for the season.
- Growers will receive training in the use of a survey which assesses the vine's potential for growing quality fruit (similar to that applied by wineries).

Free BBQ and drinks to finish the day

To register your interest for this event ring 50 213 911 or fax this sheet to 50 232 335 by January 27th 2004

Name.....

Number of people attending the field walk.....

Growers will be picked up and dropped off at the Sunraysia Horticulture Centre.

Proudly sponsored by the:
Murray Valley Industry Development Committee
Murray Valley Wine Growers Incorporated
Grape and Wine Research and Development Corporation
Cooperative Research Centre for Viticulture

APPENDIX 4

Victorian & Murray Valley
Winegrape Growers' Council Inc

Swan Hill Wine Region Grape Growers' Association Inc.
Murray - Darling Winegrape Growers' Association Inc.
Robinvale & District Wine Grape Growers' Association Inc.

ABN 27 375 625 539 Inc. Reg No. A0010590U
31 Deakin Avenue, Mildura 3500
PO Box 2745, Mildura 3502
Phone (03) 5021 3911
Fax (03) 5023 2335
Email vmvwgc@murrayvalleywinegrapes.com.au

Media Release

29/1/2004

Turning Water into Wine

An irrigation workshop for winegrape growers will be held on Monday 2nd February 2004, at the Sunraysia Horticulture Centre on the corner of Eleventh and Koorlong Ave. Under discussion will be factors affecting the rate of water use in a vineyard, how different soils hold water and what tools are available for assessing a vineyard's water status. The workshop will also involve a bus tour of growers' properties to examine irrigation scheduling and the role it plays in fruit quality. Fruit quality will be assessed using a survey method similar to that applied by wineries looking for grapes in the Sunraysia region.

The workshop will begin at 1:30pm and will end at 8pm with a BBQ.

If you are interested in attending and or need directions to the growers' properties please contact Susan Byrne at the Murray Valley Winegrowers' office on 50 213 911.

Contact:
Susan Byrne
Murray Valley Industry Development Officer
Phone: (03) 50 213 911

APPENDIX 5

SURVEY FOR MILDURA IRRIGATION FIELD DAY

1. At the field walk today did you learn new information about the visual symptoms of water stress?

   ☐ YES *(go to question two)*

   ☐ NO *(go to question three)*

2. What new information about the progressive signs of water stress did you learn today?

_____

_____

_____

3. Did you learn new information about irrigation scheduling today?

   ☐ YES *(go to question four)*

   ☐ NO *(go to question five)*

4. What new information about irrigation scheduling did you learn today?

_____

_____

_____

5. Rate the following statements. 1 = strongly disagree 10 = strongly agree (please circle)

The information content of the irrigation field walk was worthwhile.

1 2 3 4 5 6 7 8 9 10

I enjoyed today.

1 2 3 4 5 6 7 8 9 10

I would like to continue being involved in irrigation extension activities.

1 2 3 4 5 6 7 8 9 10

6. From what you learnt today, would you like to be involved in a **CRCV Viticare Irrigation Trial** for season 2004/05?

   ☐ YES *(go to question six)*

   ☐ NO *(finished survey)*

7. What kind of trial would you like to be involved in for 2004/05?

   ☐ - Soil moisture monitoring ☐ - Irrigation scheduling

   ☐ - Irrigating different varieties ☐ - Irrigating different soils

   ☐ - Deficit Irrigation ☐ - Other _____

THANK YOU FOR TAKING THE TIME TO FILL IN THIS SURVEY

NAME.....

APPENDIX 6

VINEYARD FIELD WALKS

PROPERTIES VISITING

Peter Speed ➔ Cabernet Sauvignon, Cardross
Jeff Mitchell ➔ Merlot, Red Cliffs
Bob Bate ➔ Chardonnay & Shiraz, Red Cliffs

CONSULTANTS

Garth Swinburn from Scholefield Robinson
Jeff Mitchell from Vine Science
Peter Ryan & Brendon Goullet from Yandilla Park

TOPICS TO BE DISCUSSED

- Irrigation requirements of grapevines at different growth stages
- Irrigating different varieties
- Affect climate has on the irrigation requirements of grapevines
- Preparing your vineyard for hot weather
- Soil characteristics
- Vine balance
- Soil moisture monitoring
- Fruit quality

➢ *Participants will be divided into small groups of 15; a bus will take the groups around to each of the properties.*

➢ *There will be 2 field walks visiting the same properties – allowing participants to follow the progress of the vineyards.*

FIRST FIELD WALK
Monday 13th December 2004. Starting at 8:30am, expect to finish at 12pm
Meet at the Sunraysia Horticulture Centre, corner of 11th St & Koorlong Ave

SECOND FIELD WALK
Tuesday 18th January 2005, starting at 7:30am, expect to finish at 10:30am
Meet at the Sunraysia Horticulture Centre, corner of 11th St & Koorlong Ave

STRICTLY LIMITED TO 45 PEOPLE EACH WALK!

TO REGISTER
☎ Ring the Murray Valley Winegrowers' office on **50 213 911**
OR
Fill in the form below and fax to **50 232 335**

☑ Yes I will attend the first field walk on Monday 13th December 2004

Name……

Phone Number……Fax Number……..

Murray Valley
Winegrowers' Inc

APPENDIX 7

Murray Valley
Winegrowers' Inc

MURRAY VALLEY WINEGROWERS

you are invited to the

IRRIGATION FIELD WALKS

When: Friday 21st October

Bus Pickup points:

1. St Joseph Stadium (Bendigo Bank Centre) 11th St, (9.10am)
2. Lower Murray Water, 15th St Irymple, (9.30am)
3. Opposite Landmark / Growmart, Redcliffs (9:45am)

Time: 9.10am - 2:30pm

RSVP: for catering purposes please RSVP below

On the day visit two local winegrape properties and hear from:

- **Yandilla Park** - What volumes of water are vines using now?
- **Dr Chris Soar** - CSIRO - How does rootstock type affect vine water uptake and how can you manipulate your irrigation to suit your variety's reaction to water stress?
- **Dougal Currie** - CRCV - What effect is drip irrigation having on soil structure in your vineyard?
- **Nicole Dimos** - CRCV - What can mulching do for your vineyard?

TO REGISTER

Phone Murray Valley Winegrowers on (03) 5021 3911 or fax the following to (03) 5023 2335

☐ I would like to attend the irrigation field walks on the 21st October.

Name(s)……

Phone Number……..

APPENDIX 8

yandilla park agribusiness

Spring Water Use of Vines

Murray Valley Winegrowers field walk on 21/10/05
Brendon Goullet B.Ag
Yandilla Park Agribusiness

Spring Water Use Key Points

- Spring Water use is generally evident in the upper portion of the vine rootzone
- Spring Water use is generally low until mid October, until the soil temperature increases.

What are the implications of incorrect moisture during spring?

- Irrigation during winter and spring is important in years of low rainfall.
- In some cases, reduced spring growth can be evident if moisture levels aren't maintained over this period.
- If too much water is applied, there is the risk of root rot setting in.
- If on lime soils, over watering can cause yellowing of the vine leaf.

How much water should I be applying in Spring?

- When assessing spring soil moisture status, we should be concentrating on the top 30cm of the soil.
- Fertilizer should be aimed at this active root area, meaning shallower irrigations during these times.
- Spring irrigations on a full coverage system will be around the 15-25mm amount depending on soil type.
- Spring irrigations on a drip system will be around the 2-4 hour mark depending on soil type.

Should I treat white wine Grapes different to red ones?

- This mainly depends on the desired outcome of the vine at the end of the season.
- Generally white wine grapes need more topsoil moisture than red grapes.
- White wine grapes generally show earlier water use than red grapes.
- Generally white grapes need more moisture to achieve adequate cane length for summer.
- Soil type, rootstock and irrigation system will influence how you treat your varieties.

What should I do to prepare for the upcoming summer period?

- Due to our shallow spring water application, subsoils can dry out over this period.
- When moving to the late spring period as the warmer weather approaches, irrigations should be pushed deeper into the rootzone to bring up subsoil moisture before summer hits.

Monitoring Spring Water use.

- Any moisture monitoring tools should have different parameters set for specific growth stages and variety.
- The use of a dig stick or auger is a handy tool to assess moisture during the spring period.
- Spring Rainfall can have a dramatic effect on early season water use due to it's evenness of distribution and cooling effect on soil temperature.

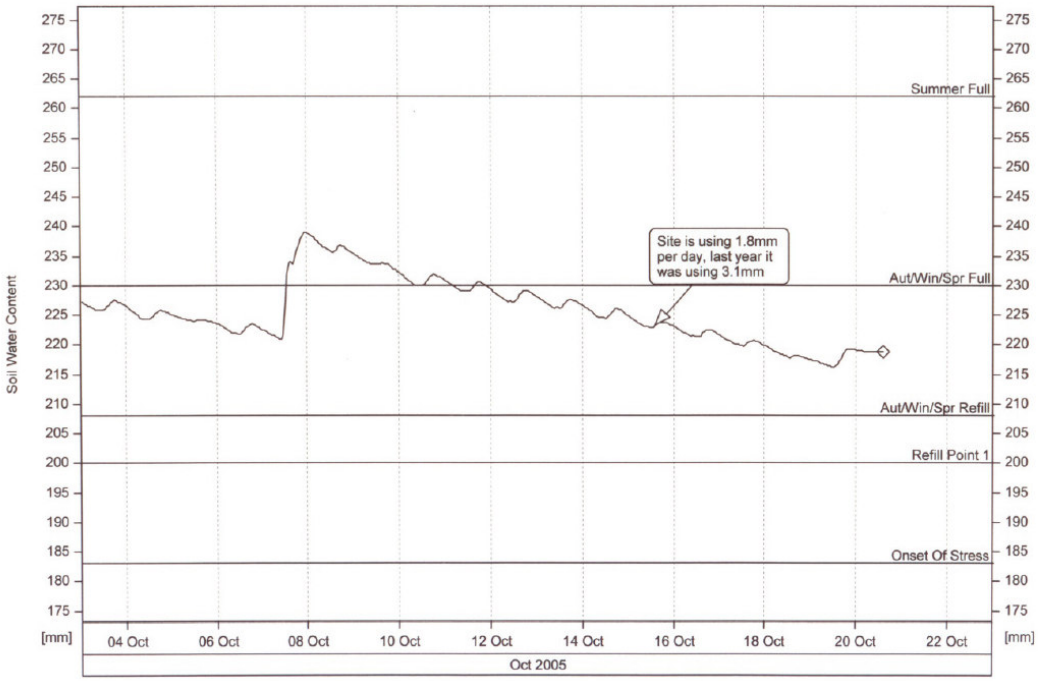
HEAD OFFICE / PRODUCTION
Chowilla St
PMB 52
RENMARK SA 5341
Ph: 08 8586 1200
Fax: 08 8595 1394
Email:

RENMARK AGRONOMY
Chowilla St
PMB 52
RENMARK SA 5341
Ph: 08 8586 1271
Fax: 08 8586 1272
Email:

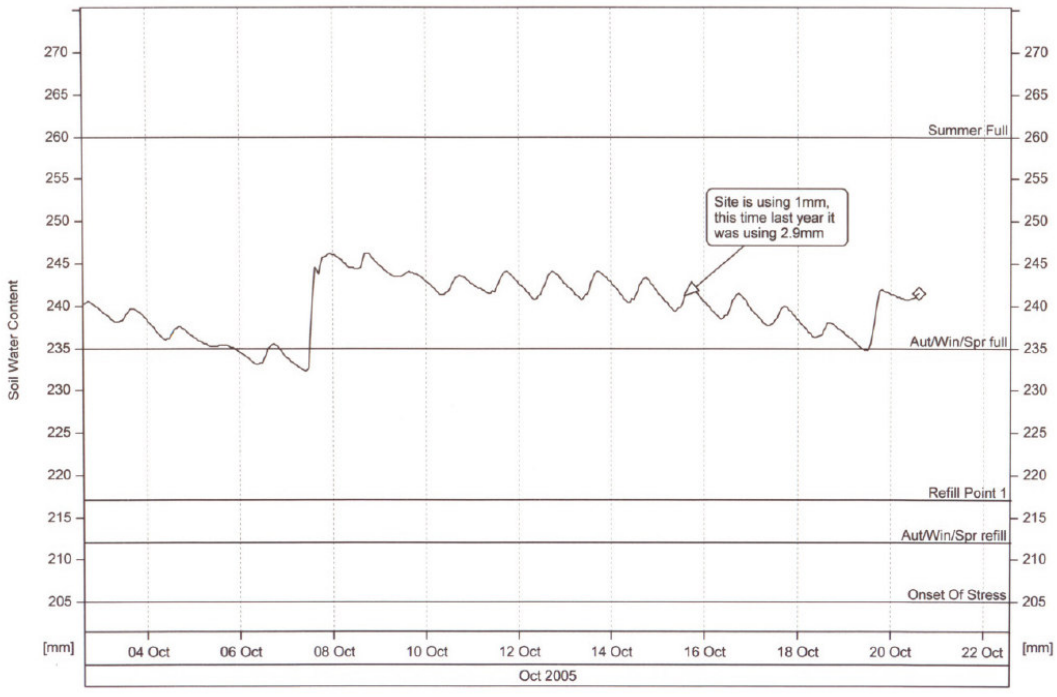
SUNRAYSIA AGRONOMY
14 Tenth St
MILDURA VIC 3500
Ph: 03 5018 7700
Fax: 03 5018 7799
Email:
services.sun@yandillapark.com.au

ADELAIDE OFFICE
33/239 Magill Road
MAYLANDS SA 5069
Ph: 08 8366 6541
Fax: 08 8366 6501

EnviroSCAN ® Summed Graph - Interpolated	Logger ID: Wrate	Last Download: 20/10/2005 02:44:04 PM
Site ID's: Chardonnay		
Probes: P1	Sensor Depth (cm): 10 + 30 + 60 + 90	
Comment:		

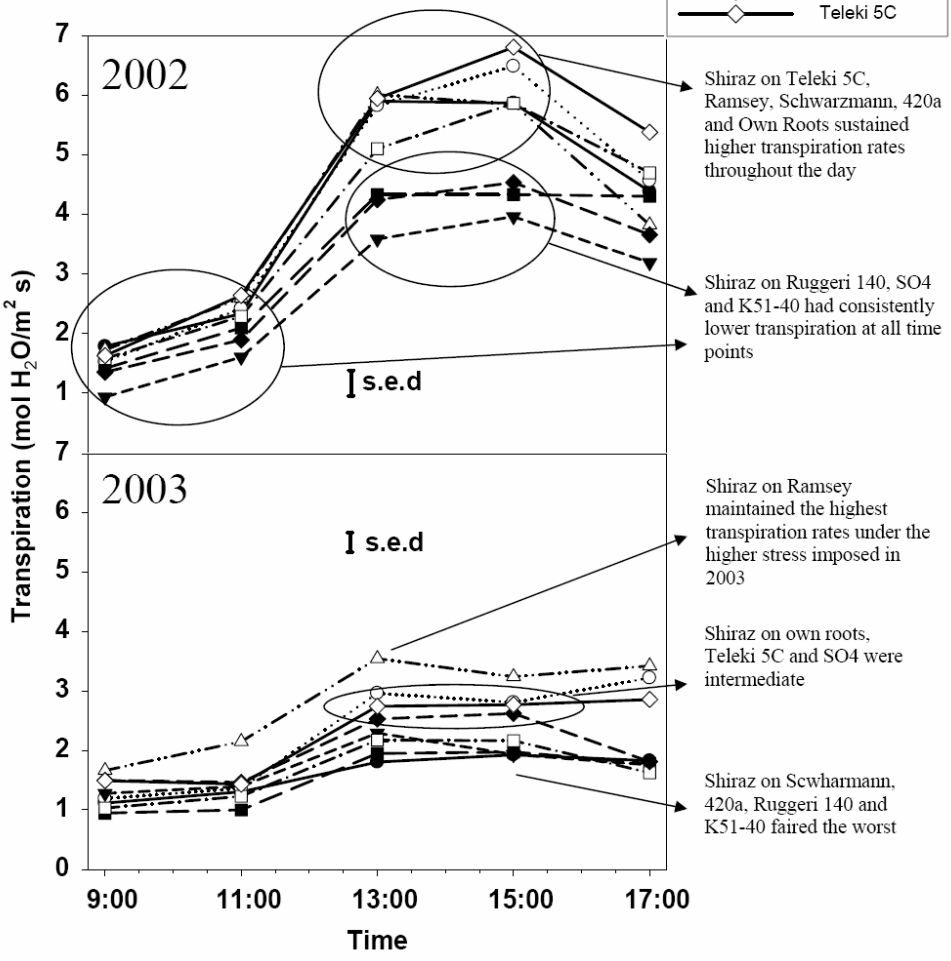


EnviroSCAN ® Summed Graph - Interpolated	Logger ID: Wrate	Last Download: 20/10/2005 02:44:04 PM
Site ID's: Shiraz		
Probes: P2	Sensor Depth (cm): 10 + 30 + 50 + 70	
Comment:		



Dr Chris Soar

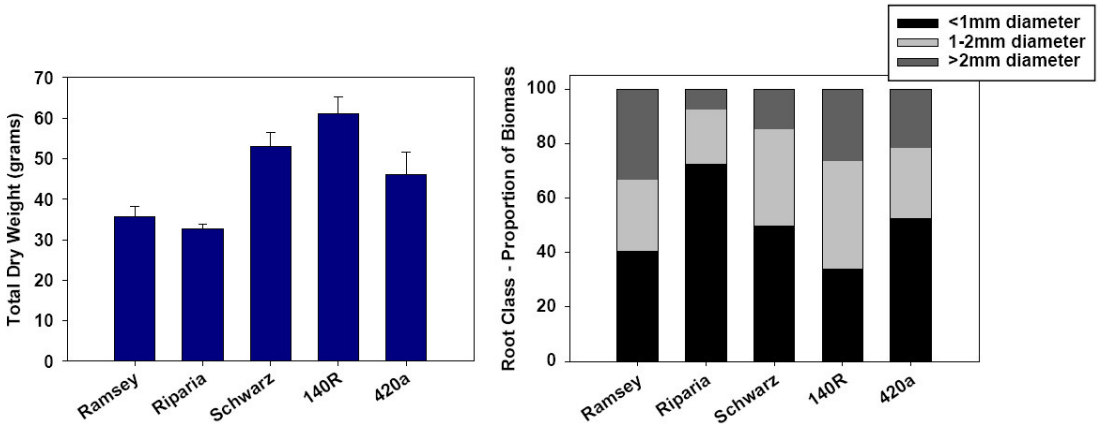
Rootstocks and Drought Tolerance



- High vigour rootstocks had higher rates of leaf water use
- 2003 had 1/2 the water inputs of 2002,
  - Leaf transpiration on all rootstocks was reduced in 2003
  - Shiraz on Ramsey, Teleki 5C and own roots maintained higher rates than other rootstocks under stress
  - More drought tolerant
- Ruggieri 140 struggled more than expected
  - Interaction with environment is important!

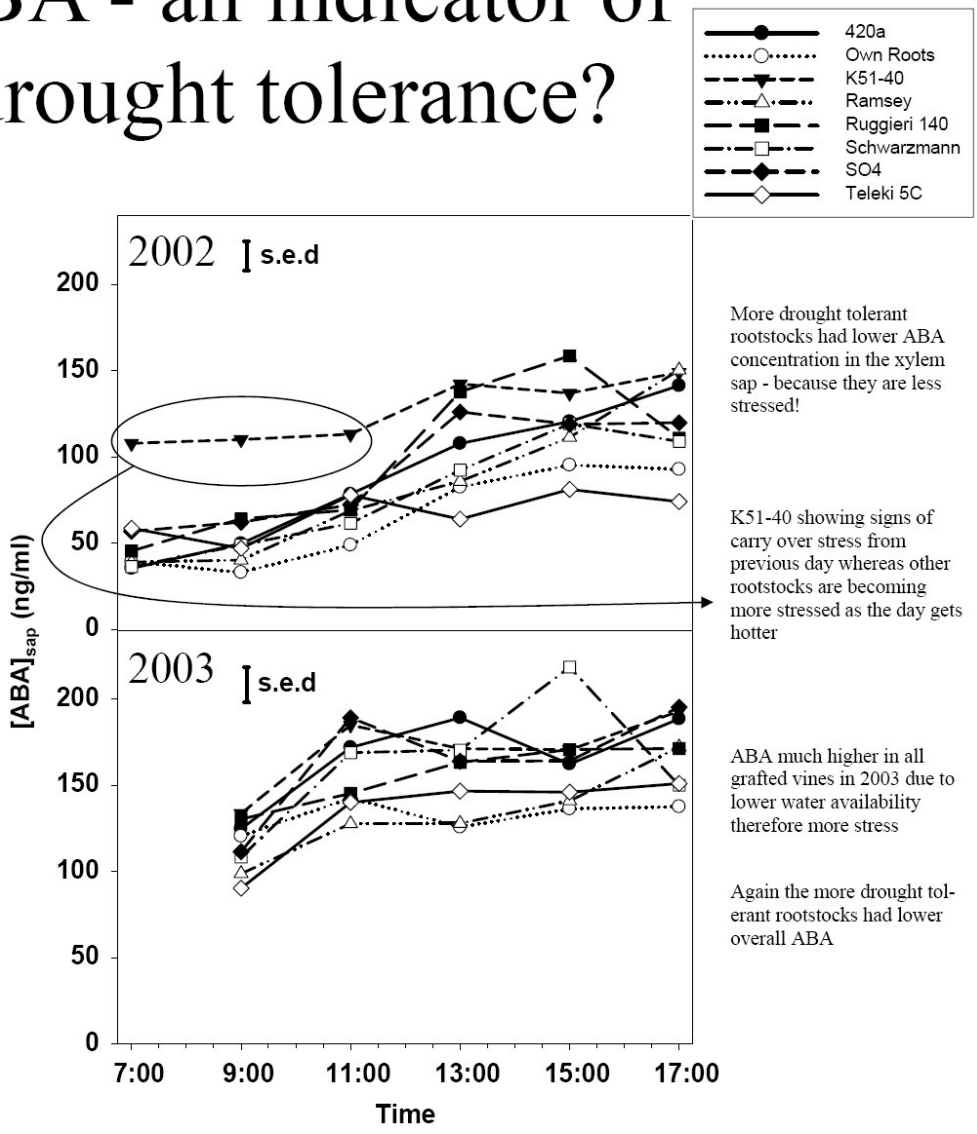
Root Growth and Structure

Ramsey **Ruggeri 140** **Riparia Gloire** **Schwarzmann** **420a**



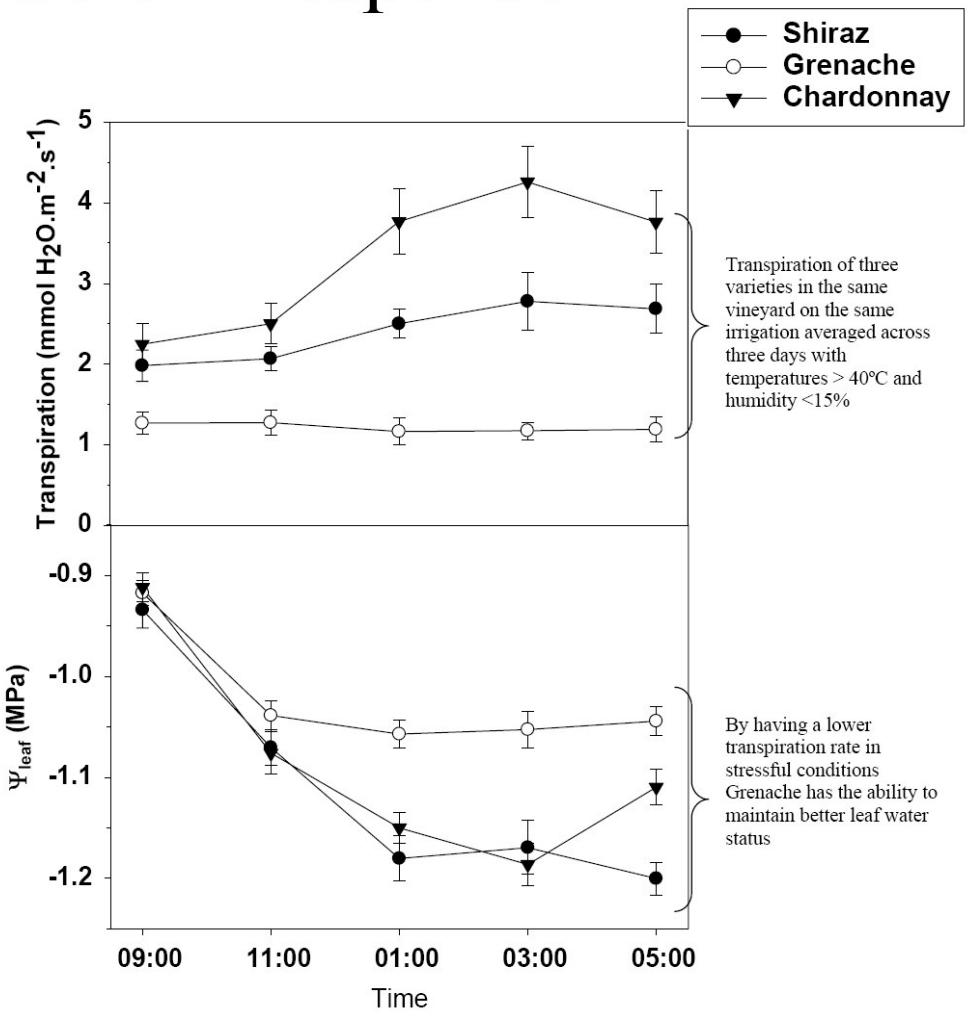
- Rootstocks vary considerably in root architecture
- Drought tolerant rootstocks seem to have a greater proportion of thick roots
- Drought susceptible rootstocks seem to have a lower proportion of fine roots

ABA - an indicator of drought tolerance?



- The stress hormone (ABA) is high in the sap of graft combinations that seem to be stressed!
- May be a useful indicator of drought tolerance in breeding trials
- In this example an increase in ABA appears to be a leaf response to a drop in leaf water status rather than a root signal

Scion Response



- Varieties respond differently to water deficits
- Pessimistic varieties such as Grenache are more responsive to stress than the optimists such as Shiraz
- Likely to respond differently to rootstocks and irrigation management

Key Points

- Rootstocks have the potential to dramatically influence the drought tolerance of a grafted scion variety
- Drought tolerance did not improve transpiration efficiency but may result in better overall vineyard WUE through reduced irrigation requirement
  - Canopy management will be a factor
- Differences in root structure are likely to be an important factor in determining drought tolerance
  - Soil volume explored and the ability to supply water to the shoots
  - Genotype x environment will be very important
  - Explains some of the variation in reported drought tolerance
  - This is an area we currently do not have enough information about
- Scion varieties have evolved different strategies for coping with water stress
  - This should be a management consideration
  - Different varieties are therefore likely to have varying sensitivity to use of rootstocks
  - Currently the focus of further study (GWRDC funded project)

Dr Chris Soar
Research Scientist
CSIRO Div. Plant Industry
Entry No. 2 Hartley Grove Road
Urrbrae, South Australia 5064

Postal Address:
PO Box 350
Glen Osmond
South Australia 5064

Phone: 08 83038613

DRIP IRRIGATION CAN DEGRADE SOIL STRUCTURE

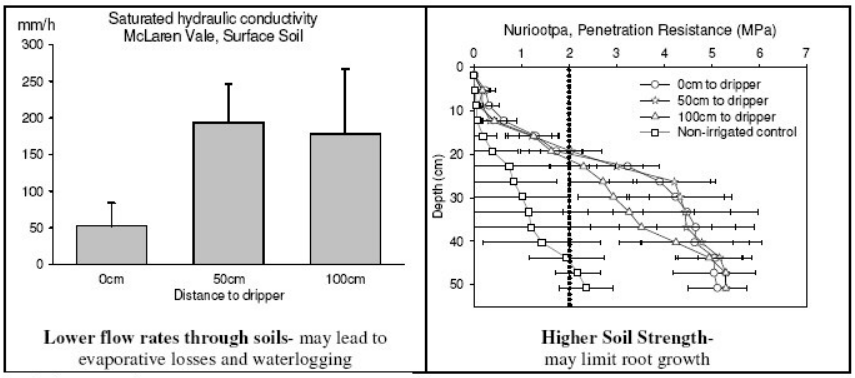
Dougal Currie, CRCV, Adelaide University

⇒ Maintaining good soil structure is vital to grapevine performance and water use efficiency
- Soil structure controls the flow of air, water and nutrients to roots

⇒ Irrigation can degrade soil structure by:
- Changing the nature of water flows through soils
- Changing a soil's chemical composition

⇒ The relationship between soil structure and irrigation water can be demonstrated by leaching soil columns (of different sodium levels) with waters of different salt concentrations:
- More sodicity (soil-sodium levels often promoted by irrigation) leads to dispersion (structural breakdown). **But** dispersion occurs when the salinity of the irrigation water is decreased, not if a high salt concentration is maintained.
- **Structural breakdown occurs when a soil of high sodicity is exposed to waters of low salinity** (ie during rainfall or with less saline irrigation).
- This process has been demonstrated in Barossa Valley where long-term irrigation with saline borewater promoted sodicity. Use of gypsum was also studied as an effective way to break the chemical cycle, but can it undo the structural damage?

⇒ What is the impact of irrigation on soil properties that control plant water availability?



Lower flow rates through soils- may lead to evaporative losses and waterlogging

Higher Soil Strength- may limit root growth

⇒ Other questions to answer
- How will changes in soil physical properties affect transpiration/plant performance?
- How do grapevine roots cope with higher soil strengths?
- Does soil drying influence soil structure?

⇒ Implications for Murray Valley growers
- Different soil types, but it's likely that irrigation is increasing sodicity.
- Higher levels of irrigation vs rainfall (compared to wetter growing regions) may maintain structure by keeping soil water above threshold salinity concentrations.
- **But** soil structural problems may emerge if soils are exposed to only rainfall for a number of seasons, if less saline waters are used for irrigation, or if irrigation systems are dramatically changed.

Cooperative Research Centre for Viticulture

Dougal Currie
Soil & Land Systems,
Adelaide University, Waite Campus
PMB 1 Glen Osmond SA 5064
dougal.currie@adelaide.edu.au
ph: 08 83037284

ADELAIDE UNIVERSITY AUSTRALIA

Cooperative Research Centre for Viticulture

Irrigation Field Walks

Mulching and Irrigation Management

Nicole Dimos

www.crcv.com.au

Cooperative Research Centre for Viticulture

The CRC for Viticulture is a joint venture of these core participants:

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 management from vine to palate.

Australian grape growers and winemakers 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.

www.crcv.com.au

Cooperative Research Centre for Viticulture

Viticare Trials in the Murray Valley

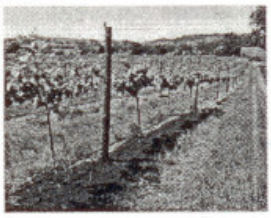
Mulching and Irrigation Management project aims:

- Compare the effects of soil water retention on straw mulch application
- Compare fruit quality and yield
- Assess soil fertility, soil temperature, canopy and vine health
- To assist in irrigation management decisions by demonstrating different soil moisture monitoring equipment

www.crcv.com.au

Cooperative Research Centre for Viticulture

Trial site



- 8 y.o. Merlot
- Drip irrigated
- Soil pH 7.7-9.4 (with depth)
- 0.9% soil organic matter
- Sandy heavy clay soil type at root depth
- Mulch applied end Oct.

www.crcv.com.au

Cooperative Research Centre for Viticulture

Impacts of Alkaline Soils

- Nutrient deficiencies: Zinc and Iron
- At pH 9.2+, little root growth occurs, defining the depth of the rootzone affecting readily available water (RAW)
- At pH >8.4, soils can become alkaline sodic

- Sodic soils generally have:
  - Poor physical properties
  - Are prone to crusting and hard-setting and
  - Provide a very poor environment for roots

www.crcv.com.au

Cooperative Research Centre for Viticulture

Things to consider

- Cost - straw can cost from $300-500/ha compared to $1200+/ha for composts
- Shelf life of mulch
- Organic N is slowly released to the vines, and up to 15% is available in the first year. This ultimately leads to reduced fertiliser inputs
- Cooler soil temperature leads to cooler vine temperature can lead to better colour and phenolic development

www.crcv.com.au

Mulches

Advantages	Disadvantages
Conserves soil moisture through reducing evaporation	Can cause waterlogging in areas of poor drainage
Reduced weed growth	Increased frost and fire risk
Constant & lower soil temperature	Benefits are slow to appear (3 years)
Improved soil pH and structure near soil surface (reduced soil crusting)	High K levels may deplete Mg level which may lead to stuck fermentation
Addition of organic matter increases level of nutrients in the soil	Can cause increased, unwanted vigour due to increase in macronutrients and be aware of mulch contents (salts)
Encouragement of earthworms & micro-organisms	Coarse mulch may provide shelter for pests

Earthworms

Benefits of worms:

- Improved soil structure
- Water infiltration can be five times higher
- Earthworm channels help rain/irrigation water deeper into the soil profile
- Increase nutrient availability

Earthworms like:

- Good supply of organic matter
- Moist soil – the longer soil is moist, the longer they're active
- Soil without chemicals
- Soils with a pH between 5 - 7.5

Mulching and Irrigation Management

2 treatments - straw mulch, no mulch

- Soil surveys (EM38)
- Soil moisture monitoring
- Water stress symptoms (leaf orientation, leaf colour)
- Canopy variability through visual observations (incl. health)
- Nutrient analysis (petioles)
- Canopy and soil temperature
- Maturity, grape quality and yield analysis
- Berry colour development
- Soil OM and earthworm counts
- Pruning weights

Harvest Results

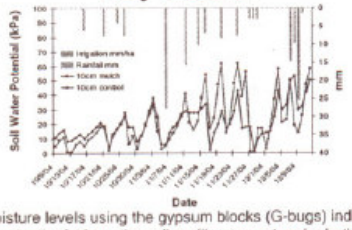
FRUIT PARAMETER	Road end MULCH	Road end CONTROL	Dam end MULCH	Dam end CONTROL
No. bunches/transect	56	44	50	47
Average berry wt (g)	0.93	1.032	0.963	1.045
Baume	13.97	14.28	14.13	14.13
pH	3.773	3.811	3.795	3.779
TA (g/L)	5.316	5.370	5.419	5.729
Colour (mg anthocyanins g/berry wt)	1.261	1.178	1.260	1.225
Phenolics (Absorbance units g/berry wt)	1.706	1.665	1.752	1.726
Yield (kg)/transect	0.46	0.49	0.48	0.46

Vine characteristics

- Reduced maximum and minimum canopy temperature.
- No significant differences in pruning weights
- Moderate shoot lengths (80-110cm long)
- Low lateral numbers

- Uneven berry ripening
- 'hen' and 'chickens'
- Zero disease incidence

Key Results



Soil moisture levels using the gypsum blocks (G-bugs) indicated that at a depth of 10cm, the soil profile was wet under both straw and bare areas.

Cooperative Research Centre for Viticulture

Best and worst

Results after 1 season:

- Grower feels that vine health has improved
- Irrigation scheduling has improved
- Problems with straw mulch not being applied thick enough

Cooperative Research Centre for Viticulture

Contact details

For further information on Viticare trials in the Murray Valley, please contact:

Nicole Dimos
Regional Support Officer (Murray Valley)

Ph. 5051 4540
Fax. 5051 4523
Mob. 0417 118 653
Email. nicole.dimos@dpi.vic.gov.au

www.crcv.com.au

Viticare Trials

Trial Results from Mudgee, NSW

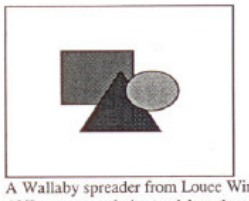
Clarrie Beckingham
District Horticulturist – Mudgee
NSW Department of Primary Industries,
Ph 02 6372 4700, Mob 0427 900 135
clarrie.beckingham@agric.nsw.gov.au

Cooperative Research Centre for Viticulture

ASSESSING UNDER VINE PRACTICES FOR SUSTAINABLE SOIL & WATER MANAGEMENT

A Cooperative research Centre for Viticulture Viticare trial commenced during October 2004 at Gelland Vines, Cooyal in Mudgee with the aim of exploring ways in which the environmental performance of Central Ranges vineyards can be developed.

The trial was identified as a regional priority following a survey of key viticultural representatives in the region.



A Wallaby spreader from Louee Wines applies ANL composted vine mulch to the trial

The trial treatments on drip irrigated Cabernet Sauvignon included:

- Straw (2.5 large round bales per 300meters of row)
- ANL Vine Mulch®, (50cm wide by 10cm deep)
- No till treatment of slashing (2 slashings)
- Cultivation treatment (2 cultivations)
- Conventional herbicide (2 post em herbicides)

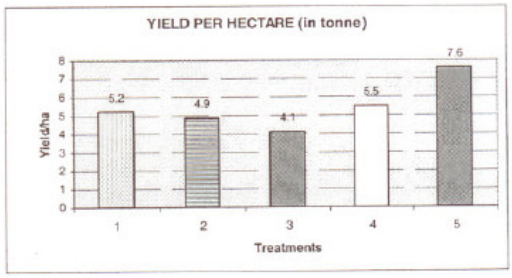
In the first year of this trial the aim was to assess the effects of these treatments on weed control, soil moisture, soil temperature, fruit yield and quality.

All treatments received the same amount of irrigation and the mid-row practice of mowing was common to all treatments. The average annual rainfall in Mudgee is 670 mm and this season was dryer than this average with low levels of rain during the ripening months. The irrigation requirement in the trial vineyard site varies with the seasons ranging from approximately 2 ML in a dry season like the one just past and 1 ML in a wet season. The soil on this trial site is a red brown podzolic.

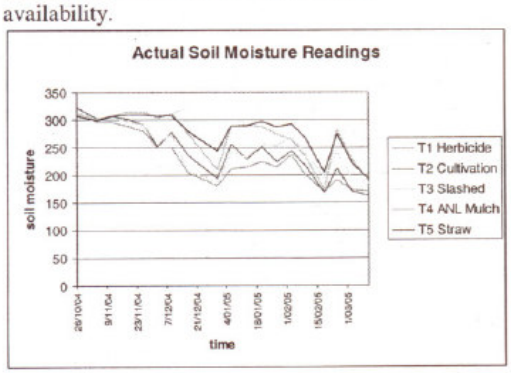
These conditions need to be considered if you are interested in applying any of these treatments to your conditions since the performance of the trial treatments will vary with soil , weather, irrigation conditions & other practices influencing soil moisture and canopy conditions.

Results Year 1

 # Yields: Straw mulch produced the highest yield, followed by ANL Vine Mulch®. Cultivation and herbicide were similar, slashed yielded lowest. Largest bunch size was achieved with the mulched treatments. For this first season, Vine Mulch® had a lower bunch number compared with straw mulch.

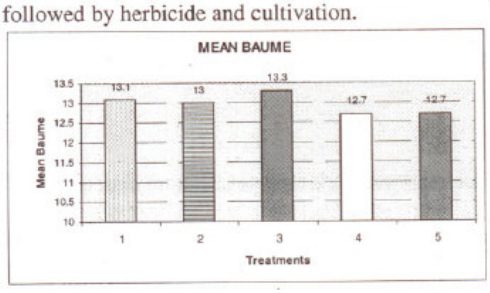


 # Moisture Conservation: Using a Diviner probe, soil moisture was monitored weekly throughout the growing season. For the mulch treatments, soil moisture was retained longer, lower fluctuation due to weather conditions and indicated an estimated 10 % more water availability.

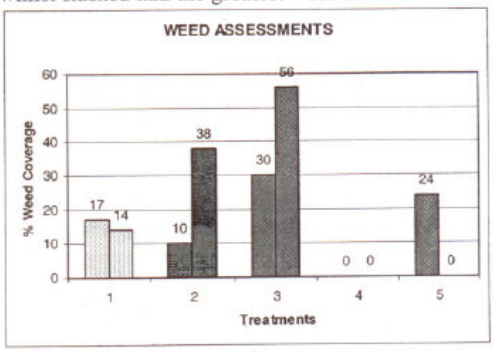


 # Fruit Quality: There appeared to be no negative effects on pH or Titratable acidity (TA) with any treatments.

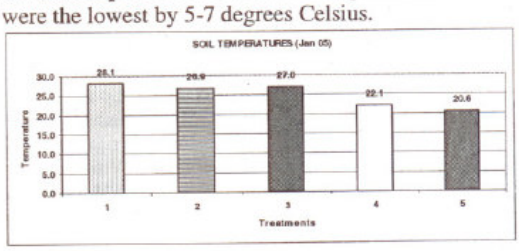
 # Fruit Ripening: Mulched treatments ripened a little slower whilst slashed ripened fastest followed by herbicide and cultivation.



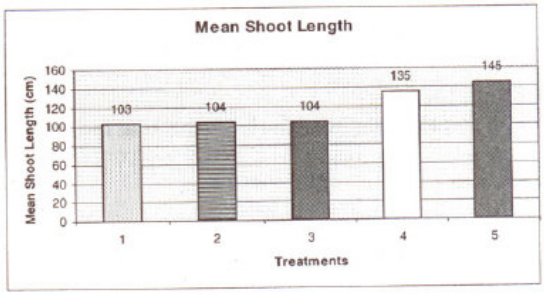
 # Weed Control: ANL Vine Mulch® provided complete control of weeds. Straw mulch also produced good weed control but required one spot spray to control self sown cereals. Herbicide and cultivation had more weed presence; cultivation being more of a problem, whilst slashed had the greatest weed numbers.



 # Soil Temperature: Mulch soil temperatures were the lowest by 5-7 degrees Celsius.



 # Canopy Effects: Shoot length was increased as a result of the mulch treatments which is likely to be a secondary effect from addition moisture availability.



Summary

Mulches have not been widely accepted but these results indicate a potential to increase yields, assist with moisture conservation, control weeds, minimise temperature fluctuations of the soil and develop soil health through providing organic matter and minimising herbicide use. The potential negative effects include slower ripening and more vigorous canopies exposing the fruit to more disease pressure but only if irrigation cannot be decreased to manage these effects.

Cultivation & slashing do not require herbicide use. Cultivation however disturbs the soil, potentially doing damage to soil structure and the results indicate stimulation of seed germination resulting in high numbers of weeds found between cultivations. Slashing does not disturb the soil structure and improvements would be expected due to organic matter and root structures however the effects of this treatment include decreases in yield & increases in ripening rate compared to herbicide use.

The most beneficial treatment would depend on what is trying to be achieved. For example in the wettest area of the vineyard mulches would not be suitable and slashing might be best, while in the dryer areas of the vineyard mulching might be beneficial at increasing vine performance. The variation between sites and within sites needs to be considered to identify the most suitable practice for the conditions.

These results were presented at the recent Mudgee Symposium in June and a farm activity will be organised during the next growing season to generate regional discussion about these trial results.

Acknowledgments

The trial team includes,
Mr Warren and Mrs Stephanie Gelland (Grower Co operators)
Ms Sheri Robinson (Trial Advisor) CRCV),
Mr Clarrie Beckingham,Regional Coordinator CRCV)
Mr Bernard Blackley (Grower Co operator)
Dr Neil Coombes, (Biometrician)
Mr Ben Bryant,Orlando Wyndham,(Fruit Analysis)
Mr Mark Roth (Straw Mulch Application)
Mr Phil Murray (Vine Mulch Application)
Mr Jon Harris,Australian Native Landscapes (Composted Vine Mulch)
Ms Thea Ridley,PB Ag Consulting (Irrigation Data)
Mudgee Wine Grape Growers Assoc Viticulture Sub Committee
Mr Richard Plummer NSW DPI (Trial Management)
Graphs by Mr.Bernard Blackley

Future Direction

This trial will continue in 2005 -06 and further results will be available next year. Future measurements will include:

- Altering water application based on savings water use from the results to compare these practices under altered water use situations.
- Soil health measurements
- Potassium levels will be measured in petioles at veraison to ensure excessive levels are not occurring as a result of the ANL vine mulch treatment.
- Assess costs vs benefits.

Potential Benefits from this trial include identifying practices which:

- Improve environmental performance of vineyards and wineries
- Lower water use
- Improve yield
- Provide soil health benefits
- Decreased herbicide use
- Have a cost benefit

Viti-Notes

www.crcv.com.au 2005

Cooperative Research Centre for Viticulture

Current topics in this Vitinotes series include:

Viticare On Farm Trials Report

Managing soil moisture and weeds using straw and composted mulch

TRIAL AIM:

Assess the effect of different types of surface mulches on soil water retention and weed suppression in a vineyard.

The use of mulches can have a number of functions in a vineyard, two of which are the conservation of moisture in the soil profile and suppression of weeds. Soil moisture retention is brought about principally by the protection of the soil surface from water loss through evaporation, and weeds can be suppressed through reduced or zero light levels on the soil surface.

A local viticulturist participating in the CRCV On farm Trials Project set up a trial in an own-rooted Cabernet Sauvignon block in a vineyard in the Yarra Valley in Victoria. This trial was conducted over two seasons from 2001 to 2003 and since this site received no irrigation there was interest in conserving soil moisture and decreasing herbicide use.

To assess the effectiveness of mulches to achieve this aim a 'control' (the current practice) and 2 different mulch treatments were applied under vine.

Control:	Maintain bare soil under vines using herbicides
Treatment 1:	Spread purchased cereal straw
Treatment 2:	Spread purchased composted mulch product

Regional and site details

The vineyard is situated in a cool climate region with moderate to high rainfall of approximately 770mm per annum. The site is not irrigated at all and this is why mulching is of particular interest. The vines are grown on hard mottled yellow duplex soil, mainly silty loam overlying yellow clay. The trial was replicated four times in both high and low lying areas of the vineyard to assess how the treatments performed under possibly different conditions.

Measurements

During the course of the trials, a number of measurements were made at different times during the season to track the behaviour of vines in relation to the treatments in both the control and treatment areas. These measurements included:

- Soil water content - using gypsum blocks (every 5 days).
- Weed counts in February and April.

TRIAL RESULTS

Soil moisture

In both years of the study there was a significant difference in soil moisture levels measured at 200mm and 400mm below the surface between the control and the two treatments. In the first year of the trial the weather was particularly wet in the region, the soil in the herbicide treatment showed drying and wetting (between 60-400kPa) at both 200mm and 400mm while the straw and composted mulch treatments did not allow the soil to dry out past 60kPa. In the second season, regional rainfall was significantly below average.

The soil in all three treatments dried out, but this occurred more slowly in the straw treatment delaying the drying of the soil by around a month compared to the composted mulch and herbicide treatments. Additionally straw and mulch were effective in both the low lying and higher areas of the vineyard.

Weed cover

Monitoring for weeds was undertaken at two different times towards the end of the growing season prior to herbicide applications in the second year of the trial only:

- The number of weeds was significantly higher in the herbicide control on both occasions.
- The weed cover was relatively low overall (no greater than 20%).
- By the time of the later assessment, despite the lower number of weeds the % weed ground cover between the composted mulch and the herbicide treatments were not significantly different from each other but were significantly greater than the straw treatment.
- The composted mulch treatment suppressed the number of weeds, but had a high % weed ground cover, possibly due to high levels of nutrients in the compost mixture promoting growth of those weeds that were able to germinate.
- Straw suppressed weeds the best at both monitoring times, with low numbers or almost no weeds present and almost no weed cover.

Trial outcomes

- The grower determined from this trial that straw was a much better alternative than selected composted mulch as the composted mulch product used was somewhat water resistant, not very durable and was not very good at controlling weed growth, whereas the straw proved durable, retained moisture well and acted as an effective weed suppressant.
- This grower continued to apply straw throughout the vineyard and also purchased more gypsum blocks to continue monitoring soil moisture levels.

The Cooperative Research Centre for Viticulture would like to acknowledge the participation of Sheri Robinson, Natalie Laukart and Natalia Tostovrsnik, and the contributing OFT teams in the preparation of this Vitinote.

Further information

Product or service information is provided to inform the viticulture industry about available resources, and should not be interpreted as an endorsement.

The information in this Vitinote has been trialed by viticulturists as part of the Cooperative Research Centre for Viticulture's *Viticare Participatory On Farm Trials* project. The treatments and results from these trials apply specifically to the regions and vineyards in which they were conducted - modifications to treatments may be required or different results achieved from at sites. For details to design a similar trial in your own vineyard please contact Sheri Robinson at shrobinson@csu.edu.au

For information about *On Farm Trials* (CRCV Viticare Trials) visit www.crcv.com.au/viticare/projects/

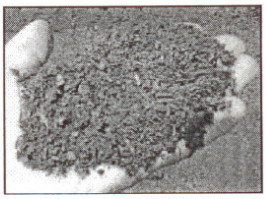
Visit the web site at www.crcv.com.au/viticare/vitinotes/ for updates and more Vitinote titles.

Department of Primary Industries

Compost for Wine-Grape Growers

Fact Sheet 1: What is Compost?

Compost is partially decomposed organic matter produced by naturally occurring microorganisms. Compost is a dark, crumbly mixture that can help improve the chemical, physical and biological properties of soil. Compost will often have an earthy smell and its odour should not be unpleasant.



Quality compost products can be used to:

- improve soil quality;
- reduce use of water, fertiliser and pesticides;
- increase productivity, and
- reduce nutrient run-off and soil erosion.

How is compost made?

Many different organic materials can be safely composted, including: animal manures, garden organics (eg grass, tree prunings etc), food, wood, shellfish & other fish by-products, wool & hair and biosolids. Many of these ingredients can be composted on their own, but the best result often occurs when a number of materials are blended together.

Typically organic materials must be shredded or pre-processed and mixed in a balanced and consistent 'recipe' to ensure optimal conditions for biodegradation to produce high quality and uniform compost.

Naturally occurring microorganisms then begin the process of rapid breakdown of the organic materials by using the available food (principally carbon and nitrogen), water and oxygen to grow and multiply. The microorganisms generate heat as they break down the organic matter. This heat (usually in excess of 55°C) is very important as it kills weed seeds and disease causing organisms.

Sheets in this series

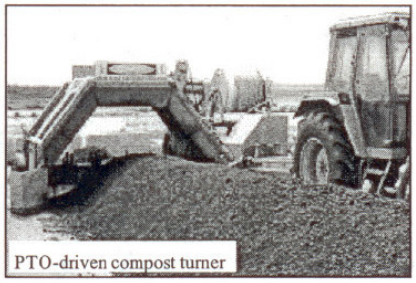
This is the first fact sheet in a series for wine-grape growers. These sheets will provide you with information about composting, compost products and how to best use them to suit your needs.

Victoria The Place To Be

ecoRECYCLE VICTORIA

Department of Agriculture

For quality control purposes, composting conditions are monitored regularly, usually by recording moisture content and the internal temperature at several locations within a heap. Heaps are turned frequently for aeration and to mix the outside into the centre (e.g. see picture).


PTO-driven compost turner

The entire process is usually complete within 8 to 24 weeks, at which point the compost cools down, and the rate of breakdown slows. The compost is then screened to remove rocks and contaminants and to produce a product with the desired particle size grading (ie coarse or fine grade). This is the point at which composts are most versatile, and can be used for many plant growth and soil conditioning purposes.

Compost quality

Quality composts are safe to use, meet both industry and government standards and are also 'fit for purpose' .

It is important to first identify why you want to use compost and what you want to achieve. When you have done this, talk to a supplier of quality compost that can help you select the right product for your requirements. The highest form of guarantee for compost is certification to the Australian Standard for Composts, Soil Conditioners and Mulches (AS 4454-1999).

These standards ensure that compost will be safe to use but do not necessarily determine which use they are best suited for.

Further information is available from:

Primary Industries Research Victoria (PIRVic) Knoxfield Centre, Private Bag 15, Ferntree Gully Delivery Centre, Victoria 3156. Phone: 9210 9222 www.dpi.vic.gov.au

EcoRecycle Victoria Level 2, 478 Albert St. East Melbourne 3002 Phone: 9639 3322 www.ecorecycle.vic.gov.au

Department of Agriculture, Western Australia, Locked Bag 4, Bentley Delivery Centre, Western Australia 6983 Phone: 08 9368 3333 www.agric.wa.gov.au

ISBN 1 74146 283 5; Set ISBN 1 74146 282 7

Department of Primary Industries

Compost for Wine-Grape Growers

Fact Sheet 2: Why Use Compost?

Australian soils generally have low natural fertility, low organic matter levels and are fragile to intensive agricultural practices.

Farming practices have lead to problems like compaction and erosion, which eventually lead to lower soil productivity. These problems are exacerbated when soils are depleted in organic matter. Less productive soils require higher inputs of fertilisers, pesticides and water - at a cost to the grower and the environment.

Compost trials across Australia have shown improved soil moisture levels and other aspects of soil quality including, soil organic matter, moisture holding capacity, bulk density, cation exchange capacity and pH. Grape yields in many trials have been improved without any detriment to fruit quality.

Compost is not a 'silver bullet' solution, but it can be an important tool for improving soil quality and crop performance.

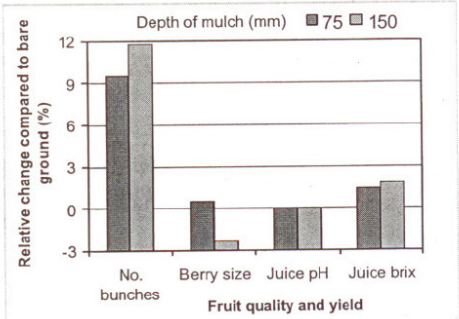
Sheets in this series

What makes compost so valuable?

Compost is a versatile material that can improve the physical, chemical and biological fertility of soil.

In Australian viticulture, compost is used most frequently as a mulch under vine. While soil structure also improves, the main benefits attributed to mulching are improvements in soil water content and weed control.

Compost contains and contributes to the development of soil humus, which is an advanced state in the decomposition of organic matter. Humus is responsible for many of the benefits usually attributed to soil organic matter and compost. These benefits are outlined below.

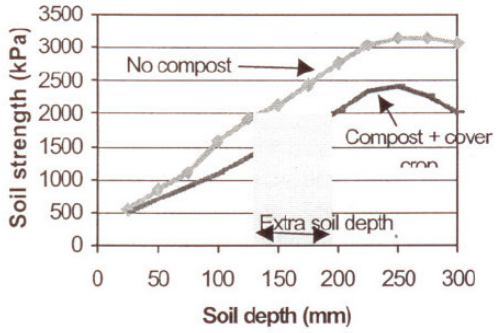


Trials in South Australia with composted mulches showed large yield increases in young vines without a reduction in fruit quality. The yield increases were found to be due to an increase in the number of bunches surviving at harvest. Source: After Buckerfield & Webster, Aust Grapegrower and Winemaker Oct 2001

Quality composts can:

Improve Soil Structure

Incorporation of organic matter reduces soil bulk density by promoting the formation of soil aggregates ('clods') which improve the friability of the soil.



Incorporation of compost at 45m³/ha together with a cover crop reduced soil compaction (measured as 'soil strength') and increased the effective depth of a clay loam soil by 60 mm. Root growth at field capacity is severely restricted above 2000 kPa. Source: K. Wilkinson, DPI, Vic.

Heavy soils become more 'open' or porous and their workability, aeration, drainage and potential moisture availability improves. Composts used on lighter soils improve water holding capacity as well as aeration and drainage.

Improve nutrient management

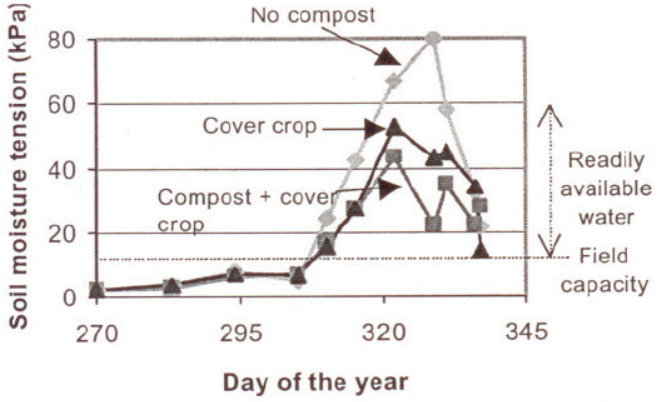
Compost contains a range of nutrients and trace elements required for most crops.

Many of these nutrients are not immediately available to a crop because they are bound up in organic matter. Nutrients become available as a result of the ongoing decomposition of soil organic matter. Though composted mulches are not normally needed for their nutrient content, they can provide useful quantities of nutrients. Repeated application of compost could quickly supply all the nutrient requirements of vines, especially when it is used in combination with cover crops. Organic matter in the soil holds on to nutrients, keeping these in the root zone where plants can use them. This means less nutrients lost, lower demand for fertilisers, and less potential pollution of waterways and groundwater from nutrient run-off.

Quality composts can:

Increase soil moisture

Use of compost as a mulch under vine reduces evaporation. Conservatively, a 10% reduction in irrigation water requirements can be expected from mulching. Additional improvements in soil water content also result when soil organic matter levels increase from the use of mulch or when compost is incorporated. This is due to improvements in soil aggregation. Soil aggregates create a vast network of pores that range in size from fine capillaries to relatively large voids. These capillaries together with humic substances greatly increase soil moisture holding capacity.



Incorporation of compost at 45 m³/ha together with a cover crop increased the readily available water (RAW) content of a clay loam soil. RAW is the amount of water in soil that is easily obtainable by plants. Source: K. Wilkinson, DPI, Vic.

Support beneficial soil organisms

Soils with high organic matter content usually support a vast number of organisms ranging from relatively large worms and arthropods to nematodes, fungi, protozoa and bacteria.

These organisms play important roles in nutrient cycling and soil aggregation. Biologically active soils are less likely to support disease-causing organisms. Compost has been shown to contain certain micro-organisms that can suppress or kill disease causing organisms such as root rots and nematodes. Trials in vineyards have shown increases in earthworm activity in soils under composted mulches. Earthworms assist soil aeration, moisture penetration and the incorporation of organic matter from decomposing compost into the soil profile.

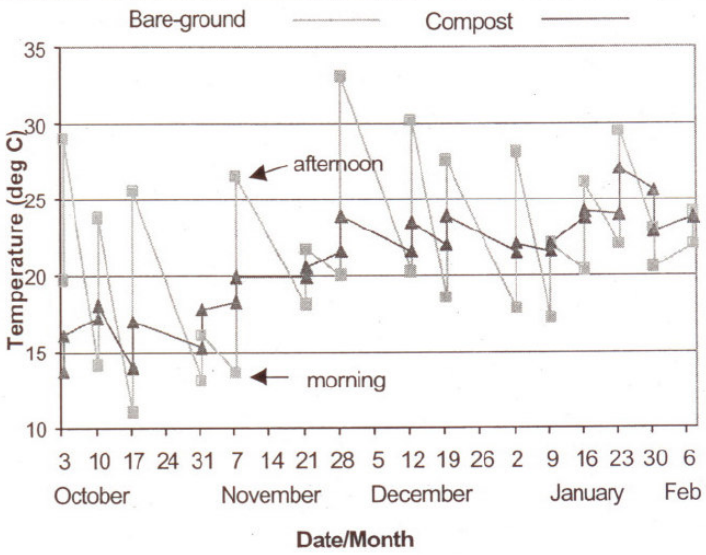
Reduce weed growth with mulching

Compost helps control weeds when it is used as a mulch under vine. It can reduce the need for spraying by more than half over the life of the mulch (about 3 years).

Quality composts can:

Reduce soil temperature fluctuations with mulching

Compost helps reduce the extremes of soil temperature when it is used as a mulch under vine. This reduces the stress on the vine, especially during summer, and reduces the likelihood of crop losses.



Soil temperatures at 5 cm depth fluctuated less under composted mulch than bare ground from Oct 2000 to Feb 2001. Temperatures were recorded in the morning and mid-afternoon of the same day. Source: P. Wong, NSW Agriculture

Stop Press

Very large yield increases have been observed in some cases with the use of composted mulch under young vines. These yield increases occurred without detriment to fruit quality. Under these conditions, the use of compost is highly profitable.

In most cases only small yield increases are needed to cover the cost of mulch application. Alternatively, compost can be used profitably to improve productivity in the parts of a vineyard where the vines are really struggling.

Further information is available from:

Primary Industries Research Victoria (PIRVic) Knoxfield Centre, Private Bag 15, Ferntree Gully Delivery Centre, Victoria 3156. Phone: 9210 9222 www.dpi.vic.gov.au

EcoRecycle Victoria Level 2, 478 Albert St. East Melbourne 3002 Phone: 9639 3322 www.ecorecycle.vic.gov.au

Department of Agriculture, Western Australia, Locked Bag 4, Bentley Delivery Centre, Western Australia 6983 Phone: 08 9368 3333 www.agric.wa.gov.au

ISBN 1 74146 284 3; Set ISBN 1 74146 282 7

Department of
Primary Industries

Compost for Wine-Grape Growers

Fact Sheet 3: Getting Started

To get the best out of compost, it needs to be used regularly as an integrated part of crop and soil management. Therefore, you need to be clear about what you want the compost to achieve and talk to suppliers about products and methods of using them that will most cost effectively meet your needs.

Use the table below to match your required outcome with the suggested product type (in general terms) and method of application. Detailed advice on product specifications should be supplied by the compost producer.

Desired outcome	Suggested approach
Better soil structure	Regular use of fine grade, stable compost of high organic matter content. Best results obtained when it is incorporated.
Reduced soil moisture evaporation	Use composted mulch under vine.
Reduced erosion on slopes	Apply compost on soil surface under vine or in the inter-row. Also consider growing a cover crop with the compost in the inter-row.
Improved establishment and growth of young vines	Incorporate fine grade, stable compost in soil at planting, and/or use composted mulch under vine.
Better nutrient management	Regular use of fine grade, stable, high nutrient compost (e.g. manure-based composts or compost/fertiliser blends); Apply by banding under the irrigation line. Alternatively use compost in inter-row together with a cover crop.
Control weed growth	Apply composted mulch under vine. Ensure that weeds are controlled prior to mulch application. Compost should contain a mixture of coarse and fine particles.

Sheets in this series

Victoria
The Place To Be

ecoRECYCLE VICTORIA

Department of Agriculture

This exercise will go a long way in assisting your compost supplier match both your production goals and target benefits with the best product to achieve them. Some suppliers will provide products at discounted rates to encourage commercial growers to try compost. For further information, contact EcoRecycle Victoria on 9639 3322.

Further information is available from:

Primary Industries Research Victoria (PIRVic) Knoxfield Centre, Private Bag 15, Ferntree Gully Delivery Centre, Victoria 3156.
Phone: 9210 9222
www.dpi.vic.gov.au

EcoRecycle Victoria
Level 2, 478 Albert St. East
Melbourne 3002
Phone: 9639 3322
www.ecorecycle.vic.gov.au

Department of Agriculture, Western Australia,
Locked Bag 4, Bentley Delivery Centre,
Western Australia 6983
Phone: 08 9368 3333
www.agric.wa.gov.au

ISBN 1 74146 287 8; Set ISBN 1 74146 282 7

Department of Primary Industries

Compost for Wine-Grape Growers

Fact Sheet 4: Choosing a Supplier

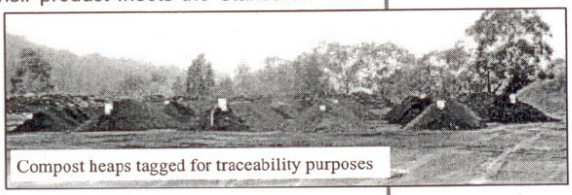
The right supplier will help you select the product that matches your broader production goals and specific performance requirements. The supplier must also meet your quality assurance requirements. The best suppliers will also work with you to develop products to match your particular specifications.

Quality assurance

Certified Product™ Australian Standard

The benchmark for compost quality in Australia is the Australian Standard for Composts, Soil Conditioners and Mulches (AS 4454). Suppliers of product to organic growers must also be organically certified.

- The highest form of guarantee is certification to AS 4454. Compost producers offering this level of guarantee undergo a rigorous review by an independent third party certifying body. Quality control and on-going compliance are key components of the certification system.
- Many compost producers are not certified to AS 4454, but provide their own guarantee that their product meets the Standard. You can still evaluate these suppliers and their products by asking a few simple questions. The checklist on the next page can help.

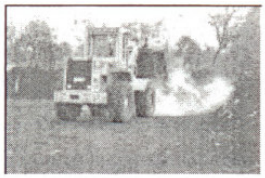


Compost heaps tagged for traceability purposes

- Compliance with AS 4454 will not necessarily meet requirements for many applications. The compost supplier must understand your needs and address your questions adequately. In particular, they need to provide you with a regular supply of consistent product and may be able to supply testimonials for specific uses.

Sheets in this series

Department of



Further information is available from:

Primary Industries Research Victoria (PIRVic) Knoxfield Centre, Private Bag 15, Ferntree Gully Delivery Centre, Victoria 3156.
Phone: 9210 9222
www.dpi.vic.gov.au

EcoRecycle Victoria
Level 2, 478 Albert St. East
Melbourne 3002
Phone: 9639 3322
www.ecorecycle.vic.gov.au

Department of Agriculture,
Western Australia,
Locked Bag 4, Bentley
Delivery Centre,
Western Australia 6983
Phone: 08 9368 3333
www.agric.wa.gov.au

Recognising certified quality compost

An AS 4454 certified product has:

- The Standards Mark ('five-ticks' logo) clearly visible ❑
- The Standards Australia Manufacturer's Licence Number visible ❑
- A specification sheet supplied with it ❑

Non-certified quality compost

Use this checklist to evaluate non-certified products and their suppliers:

- Producer guarantees the product meets the Australian Standard or other recognised standard (e.g. Organics standard) ❑
- A specification sheet is supplied with the product ❑
- Producer shows traceability from raw material to final product ❑
- Producer shows production records (e.g. temperature monitoring) ❑
- Producer regularly tests products to the Australian Standard or other recognised standard (e.g. Organics standard) ❑

Final selection criteria

Suppliers of both certified and non-certified products should be able to:

- Offer a consistent and regular supply of quality compost ❑
- Show you documented evidence of a quality control system ❑
- Answer any questions you have about the products they offer ❑
- Tell you what a product is made from and how it is made ❑
- Understand your needs and manufacture a product to suit ❑
- Rectify and improve their products based on their performance ❑
- Provide contact details of satisfied customers ❑

Whether you are interested in trying compost for the first time or require a regular supply, these checklists will give you the confidence to choose the right supplier to work with.

Composted products often need to be developed and refined with some degree of 'trial and error', so it is important to establish a relationship with a reputable supplier that you feel you can work with for mutual benefit.

ISBN 1 74146 285 1; Set ISBN 1 74146 282 7

Department of Primary Industries

Compost for Wine-Grape Growers

Fact Sheet 5: Using Compost

The type of product you choose and the method of application depends on your production goals and your specific performance requirements (see Sheet 3, Getting started). Your compost supplier should match your needs with a particular product, giving specific advice on method and rates of application. This fact sheet provides you with some general guidelines about quality criteria for compost and how it can be used in viticulture.

Compost quality

The Australian Standard (AS 4454) provides a framework for the production of quality compost and for quality assurance (see Sheet 4, Selecting the supplier). However, an Australian Standard compost also needs to be 'fit for purpose'. In general composts should be:

- Compliant with AS 4454 specifications
- Free of rocks, glass and plastic.
- Moist, but not wet or dusty
- Neutral or pleasant smelling

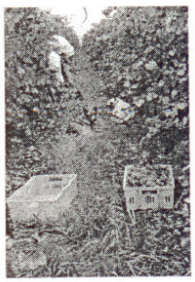
More specific compost quality specifications are included below depending on how the compost is used.

Mulching with compost

Composted mulches should have the following characteristics:

- They should be relatively coarse
- They should be of low nutrient content (e.g. total N 0.6%, total P 0.3%, total K 0.4%)
- A stable product is preferred but not essential (see 'Compost stability and maturity' below)

Sheets in this series



Victoria

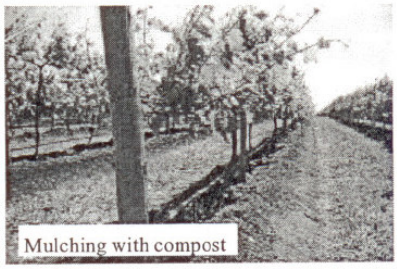
ecoRECYCLE VICTORIA

Department of Agriculture

Follow these guidelines for safe, effective mulching:

- Mulches should not hold onto large amounts of water. If the mulch is very wet and odorous after irrigation or rainfall, it may be too deep to allow water and air to flow through the mulch into the soil.
- Depending on the location of the vineyard, aesthetics may be a very important consideration. In this case, consider how good the product will look on the ground.
- A composted mulch should last at least 3 years on the ground before topping up is required. For this reason and for effective weed control, composted mulches contain mainly coarse, woody particles. Coarse particles are a more effective barrier against weeds emerging from the soil and they last longer than fine particles.
- Weeds should be controlled by chemical or mechanical means prior to laying down a mulch.
- Composted mulches are not known to exacerbate the risk of frosts occurring in the vineyard. Nevertheless, it would be prudent to avoid using mulch in high frost risk areas of the vineyard.
- Mulches should not be used in areas subject to waterlogging.

A coarse green organics compost is ideal for mulching. Apply composted mulches at up to 7.5 cm thick in a 50 cm band under the vine.



Mulching with compost

Other suggested uses for compost

Banding is an economical way of applying compost directly to vines when a mulching effect is not required or desired. A finely screened, stable product is recommended to encourage rapid incorporation of the compost into the soil by irrigation water, rainfall or soil animals.

Banding under vine

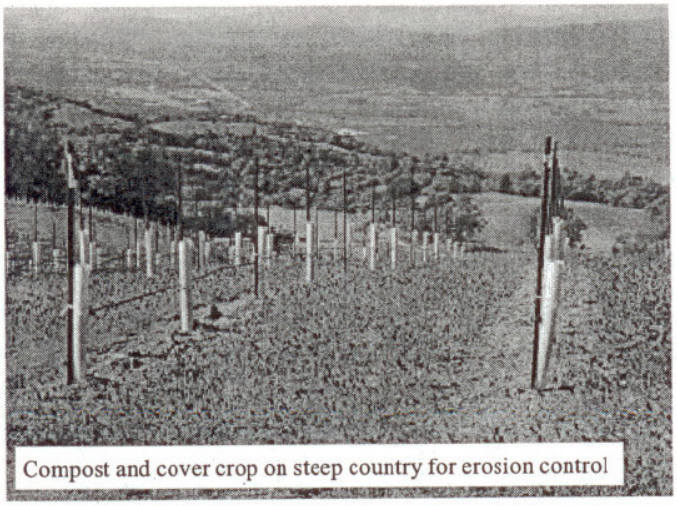
In contrast to compost used for mulching, a higher nutrient compost can be used because the rate of application is much lower. Apply compost up to 5 cm thick in a 10-20 cm band under the irrigation dripper (if present).

Compost can also be banded when establishing a vineyard. Prior to planting, apply compost up to 5 cm thick and incorporate it to 20 cm deep in sandy soil or 10 cm in heavy soil. Alternatively, and even more economically, blend compost with soil (30:70) directly in the planting hole.

Compost should be finely screened, stable and mature for this purpose.

Banding prior to planting

Compost can be used successfully in combination with cover crops in the inter-row. The combination of compost and cover crop is an effective means of encouraging nutrient cycling and building soil organic matter levels. In the example shown, a compost and strawberry clover combination was chosen in steep country to help prevent soil erosion.



Compost and cover crop on steep country for erosion control

Apply compost in the inter-row at 2 to 10 t/ha. Work this into the soil and sow the cover crop into it. Alternate inter-rows can be treated in this manner every few years, leaving them fallow in-between. If a cover-crop is required in every inter-row, top-dress with compost every year or two. Compost should be finely screened, stable and mature for this purpose.

Compost stability and maturity

Stability is the level of biological activity in moist, aerated compost. Stable composts are unlikely to compete with crops for available nitrogen or cause oxygen deficiency in soil. Compost maturity is related to stability, but reflects the level of further composting that has occurred. These attributes are more important for compost that is incorporated in the soil, rather than for mulches. However, stable composted mulches should also last longer because they break down more slowly than unstable composts. Here are a few signs to look for when predicting the stability and maturity of composts:

- Unstable and immature composts can be odorous and very hot
- Stable composts usually take 6-12 weeks to make. Compost requires a further 4 weeks or so of composting to become 'mature'
- Check the compost specifications - the carbon to nitrogen ratio (C/N) should be under 20:1 and toxicity (a plant growth screening test) should be greater than 60% for stable and mature compost. C/N ratio is more relevant as an indicator of quality for products that are incorporated in soil. Nevertheless, composted mulches with C/N ratios higher than 35:1 should also be treated with caution.

Plan to succeed

Getting the most out of compost is achieved by selecting the right product for the job and monitoring performance. Adjustments may need to be made to compost use, canopy management or fertilizer rates depending on soil and crop performance. Depending on the rate of application, sufficient P, K, Mg, Ca and trace elements can be supplied by compost from day one. Depending on the crop's requirement for N, it may take several years to build up soil organic matter to high enough levels before sufficient N is supplied by compost.

Rules of Thumb

In some cases it may be necessary to monitor soil and petiole N levels to keep vigour in check.

Use these 'rules of thumb' to predict how much N is supplied by compost:

- In the 1st year N availability in stable compost is about 10-15%
- In the 2nd & 3rd years, an additional 10-15% (in total) becomes available
- Woody, green organics mulches are unlikely to contribute any N until soil organic matter levels rise significantly.

Further information is available from:

Primary Industries Research Victoria (PIRVic) Knoxfield Centre, Private Bag 15, Ferntree Gully Delivery Centre, Victoria 3156. Phone: 9210 9222
www.dpi.vic.gov.au

EcoRecycle Victoria
Level 2, 478 Albert St. East
Melbourne 3002
Phone: 9639 3322
www.ecorecycle.vic.gov.au

Department of Agriculture, Western Australia, Locked Bag 4, Bentley Delivery Centre, Western Australia 6983
Phone: 08 9368 3333
www.agric.wa.gov.au

ISBN 1 74146 286 X; Set ISBN 1 74146 282 7