



Assessing Disease Management In Western Australian Vineyards

FINAL REPORT to
GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

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Executive summary

Western Australian grape growers had previously reported problems with powdery mildew, Botrytis and downy mildew despite using comprehensive spray programs.

The study was therefore based around three questions
- Are the current disease management methods effective?
- If not why not?
- Is further research/work needed?

Twelve, 11 and 12 growers volunteered from Margaret River, Pemberton and Great Southern respectively to participate in the study.

A block of Chardonnay was chosen on each property and the growers used a standard recording booklet. They recorded disease incidence and severity at critical phenological stages, factors that may have predisposed vines to disease during the season, and methods used to manage disease- cultural, biological and chemical (detailed spray diaries).

Only a third of the growers completed the study booklet, however this provided useful information for the final workshops which were held in June in the Great Southern and at Pemberton.

Very little disease was apparent in the study blocks early in the season. However there was a good deal of summer rain that gave a significant risk of all three diseases in all regions. There were also tight bunches and, in some cases, berries damaged by hail or birds. Early symptoms of powdery mildew were fairly common as was Botrytis bunch rot. Downy mildew symptoms were also seen in two instances. However, most growers were able to control all of these diseases with negligible harvest loss.

The use of cultural methods was quite variable, however most growers were satisfied that their canopies were not too dense. The use of biological control was also variable. Chemical methods used showed some similarities but also varied widely in the numbers and timing of sprays. Most people felt they used the right chemicals at the right rates.

Overall, the growers at the two workshops felt that current methods of disease control were mostly effective. However the effectiveness was sometimes reduced due to weather problems, gaps in spraying schedules and spray coverage issues.

The growers concluded that further work should include a costing study of disease control practices (a benchmarking study) and a series of half day training workshops-practical sessions on disease control and spray technology.

2. Background

In the two years prior to this study, grape growing regions in Western Australia reported problems with powdery mildew and Botrytis bunch rot. Local vineyard managers expressed concern over the high incidence of disease despite using comprehensive spray programmes based on outcomes from research conducted in South Australia and Victoria.

With such a high financial cost of spraying, and a significant loss of fruit quality, growers were keen to identify effective management programmes for local conditions.

This study was undertaken to help identify disease management issues for WA growers and provide the first step towards ensuring efficient management of the major grapevine diseases in WA.

3. Objectives

The study was aimed at addressing the following questions:

- Are current disease management methods effective in controlling the three major grapevine diseases (Botryits, powdery mildew, downy mildew) in three major grape growing regions of WA?

- If management options are found to be ineffective, why are they not working?- and is there any scope for improvement?

- Is further research or other work required?

4. Method

It was decided that the study would be confined to the Chardonnay variety.

An invitation to growers to participate in the study was sent out at the start of the season via the growers associations in each region. This resulted in 12, 11 and 12 growers volunteering from the Margaret River, Pemberton and Great Southern regions respectively. In each region the volunteering vineyards were well spread geographically.

Each grower was visited at the study sites by Department staff at the beginning of the study and at intervals thereafter, including shortly before harvest.

The study block of vines on each property was decided in discussion with the grower at the initial visit.

Recording booklets were prepared for each grower to use throughout the season. The booklets had provision to record the following:

- Disease incidence and severity
  Monitoring for the three diseases (Botrytis, powdery mildew, downy mildew) was encouraged on at least a fortnightly basis with particular attention to critical phenological stages of the vines
- Risk factors that occurred during the season
  In general, and specifically in relation to Botrytis, powdery mildew, downy mildew
- Methods used to manage disease
  Cultural practices
  Biological methods
  Chemical methods (detailed spray diaries)

Department staff formally monitored disease incidence in each vineyard at flowering, there being negligible disease apparent. Additional formal monitoring by the Department was also envisaged at veraison and harvest. However, this was not done due to the resignation of the Plant Pathologist. A more minimal inspection was undertaken instead, with a reliance on the grower's monitoring as recorded in their booklets.

Calls for growers to send in their booklets for review and collation were made a number of times after Chardonnay harvest, resulting in 1, 3 and 5 booklets being returned from the Margaret River, Pemberton and Great Southern Regions respectively.

Aside: The low return rate of booklets was disappointing but probably results from a prolonged harvest period rather than a lack of interest. The recent appointment of a new Plant Pathologist, Andrew Taylor, at Manjimup luckily provides a new opportunity to follow up the growers who did not provide booklets. Andrew will contact/visit these growers to obtain more data.

Information from the booklets was reviewed and summarised and half-day workshops were organised for the three regions for early June. Research Pathologists Trevor Wicks from the South Australian Research and Development Institute and Ben Killigrew from the University of WA were engaged to attend and provide technical input at the workshops.

Participating growers were invited to the workshops (two or three people from each vineyard). The Margaret River workshop was cancelled a week or so before the due date because of lack of participants (2 only). However, there were 6 and 13 attendees at the Pemberton and Great Southern workshops respectively.

The procedure at the workshops was firstly to present an overview of the findings from the study booklets (the same presentation at both workshops) and to facilitate the growers to discuss them with the two research pathologists. Then, after a tea break, the growers were asked to consider three questions:

1. Is current management effective?
2. If not, why not?
3. Is research/extension needed, or more information on products, spray application or timing?

The grower's responses to these questions were collectively agreed upon and recorded on a white board.

5. Results/Discussion

Disease risk factors in the 2003/2004 season

It was possible to collate the disease risk factors perceived by eight of the participating growers for the season. These are summarised in regard to general disease factors as well as those relating specifically to Botrytis, powdery mildew and downy mildew (Tables, 1, 2, 3 and 4).

It can be seen from these tables that the 2003/2004 season was a year of significant disease risk. The weather presented a considerable risk for Botrytis, powdery mildew and downy mildew. The bunches were often also at risk of infection because of their tightness and some having been subjected to hail, insects and disease (powdery mildew). Canopies were also dense in a couple of instances.

Table 1. General disease risk factors identified in the 2003/2004 season (8 vineyards)

General disease risk factors	Number of vineyards answering yes
Large congested canopy	2
Spray equipment being maintained	8
Spray equipment calibrated in past 12 months	7
Water sensitive cards used to evaluate spray coverage during sprayer calibration	4
Water quality has been checked for fungicide/s being used	4

Table 2. Botrytis risk factors identified in the 2003/2004 season
(8 vineyards)

Factor	Number of vineyards answering yes
High level of Botrytis previous season	1
Wet conditions around flowering	5
Prolonged rain or high humidity before harvest	4
Bunch remnants left on vines at pruning	3
Prunings left on vineyard floor	4
Berries damaged by weather	2
Berries damaged by other diseases	2
Berries damaged by insects	3
Berries damaged by birds	4
Tight bunches	6
Right fungicide/s, at right time, at right rate	6
AVCARE Resistance Management Strategy	6
Botrytis Resistance Tested in the past 2 yrs	1

Table 3. Powdery Mildew risk factors identified in the 2003/2004 season
(8 vineyards)

Factor	Number of vineyards answering yes
High level of powdery mildew the previous season	0
Mild cloudy weather	5
Right fungicide/s, used at right time, at label rate	8
AVCARE Resistance Management Strategy followed	7-8

Table 4. Downy Mildew risk factors identified in the 2003/2004 season
(8 vineyards)

Factors	Number of vineyards answering yes
High level of downy mildew the previous season	0
10:10:24 conditions occurred, followed by warm wet nights	6
Right fungicide/s, used at right time, at label rate	5
AVCARE Resistance Management Strategy followed	6-7

Management used by the various growers

There were management similarities and differences between the various growers (Tables 1-5). All did regular monitoring of disease and most monitored the weather.

All felt they had used the right chemicals at the right time and at the correct label rates and all or most used a strategy to avoid resistance build up (Tables 2-4).

There was good (but variable) use of cultural and biological methods of disease control (Table 5).

Table 5. Cultural and biological disease management techniques used in the 2003/2004 season
(7 vineyards)

technique	Number of vineyards answering yes
Regular disease monitoring	7
Regular weather monitoring	6
Bunch remnants removed at pruning	5
Prunings removed from vineyard floor	3
Bird control	2
Prune according to vine capacity	6
Shoot trimming, shoot thinning or bunch thinning	5 (various)
Leaf plucking	4
Regular nutrient tests	6
Cover crops	5
Biological control agents	3

Disease spray programmmes used by the various growers

Tables 6, 7 and 8 summarise the spray programmes used by the various growers. There were nine growers who recorded their spray programmes, including one with two blocks on the same vineyard (vineyard blocks A and B). Thus a total of 10 vineyard blocks are shown in the tables.

The spray diaries for Botrytis shown in table 6. show that no spray was applied early in the season however all but one sprayed at late flowering. A number also sprayed at other times, particularly bunch closure and veraison/pre-harvest. The practice of rotating of chemicals is also evident.

Great Southern Workshop (discussion re Table 6.)
T. Wicks – Using Captan at bunch closure can leave chemical residues on the fruit, especially if leaf plucking has been done. Captan may not be as effective at Botrytis control as other chemicals (eg. Switch? Scala? Teldor?) and there is the risk of stuck ferments if the withholding period is not observed for Captan.

Pemberton Workshop (discussion re Table 6.)
T. Wicks- The spray diaries look OK. Be careful re Captan (as commented above at Great Southern). Post infection- it is not clear how good the eradicant effect of chemicals is. Resistant strains occur to some of the chemicals. There is not much one can do if rain occurs before harvest. Potassium metabisulphite (PMS) kills surface spores only and works best in hot weather. Copper can harden berries, calcium also. Minimal use of nitrogen fertiliser is advisable as too much promotes large berries with thin skins. Question Is it worth controlling leaf Botrytis. Answer: Probably yes, if it occurs close to flowering (eg. use Benlate). Re biological control- a chemical Botrezen is used in New Zealand at flowering for biological control of Botrytis- not yet in Australia.

The spray diaries for powdery mildew in Table 7. show very different approaches by the various growers, apart from all using regular applications of sulphur. However, the number of sulphur sprays varied from 7 to 11 among the various growers and the interval between these sprays ranged from about a week to more than a month.

Great Southern Workshop (discussion re Table 7.)
T. Wicks- Surprised that not more people are using Strobulins (eg Flint). Some people are using too many sulphur sprays. Tank mixing of chemicals is not recommended (eg. if Topas is involved). Good to see that most people are monitoring. People might be able to reduce the number of sprays (5 to 6 sulphurs early in the season and a Prosper, Flint/Cabrio- Cabrio is effective for downy mildew as well). The key is to keep powdery out at flowering, then there should be minimal need for spraying. Early sulphur sprays are needed for mite control and are also useful for powdery control.

Pemberton Workshop (discussion re Table 7
T. Wicks- Some growers appear to be spraying on too many occasions for powdery mildew. Should only need 6-7 sprays. Post harvest sprays are a waste of time unless they are derelict vines or young vines. It doesn't reduce the inoculum for next season- although may help with mite control. Note that no one used Cabrio- why? it acts against both powdery and downy mildew. It's important to use the 'big guns' at the right time. Don't tank mix. It may be worthwhile tightening up the frequency of spraying at flowering when growth is rapid and new leaves appear every few days. Which chemical is best? None really- they all work OK. Discussion on the relative importance of infection in the new season as a result of infected buds versus cleistothecia. Flag shoots are not commonly seen in WA?? therefore cleistothecia more important?? Lime sulphur- trouble is that you have to use 2000-3000 L/ha and make it penetrate the bark. Powdery 'hot spots' can be sprayed with food grade mineral oil.

Table 6. Summary of spray diaries used for Botrytis management in the 2003/2004 season

Vineyard block	Bud Burst	1-3 Leaves	5-6 leaves	Full inflor.	50% bloom	Fruit set	Pea Size	Bunch Closure	Verais	Pre Harv	Post Harv
A					Switch						
B					Switch						
C				Marvel	Scala	Scala		Marvel			
D					Switch			Rovral Aquaflo			
E					Teldor			Switch	Rovral Aquaflo		
F					Switch Dipel	Rovral Aquaflow					
G										Sumisclex	
H				Spinflow	Captan		Rovral	Captan		Rovral	
I					Bravo			Switch	Rovral Aquaflo	Rovral Aquaflo	
J					Spinflow			Rovral			

Table 7. Summary of spray diaries used for Powdery mildew management in the 2003/2004 season (S= sulphur)

Vineyard	Bud Burst	1-3 Leaves	5-6 leaves	Full inflor.	50% bloom	Fruit set	Pea Size	Bunch Close	Verais	Pre Harv	Post Harv
A		S Prosper	S Prosper	S	S Legend	S Legend	S		S		
B		S Prosper	S Prosper	S	S Legend	S Legend	S	S	S		
C			S	S S S S S			S Topas	S	S		
D	S	S	S	S	S Flint		S Flint	S	S	S	S
E			S	S S S S S		S	S	S	S		
F			S	S S S S	S	S		S	S		
G			S	S	S	S	S		S	S	
H	S	S	S Prosper	S Prosper	S Flint	S Flint		S Legend	S Legend		
J		S			S Topas	S Topas	S	S Rubigan	S		
I			S	S S S S	S	S	S	S	S	S	S

Table 8. Summary of spray diaries used for Downy mildew management in the 2003/2004 season (Cu = Copper)

Vineyard	Bud Burst	1-3 Leaves	5-6 leaves	Full inflor.	50% bloom	Fruit set	Pea Size	Bunch Closure	Verais	Pre Harv	Post Harv
A							Cu Agri-Fos	Cu			
B							Cu	Cu			
C			Cu Mancozeb	Cu	Cu						
D											
E			Cu	Cu	Cu	Cu	Cu	Cu	Cu		
F		Cu Mancozeb			Cu Mancozeb	Cu					
G						Cu	Cu	Cu	Cu		
H	Mancozeb	Mancozeb	Cu Mancozeb Mancozeb	Cu FungiPhos		Mancozeb	Mancozeb				
I			Cu	Cu	Cu	Cu	Cu AgriFos	Cu			
J		Cu Penncozeb	Cu Penncozeb					Penncozeb			

Disease levels

Very little disease was apparent in the study blocks early in the season. However, later in summer and autumn symptoms of Botrytis and powdery mildew could be found in most study blocks. Fortunately these did not develop into significant problems except 1-2 vineyards for Botrytis and one vineyard for powdery mildew. Symptoms of downy mildew were found in two study blocks but did not develop into significant problems. The two properties with the Botrytis problems recorded the following risk factors

Risk Factor	Property 1	2
Congested canopy	no	yes
Botrytis last season	no	no
Wet at flowering	yes	no
Bunch remnants left	yes	no
Other disease damage	yes	yes
Insect damage	yes	yes
Bird damage	no	yes
Right spray program	gap	yes

Thus a range of risk factors were present. However, the main Botrytis risk factor on both properties appeared to be other disease damage, this being powdery mildew. In one case the powdery mildew damage appeared after a lengthy gap between sulphur sprays coupled with mild cloudy weather conducive to the disease. On the other property inadequacy of sulphur spraying may also have contributed, plus again, the conducive weather.

Observations from the other properties in the study who did not submit booklets, included the following.

- One property with serious powdery mildew
  (mild, cloudy conditions conducive to the disease)
- One with serious botrytis
  (dense canopies, wet at flowering and prior to harvest)
- Many with symptoms of Botrytis but managed OK
- Two with symptoms of downy but managed OK

Overall, disease was mostly well controlled by the study participants in a season that posed significant risks of all three diseases. Downy was well controlled, but people are still becoming familiar with managing this relatively new disease for WA.
Powdery mildew appeared only to become a problem when spray programmes were inadequate.
Botrytis was a challenge in the season for all growers but only became a significant problem after damage from powdery mildew.

6. Outcome/conclusion

The project ended with the outcomes from the two workshops. As planned these take the form of the collective responses from the workshop participants when addressing the three study questions- as follows.

Study Question 1: Are current methods of disease control effective?

Great Southern workshop- Yes, but….(see question 2)

Pemberton workshop- Mostly

Study Question 2: If not why not?

Great Southern workshop: Is it cost effective? Is it sustainable?
Monitoring is important; future will see improved assays that will assist

Pemberton workshop: Weather problems, people use different cultural practices, gaps in spraying schedules, spray coverage issues

Study Question 3: What should be done?

Great Southern workshop: Do a costing study of growers disease control practices (benchmarking)- ie extension
Comparison of chemicals for Botrytis- ie research
Spray technology- development and training

Pemberton workshop: Training workshops on disease control and spray technology (half day sessions for small as well as large producers)
Research to control powdery mildew in Verdelho (a very susceptible variety)

7. Budget Reconciliation

Budget	Funding from GWRDC		Local contribution
	allocated	expended	
Labour (Research)			9,200
(Casual)	1500	754.40	
Vehicle usage	3000	3768.65	
Accommodation	3000	2733.21	
Air Fare (Wicks)	nil	509.42	
Consumables	500	455.36	
Workshop			1000
10% GST	800	822.10	
Total	8800	9043.14	