Queensland Government
Department of Primary Industries

Granite Belt Wine Industry Association Inc

Improved Control of Bunch Rots in Granite Belt Wine Grapes



FINAL REPORT to

GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Principal Investigator: **Alex Banks**

Project Number: **RT 01 / 19 - 2**

Research Organisation: **Granite Belt Wine Industry Assoc.**

Date: **May 2003**

Improved Control of Bunch Rots in Granite Belt Wine Grapes

Final Report

May 2003

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Executive Summary

This report details project work carried out during the 2001/2002 season. The Granite Belt Wine Industry Association sought to extend similar work being conducted in the South Burnett as control of bunch rots was also an important issue for the region. The association contracted DPI's Queensland Horticulture Institute through its Applethorpe Research Station to plan and conduct the work and sought and received funding through GWRDC's RITA program.

Project activities included a survey of Chardonnay and Shiraz blocks to identify the range of bunch rots organisms present and assess their incidence, severity and relative importance for yield and fruit quality. Vineyard training activities and a review workshop were used to increase grower awareness and understanding of bunch rots. An interstate specialist in bunch rots was obtained as guest speaker at the workshop.

Two syndromes (referred to as "Dry Berry" and "Shrivel Berry") and Botrytis affected both varieties. In the case of Shiraz, "Dry Berry was by far the most significant problem. Although an *Alternaria sp.* was nearly always associated with the syndrome, its cause remains unclear. Its main impact seems to be in reduced yields while its affect on wine quality at this stage appears minimal. "Shrivel Berry" appears to be related to water stress post veraison.

A *Colletotrichum* species was found at low levels in most vineyards. Discussions with SARDI pathologist Barbara Hall and a CSU student involved in work on this organism indicate that almost certainly it is *C. acutatum*. Its incidence varied widely between blocks of both varieties. There is concern that this organism may cause serious problems in vineyards and wine production under wet conditions at harvest. At present the fungus is not well understood and control strategies are still being developed and tested. Urgent consideration and support should be given to investigate this organism.

Botrytis was generally well controlled in most vineyards. Below average rainfall, especially in the pre-harvest period did not provide conditions conducive to its development. Very high levels in two vineyards inflated district averages in both varieties and indicate the potential problem this disease poses if ineffective control programs combine with wet weather.

The spray programs used by growers showed that their basic understanding of control strategies for bunch rots was not as good as expected. Presentations at the review workshop by guest speaker, SARDI pathologist Barbara Hall highlighted issues of chemical selection and timing that should be addressed with training and information resources. Most growers did not recognize Colletotrichum in the field. The interaction with DPI pathologist Shane Dullahide during field assessments provided an excellent training opportunity in correct disease identification.

Background

The Granite Belt Wine Industry Association became aware of project work to improve the control of bunch rots in South Burnett vineyards. The Association had also identified this issue as being one of the most important facing its growers and winemakers. They requested that the work being undertaken by the Department of Primary Industries Queensland Horticultural Institute for the SBWIA be extended to include the Granite Belt.

Queensland's summer dominant rainfall and high humidity during harvest provide ideal conditions for the development of bunch rots (including botrytis) in most seasons. These diseases cause significant yield losses to Queensland wine grape growers and compromise the quality of wine produced. Vineyard and winery profitability are decreased through increased disease control costs. Added to this is the influx of many new growers with limited viticultural experience into the industry in recent years. An important consequence of this situation is the high risk of overuse of eradicant chemicals with consequent development of resistance.

An analysis of pathology records over recent seasons by Qld Department of Primary Industries at Applethorpe has shown that botrytis accounts for less than 50% of the organisms being isolated from bunch rot specimens. A number of other fungal and yeast species are present, many of which have not been clearly identified. The extent and severity of these bunch rots is unclear but their presence may have significant implications for the management of disease control programs.

Because most Queensland growing regions experience problems with bunch rots in most seasons, the outcomes of this work will have wide application. They will be especially relevant to growers in coastal and sub-coastal regions where high rainfall/high humidity conditions provide ideal conditions for disease development. The outcomes of this project will also have application to the Queensland table grape industry.

Objectives

- Increase grower skills in monitoring and sampling for bunch rots and in maintaining records of spray control.
- Identify organisms causing bunch rots including their incidence and severity.
- Assess the relative importance of botrytis and other causal organisms.
- Determine yield losses and effects on fruit quality due to bunch rots.
- Increase industry understanding of bunch rots and how they might be better managed.
- Identify deficiencies in the effectiveness and efficiency of current bunch rot control programs.
- Identify priorities and activities for future project work on bunch rots.

Participants

Position / Role	Person	Organisation
Administrative Leader	Juliane Ferguson	Granite Belt Wine Industry Association
Project Activities Leader	Alex Banks	Qld Horticulture Institute
Pathologist	Shane Dullahide	Qld Horticulture Institute
Viticulturist	David Oag	Qld Horticulture Institute
Casual Pathology Assistant	Carol Haase	Qld Horticulture Institute
Guest Speaker / Consulting Pathologist	Barbara Hall	South Australian Research and Development Institute
Participating Growers	JohnArlidge	Beverley Vineyards
	Tony Comino	Kominos Wines
	Robert Channon	Robert Channon Wines
	Tom Dunn	
	Bryce Kassulke	Heritage Wines
	Jim Lawrie/Rod Wellings	Stone Ridge Wines
	Dennis Ree	
	Graham and Anna Reilly	Girraween Unit Trust
	Peter Watters	Seven Scenes
	Davydd Westlake	Misty River

Acknowledgment

The work was funded from Grape and Wine Research and Development Corporation's Regional Innovation and Technology Adoption program and carried out by staff from Queensland Horticultural Institute and South Australian Research and Development Institute. The Granite Belt Wine Industry Association gratefully acknowledges the support of these organizations. GBWIA also thanks the participating growers for allowing access to their vineyards and providing spray and crop records.

Method

Survey basis

Chardonnay and Shiraz varieties were chosen because:

- They are the most widely grown varieties in Queensland wine production districts.
- Their harvest periods (Chardonnay – March to early April, Shiraz – late March to early May) would give a spread of growing conditions.
- They would provide a white and red variety.

Members of the Granite Belt Wine Industry Association were invited to participate through the Association's newsletter. Eight Chardonnay and seven Shiraz growers covering the Murgon, Booie, Goodger and Nanango sub-regions of the South Burnett responded. The participants represented a spread of grower experience and vineyard size and age. Vineyard locations are shown in Figure 1 which also shows the area surveyed in the project.

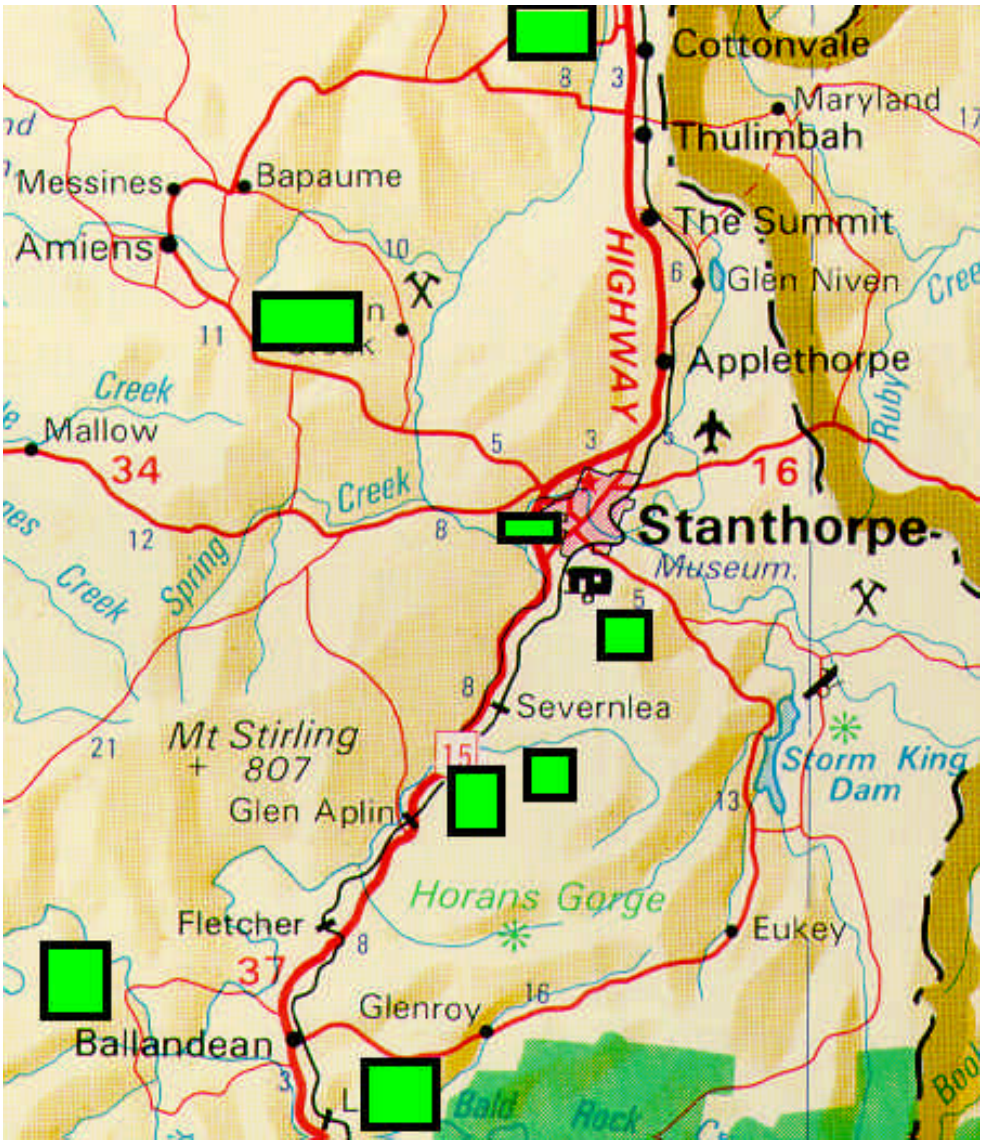


Figure 1. Map of Granite Belt showing approximate vineyard locations.

Training field day

A training activity was conducted with growers where they were introduced to the project and shown how to take samples for bunch rot laboratory analysis (Figure 2). Growers were provided with written instructions to document the procedure (see Appendix 1). Procedures for collecting spray records and weather conditions were initiated.



Figure 2. Growers attending training field day

Field Assessments

DPI pathologist, Shane Dullahide, assessed blocks of both varieties as close as possible to harvest. Chardonnay blocks were examined from 5th to 12th of March and Shiraz blocks from 22nd to 27th March 2002. Up to 150 bunches were examined in each block and the presence and identity of any suspected bunch rots recorded along with the severity of the infection or damage (see Figure 3). A rating sheet devised by Dr R W Emmett was used to give a percentage of the bunch affected (see Appendix 2).



Figure 3. QHI Pathologist Shane Dullahide examines Chardonnay bunches for presence and severity of bunch rots.

Laboratory Assessments

At the same time as field assessments were made, up to 50 bunches were sampled for laboratory analysis. This was done with growers to provide further training (Figure 4).

Samples were placed into plastic bags and transported in coolite containers to the QHI's Applethorpe Research Station. Samples in plastic bags were incubated at room temperature to allow any infections to develop. These were then evaluated and any organisms identified and their severity rated using the rating system of Emmett.



Figure 4. DPI pathologist Shane Dullahide supervises the collection of Chardonnay bunch samples by a grower.

Review Workshop

A grower workshop was conducted to discuss project results. Barbara Hall, research pathologist with South Australian Research and Development Institute presented the latest information on bunch rots and reviewed current control programs. The workshop also identified future needs and priorities and provided direction on further work to be done.



Figure 5. SARDI pathologist, Barbara Hall, presents information on bunch rots to Granite Belt growers at the review workshop.

Results and Discussion

Figures 6 to 9 show the incidence and severity of infections on Chardonnay and Shiraz blocks across the Granite Belt.

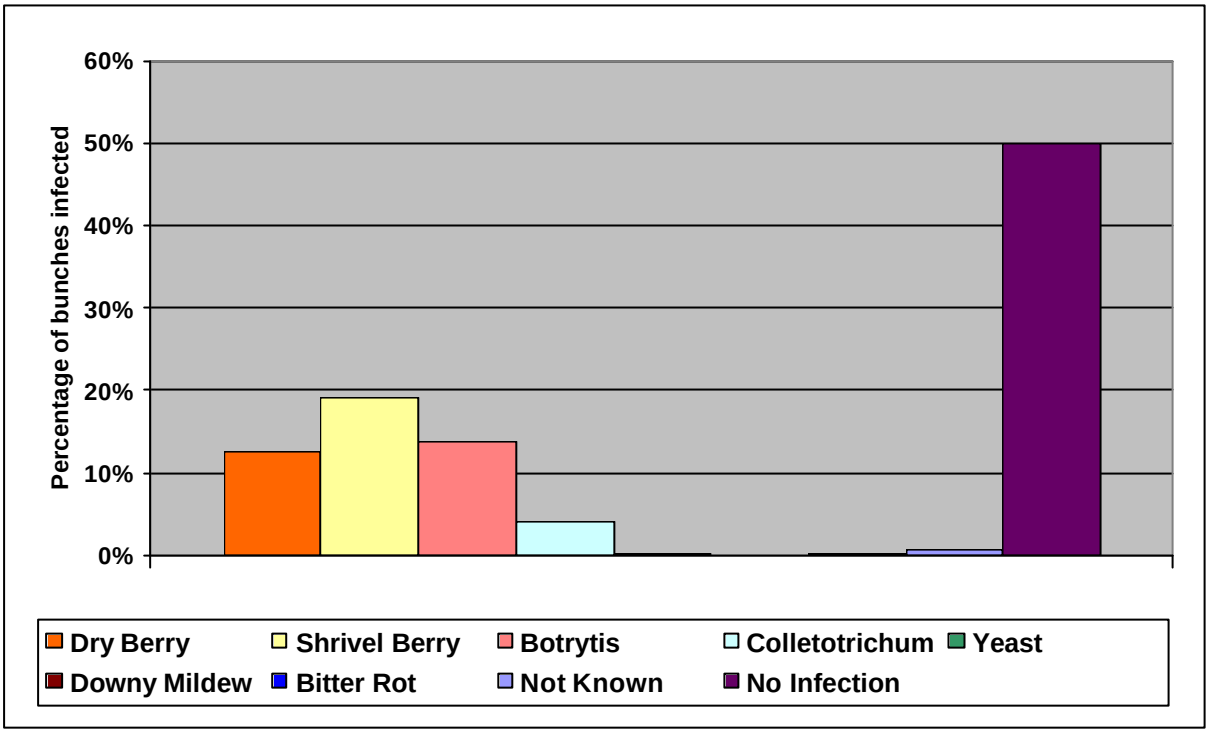


Figure 6. Incidence of bunch rots on Chardonnay.

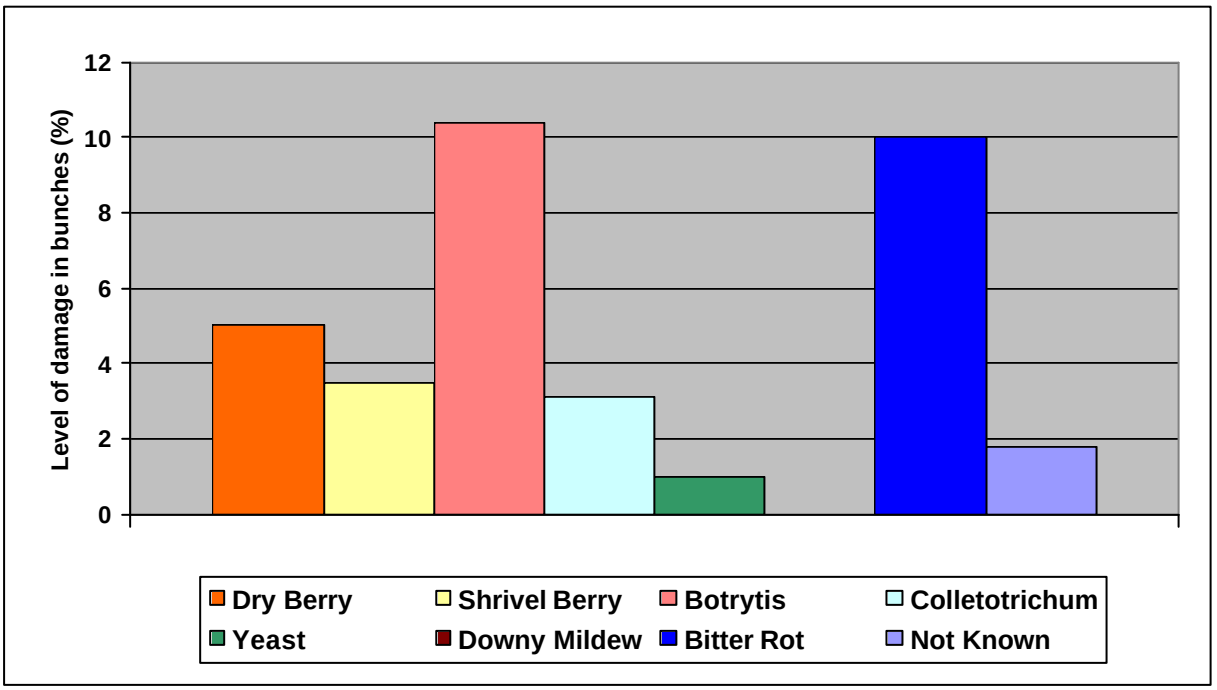


Figure 7. Severity of bunch rots on Chardonnay

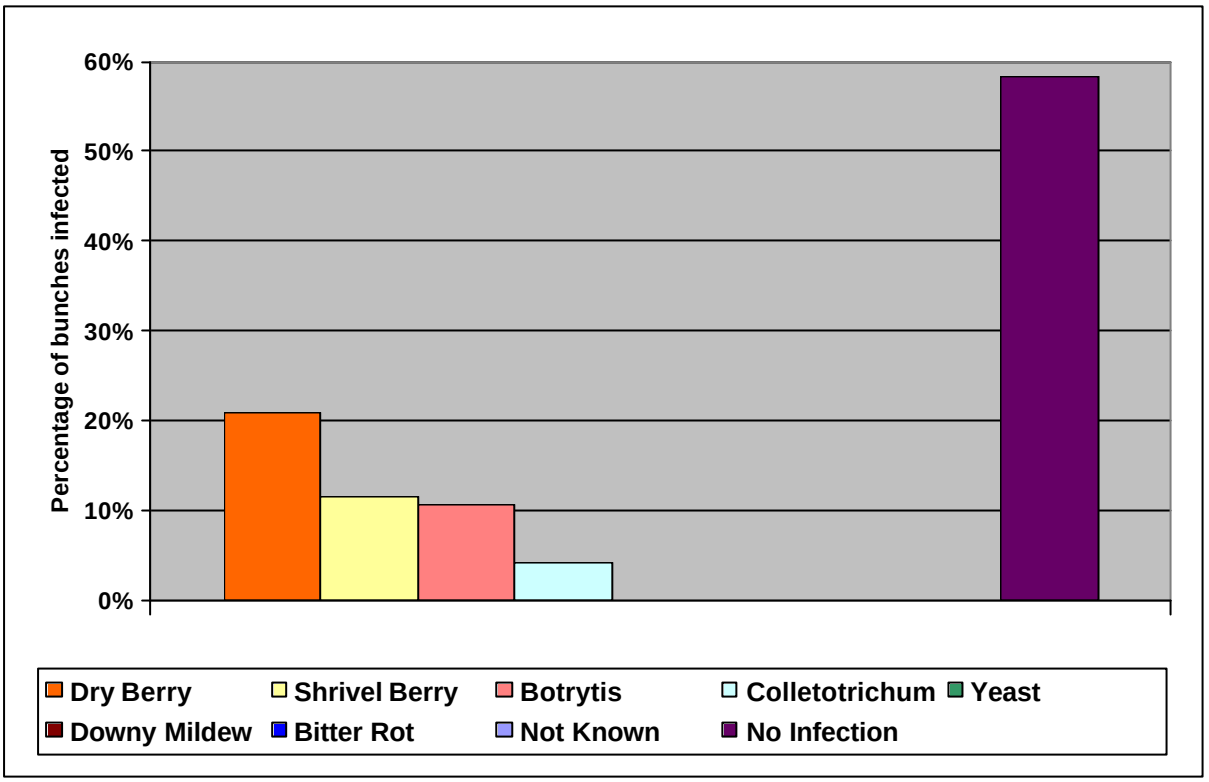


Figure 8. Incidence of bunch rots on Shiraz.

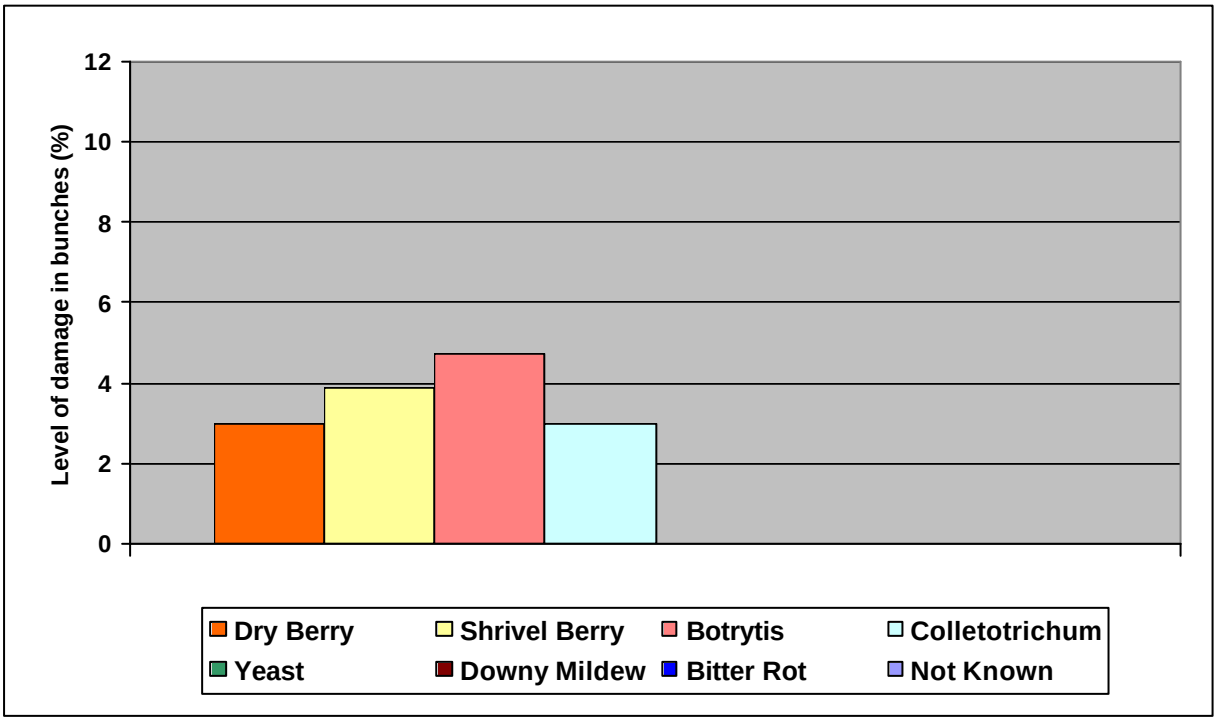


Figure 9. Severity of bunch rots on Shiraz.

"Dry Berry and Shrivel Berry" syndromes and Botrytis affected both varieties. Dry Berry was especially prevalent in Shiraz (>20% incidence). *Colletotrichum* was present at around 4% incidence. Multiplying the overall incidence and severity percentages together gives an estimate of total crop loss. This indicates that on average Granite Belt growers lost 4% of their Chardonnay crop to bunch rots but less than 2% of Shiraz crops.

Dry Berry

A syndrome referred to as "Dry Berry" affected both varieties, especially Shiraz (Figures 6 and 8). Figure 10 shows the damage.

Bunches affected by "Dry Berry" characteristically had reddish-purple berries that were



Figure 10. "Dry Berry" syndrome on Chardonnay.

shriveled but intact with red-brown pedicels. The symptom appears to have been initiated early in bunch development so that berries had not filled normally. This was in contrast to the symptom "Shrivel Berry" where berries had grown normally, reached an acceptable size, and then shriveled due to heat and/or water stress. An *Alternaria sp* was consistently associated with the dry berry symptom but it is unclear whether it is causal or merely present as is often the case with this widespread organism.

The significance of this syndrome is unclear but would appear to be of most concern to growers causing loss of tonnage. Discussions with winemakers suggest its impact in the winery is probably insignificant because:

- Berries detach from bunches very easily and are removed in the field when picked (especially where mechanical harvesters are used) or by de-stemmers at receival by wineries.
- Berries are not breaking down and have no apparent taints as occurs with Botrytis.

Botrytis and other bunch rots

Botrytis was present in about 10% of bunches in both varieties. In most vineyards, appropriate control programs (spray and agronomic) combined with the dry prevailing conditions to limit its impact. Two vineyards experienced high levels of damage because key sprays at pre-bunch closure were missed. This indicates that even in generally dry seasons, Botrytis has the potential to cause significant losses if an integrated control program is not followed and conditions occur that allow the disease to be expressed. Other bunch rots were generally present at only very low levels. One vineyard with Botrytis infection also had problems with Bitter Rot.

Colletotrichum

Colletotrichum was found at similar levels in both varieties (4% incidence, 3% severity). The actual species was not positively identified but discussions with Barbara Hall (SARDI) and Bruce Cleaves (student enrolled at CSU under Chris Steel) indicate that it almost certainly is *C. acutatum*. Figure 11 shows infections on bunches of both varieties.

The rot is characterized by salmon pink sporulation in concentric rings as the disease



Figure 11. Colletotrichum infections on Chardonnay (left) and Shiraz (right). Note the salmon pink spore masses on Chardonnay berries.

progresses. Growers generally were unaware of the disease until it was shown to them during field assessments and have probably been confusing it with Botrytis. None of the spray programs were aimed specifically at controlling this organism. Its low impact on Queensland growers and winemakers to date may be due to the disease being a recent arrival in vineyards and having been in a expansion phase. Recent dry seasons may also have limited its impact.

The widespread occurrence observed in this survey mean that this disease has potential to become a major pest if weather conditions allow its development.

Review workshop

A one-day workshop was conducted at which results were presented and discussed in relation to seasonal weather conditions and spray programs used by growers. The workshop featured SARDI pathologist Barbara Hall, as well as DPI pathologist, Shane Dullahide (see Figure 5).

Weather conditions for 2001/2002 season

Weather data was collected across the region to assist the interpretation of survey results and the review of current disease control strategies. Tables 1 and 2 show the amounts of rain received during the Chardonnay and Shiraz seasons compared to the average rainfall recorded by the Australian Bureau of Meteorology station sited at DPI's Applethorpe Research Station. The Granite Belt region has been broken into two sub-regions north and south of Stanthorpe. The rainfall averages listed for the Applethorpe Met Station represent estimates for the periods coinciding with the stages of crop growth.

Table 1. Comparison of 2001/2002 rainfalls with weather bureau averages for Applethorpe Met Station for Chardonnay crop stages in Granite Belt sub-regions. Figures are mm of rain followed by number of wet days in brackets.

Period	Dates	Applethorpe Met Station Averages	Granite Belt sub-regions	
			North	South
Flowering to Bunch closure	Late October to mid – January	223.8 (26)	172.6 (28)	165.8 (12)
Bunch closure to Veraison	Mid – January to mid – February	91.7 (12)	67 (12)	80.4 (9)
Veraison to Harvest	Mid – February to late March	113.5 (15)	91 (11)	109.5 (6)
	Totals	429 (53)	330.6 (51)	355.7 (27)

Table 2. Comparison of 2001/2002 rainfalls with weather bureau averages for Applethorpe Met Station for Shiraz crop stages in Granite Belt sub-regions. Figures are mm of rain followed by number of wet days in brackets.

Period	Dates	Applethorpe Met Station Averages	Granite Belt sub-regions	
			North	South
Flowering to Bunch closure	Mid – November to early January	167.9 (20)	155.6 (19)	147.4 (11)
Bunch closure to Veraison	Early January to early March	174 (22)	88.2 (17)	95.6 (12)
Veraison to Harvest	Early March to end of April	98.9 (15)	76.6 (12)	76 (3)
	Totals	440.8 (57)	320.4 (48)	319 (26)

The figures show that total rainfall received during the 2001/2002 season was lower than average for both varieties in both sub-regions. The deficit mainly occurred from late December to early February with both varieties moving from late flowering through to bunch closure. A significant difference between the sub-regions was the lower number of wet days experienced by both varieties growing in the southern sub-region. Greater problems with Botrytis occurred in vineyards in the northern sub-region.

Current spray programs

As part of the project, growers provided details of spray programs used to control botrytis and other bunch rots. Figures 12 and 13 show typical spray programs currently being used by Granite Belt growers and the rainfall pattern for the 2001/2002 season. The features of Granite Belt spray programs are:

- Spray programs were based on the use of protectants such as mancozeb and copper.
- Eradicants (eg pyrimethanil) tended to be applied during early flowering. There was only limited use of these from late flowering through to harvest.
- There were no targeted bunch rot sprays coinciding with bunch closure.

Barbara Hall and Shane Dullahide reviewed the Granite Belt spray programs during the workshop. Concerns were raised regarding the emphasis on protectant chemicals and especially the wide spread use of copper against bunch rots. Growers responded that the low rainfall received had reduced the impact of bunch rots and pointed to the low levels of bunch rots recorded by the survey. They indicated that cost, availability and previous experience were the reasons for the use of copper rather than other chemicals such as chlorothalonil and the newer eradicant chemicals. Growers conceded that the omission of a pre-bunch closure spray had placed crops at risk if wetter conditions had been received. This was underlined by the results in two vineyards where poor control management combined with wet conditions resulted in heavy losses to Botrytis and Bitter Rot. A discussion session developed suggested control options to suit Granite Belt vineyards and conditions (see Table 3).

Table 3. Suggested spray options for management of bunch rots.

Crop stage	Spray options	Comments
Leaf Botrytis (all stages)	dithianon or mancozeb or Synetrol	Preferred if Phomopsis also present. Preferred if using in combination with wettable sulphur. Unsure of effectiveness against Phomopsis.
Early flower (10% capfall)	chlorothalonil	Good coverage important.
Full flower (80% capfall)	pyrimethanil or fenhexamid or azoxystrobin or benomyl	Preferred if also dealing with downy and powdery mildew. Effectiveness on Colletotrichum unknown. Care needed to minimize resistance development.
Bunch closure (E-L 31)	cyprodinil or benomyl	Preferred chemical at this stage. Care needed to minimize resistance development.
Veraison to Harvest	iprodione or procymidone or potassium metabisulphite	Care needed with timing in relation to harvest and residues. Can control existing infections but does not appear to kill spores.

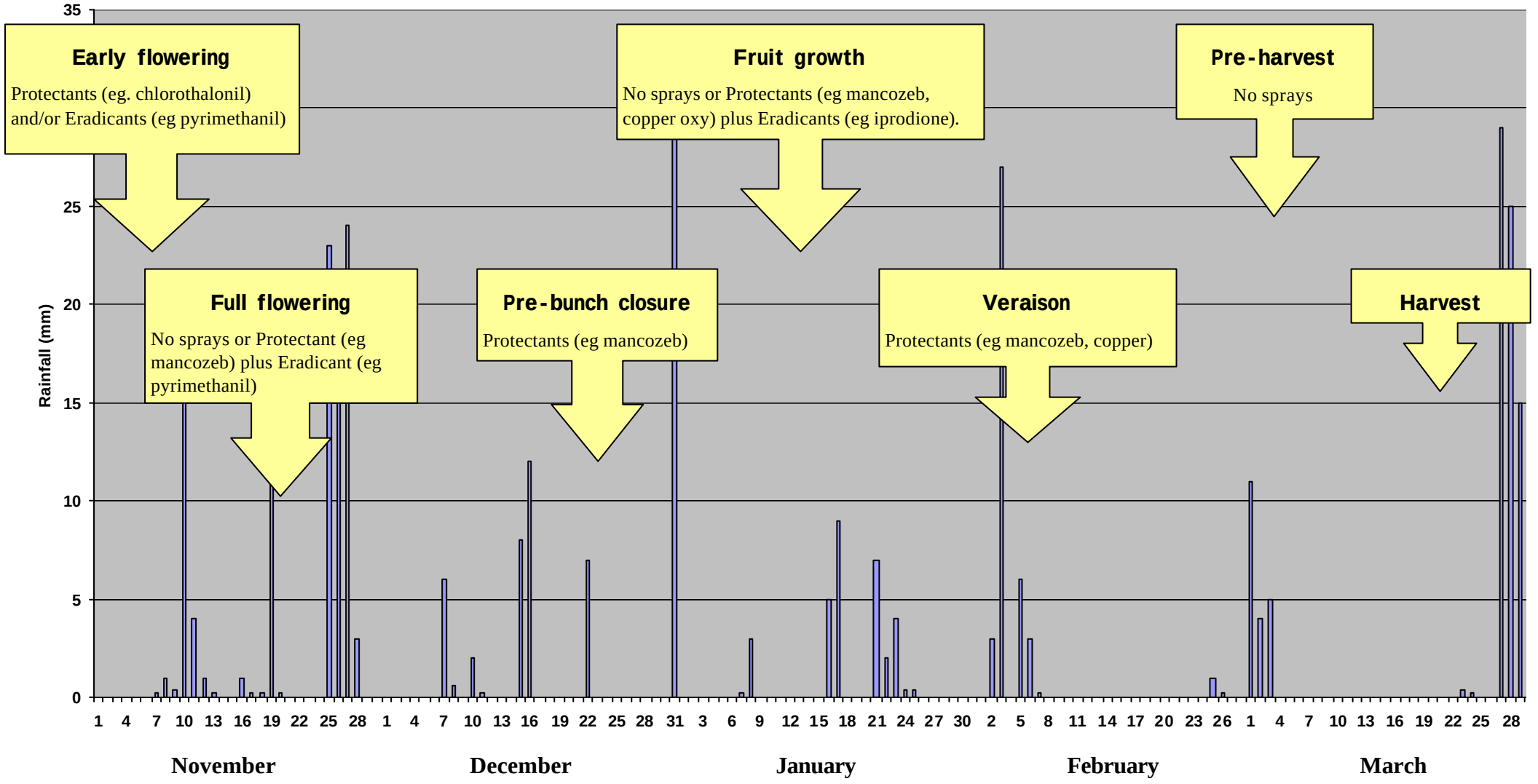


Figure 12. Spray program and rainfall associated with Granite Belt Chardonnay vineyards.

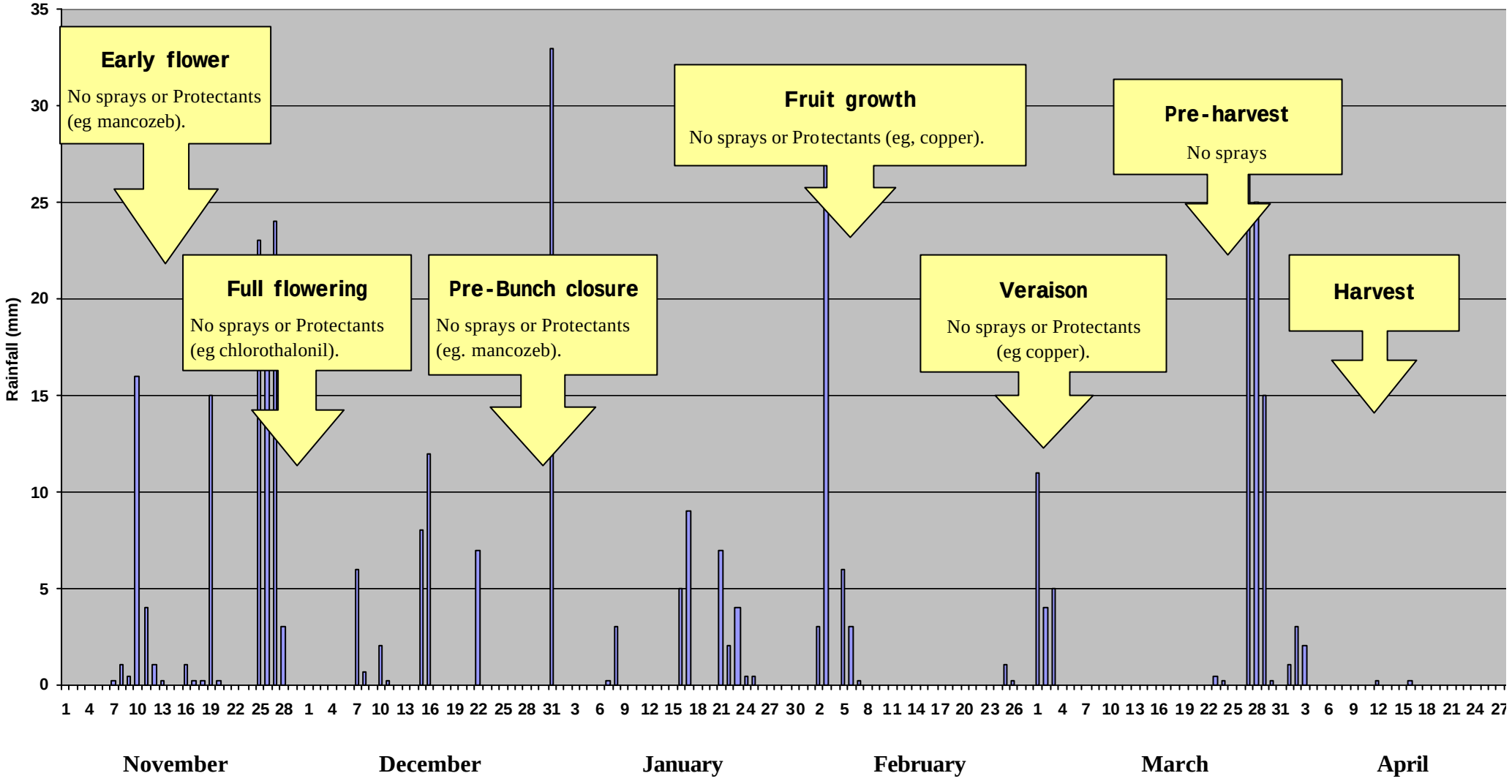


Figure 13. Spray program and rainfall associated with Granite Belt Shiraz vineyards.

Outcomes / Conclusions

Increased grower awareness and skills in managing bunch rots

The project, especially the review workshop, highlighted a number of areas where Granite Belt grower's awareness and understanding of bunch rots was lacking. These included the selection of chemicals that were less effective than other options and the timing of sprays in relation to crop stages and weather conditions. The lack of pre-bunch closure sprays in an environment where rainfall during harvest is the norm was an especially significant oversight. These findings were interesting given that the Granite Belt contains a higher proportion of experienced growers within the wine grape industry. The project was able to raise grower understanding across the board and indicate the need for further training and adoption of better control strategies. The low levels of crop loss to bunch rots (4%) were probably due more to the dry conditions than to the management to control diseases.

Most growers were unfamiliar with Colletotrichum and its symptoms. They tended to identify it as Botrytis. Participating growers benefited from being able to view the disease in the field while interacting with DPI pathologist, Shane Dullahide during the field assessments and sampling. This learning was further enhanced by Barbara Hall's presentations at the workshop.

Identification of causal organisms and their impact on yield and quality

The project identified a number of organisms and syndromes were active in vineyards causing crop losses. It confirmed that Botrytis continues to be a major cause of crop loss if weather conditions are conducive and ineffective spray programs are employed.

A syndrome referred to as "Dry Berry" was the common especially in Shiraz blocks. Its cause is unclear although *Alternaria sp.* was almost always associated with the damage. The importance of "Dry Berry" is thought to be mainly in terms of yield loss and was not considered to affect wine quality.

A *Colletotrichum sp*, subsequently considered to probably be *C acutatum*, was found to be widespread but at low levels of incidence. The importance of this disease is still to be determined but it may pose some serious concerns for growers and wine makers if suitable weather conditions allow its incidence and severity to increase.

Priorities for future bunch rot project work

The review workshop concluded that further work on bunch rots was needed. The areas for research, development and extension include:

- A need for local pathological diagnostic services including resistance testing and disease identification.
- Further survey work to better document bunch rot control programs and their resulting performance and to gather more background information on vineyard and weather influences.
- Identify the reasons for varying levels of Botrytis between different vineyards.
- Evaluate "best practice" spray schedules and combinations of chemicals over several seasons.

Budget Reconciliation

Budget	Funding required from GWRDC	Actual Expenditure
QHI salaries (2% of FTE)	$1,537	$1,537
Casual assistant (5 days with onc	$1,123	$2,110
Airfare (Bunch rot expert)	$500	$190
Travel allowances (5 nights)	$600	$160
QHI corporate costs	$515	$515
Diagnostics (QHI and external)	$300	$300
Field and Lab consumeables	$500	$365
Phone, fax, postage costs	$100	$100
Publication costs	$200	$300
Vehicle costs	$1,000	$1,000
Workshops venue and catering	$200	$0
Total	$6,575	$6,577
Add 10 % GST	$657	$657
Total funds requested from GWRI	$7,232	$7,234
Funding from other sources		
QHI salaries and oncosts		$4,600
Grower collection and dispatch of samples (per growe		$70
Grower attendance at 2 workshops (per grower)		$250

Appendix 1

BUNCH ROTS SAMPLING PROCEDURE

Aim

The aim of this procedure is to provide a sample of bunches from two key varieties from which an assessment can be made of the range of bunch rot causing organisms active in your vineyard.

Time of sampling

- Samples of each variety are taken:
    - After the start of veraison in that variety.
    - As close to the harvest of the variety as practical.
    - Within a day after rainfall which wets vines for more than 24 hours.
- If rain does not occur or is not expected before harvest, then a bunch rot sample should be taken as close to harvest as practical.
- Samples can be taken at any time of the day but it may be preferable to take them in the morning under milder conditions which allows time to get samples to the Applethorpe Research Station.
- The other consideration will be the transport of samples to Applethorpe Research Station for analysis. Sampling should not be done if there is a risk of samples being kept under warm conditions or arriving late at Applethorpe when the DPI office is not open. Fridays and weekends should be avoided where possible.

Varieties

Samples are collected from Chardonnay and Shiraz

Number of samples

50 bunches are collected for each variety.

Sampling sites

- Take samples for each variety from within one block rather than across several blocks. This will assist when correlating results with sites.
- Don't take samples from outside or at end of rows unless these are considered part of hot spots.
- Various sampling patterns can be used.
    - If the incidence of bunch rots has been generally scattered uniformly over the block, either take samples completely at random or based on some sampling system (eg one bunch taken from every 10^{th} vine)
    - If there are known hot spots for bunch rots in the block, then sampling can be concentrated on these vines.
- Individual identification of vines is optional but could assist with any subsequent follow up. If going to this extent, number vines and write this number on the sample bag.

Collecting samples

- Take only one bunch at each vine being sampled.
- If identifying samples and sampled vines, write the vine number on the vine tag and then on the sample bag.
- Collect only one bunch in each bag.
- Cut the end of the bunch with a clean pair of secateurs or snips.
- Hold the sample collection bag directly under the bunch so that it can drop directly into the bag without being touched.
- If possible, clean secateurs or snips between each sample with hypochlorite or disinfectant. Otherwise, try not to let the snips come into contact with bunch rots visible on samples or vines.
- Seal bags immediately and place in an esky or keep in the shade.
- Take samples out of the field into cool storage as soon as possible.

Sending samples

- Samples should be packed in a suitably sized carton and taken to the Applethorpe Research Station as soon as possible.
- Complete the information sheet for each variety and enclose with the samples.
- Cartons should be clearly marked to

  Shane Dullahide

  Bunch rot project

  Applethorpe Research Station

  New England Hwy

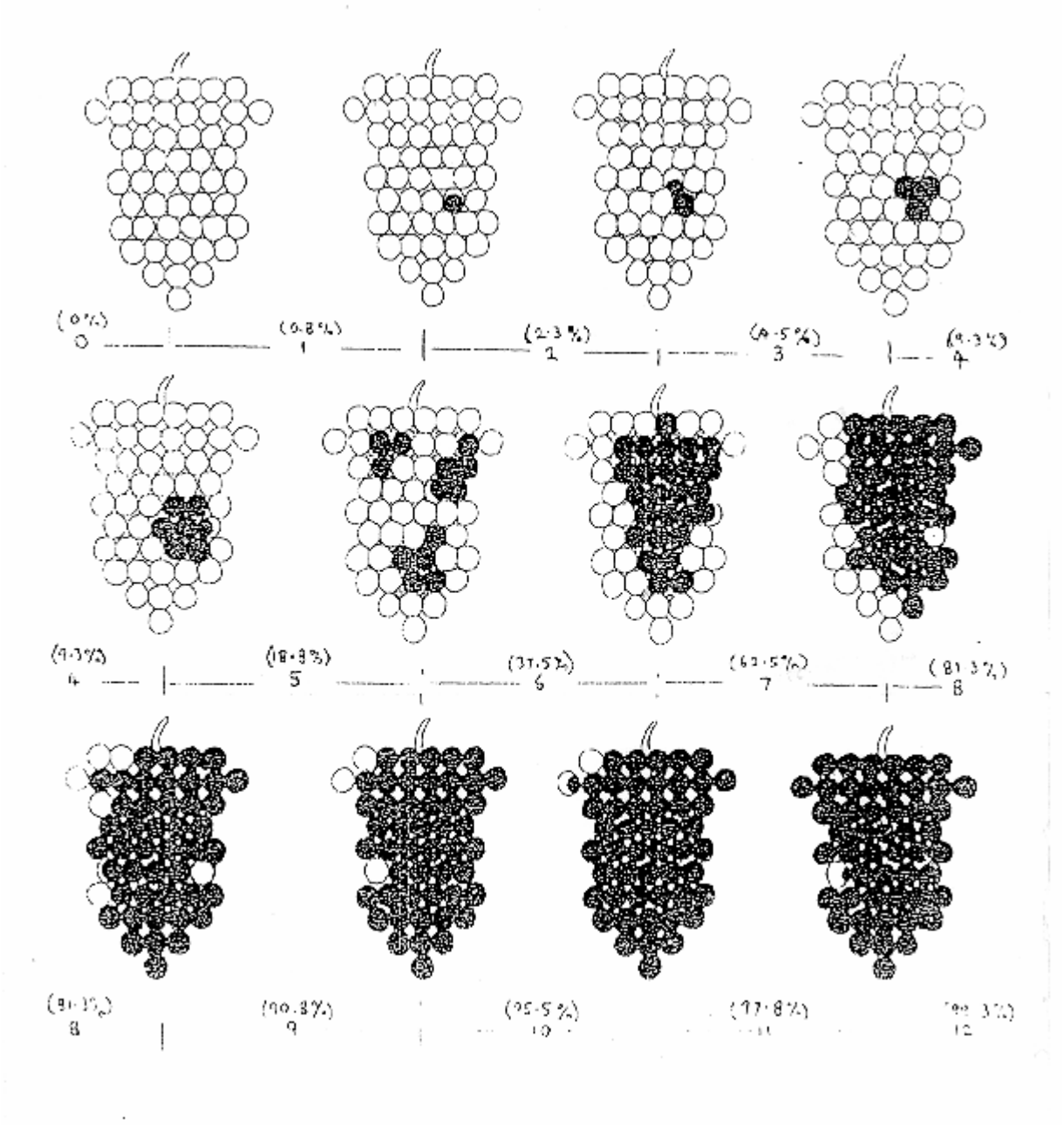
  Applethorpe

and should also show clearly **"Grape samples – please keep refrigerated"**

- If possible, notify Alex and/or Shane (phone 07 4681 1255 or fax number 07 4681 1769 or e-mails alex.banks@dpi.qld.gov.au or shane.dullahide@dpi.qld.gov.au) that samples are being delivered and the expected time of arrival so that receival can be arranged.

Appendix 2

Bunch Rots Severity of Infection Rating Chart



From Dr R W Emmett, DPI Victoria, Sunraysia Horticulture Centre, Mildura.