Management of Botrytis and other bunch rots by (a) identification of other bunch rots fungi producing PPOs and (b) Clarification of Registered Chemical against non-Botrytis bunch rots identified as potential bunch rot pathogens.



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GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

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Research Organisation: **The University of Melbourne**

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Project Title: 'Management of Botrytis and other bunch rots by –
(a) Identification of other bunch rots fungi producing PPOs (b) Clarification of Registered Chemical against non-Botrytis bunch rots identified as potential bunch rot pathogens'

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Abstract

This project was affected seriously by the drought conditions prevailing before and during the period of the project. Lack of water caused the glasshouse trials to be abandoned. An Honours student was not available in the first two years of the project so the part of the project pertaining to the identification of a possible polyphenoloxidase as the cause of the syndrome seen in the King Valley during the 2002 season was abandoned and the funding returned. Successful field trials testing fungicides against bunch rot organisms were carried out and showed that fungicides have a negative impact on beneficial fungi on the phylloplane of grapevines.

Executive summary

This project was affected seriously by the drought conditions prevailing before and during the period of the project. Lack of water caused the glasshouse trials to be abandoned.

An Honours student was not available in the first two years of the project so the part of the project pertaining to the identification of a possible polyphenoloxidase as the cause of the syndrome seen in the King Valley during the 2002 season was abandoned and the funding returned.

Fungal saprophytes have a role in the environment in recycling plant material. A few fungal species are primary pathogens under specific environmental conditions. Many species may become opportunistic pathogens given a set of circumstances in which the natural and diverse environmental population has been compromised such as in the vineyard where annual applications of chemicals have been applied.

During the past decade there has been a noticeable increase in bunch damage from opportunistic organisms always present as part of the microflora on the phylloplane but now being seen as actively damaging bunches at and around harvest when the sugars are at maximum levels, berry skins are weakest and often damaged from bunch pressure and bird and insect attack.

Growers have identified environmentally sensitive management practices and protocols as their major desire for disease management. The Botrytis Best Practice Protocols were a good example of what can be achieved with grower input. Feedback this year, 2010, from the King and Alpine Valley growers who used the Botrytis Best Practice Protocols during the recent wet weather leading up to harvest found their losses were minimal compared with growers who relied on chemical management,

This project considered the role that fungicides, in particular, botryicides, had on the major bunch rot fungi found in the King and Alpine Valleys, the Yarra valley and the Mornington Peninsula. Chemicals do affect the diversity of the phylloplane organisms.

It must be noted that levels of Botrytis and other bunch rot fungi artificially expressed in the laboratory do not approximate the expression in the vineyard under normal growing conditions. It should also be acknowledged that not all organisms were isolated from the phylloplane during these trials. Only those organisms that can grow on the synthetic media used at the temperatures selected for incubation could be identified.

Successful field trials testing fungicides against bunch rot organisms were carried out and showed that fungicides have a negative impact on beneficial fungi on the phylloplane of grapevines.

Background

The opportunistic pathogen, *Botrytis cinerea*, can cause significant loss of quantity and quality of crop and resultant wine in seasons conducive to its infection needs, ie cool, wet or warm, wet conditions at harvest. Very significant R & D resources, nationally and state based, have been aimed at the management of this ubiquitous organism. During the course of previous research developing an understanding of the epidemiology and, later, management of Botrytis, it became apparent that growers identified all grey moulds and rots as *Botrytis* or resulting from a *Botrytis* infection. This is not correct and is leading to confusion and lack of confidence in the minds of many growers.

During the years 2002-2004, data have been collected on the distribution of *B. cinerea* throughout the vineyards and the immediate environment (GWRDC RITA/GVWGIDC projects RT 02/25-3; RT 02/40-4; RT 02/38-4. It became apparent that organisms were presenting as bunch rots other than *Botrytis* with which growers were not familiar. Spraying of botryticides is not addressing the problem where other fungi are involved. Growers need to be aware and be able to recognise these potential bunch rotting fungi to management them. An outcome of this project is to:
Run workshops where growers will learn to recognise the bunch rots other than *Botrytis*,
Produce a laminated card with labelled structures and photographs for easier identification of fungi and rots that can be confused with Botrytis and Botrytis grey mould.

Test chemicals from the registered list against the non-*Botrytis* bunch rotting fungi and provide a Best Practice Protocol similar to the Botrytis Best Practice Protocols. This will be carried out in consultation with AWRI and chemical companies.

REGIONAL CONTEXT
Management of *Botrytis* is considered by the regional growers involved in previous projects to develop the Botrytis Best Practice Protocols as the most serious of their disease problems and the most difficult to manage. The Botrytis reference groups were actively involved in the outcomes and found the seminars of great use.

Table 1. Self-ratings of workshop participants for the level on confidence they have in managing Botrytis, before and after the workshop.

Workshop location	Number in group		Self rating - % of group						Mean self rating score		Change in score
			Low		Medium		High				
	Before	After	Before	After	Before	After	Before	After	Before	After	
Knoxfield	34	24	5.9	0	47.1	33.3	47.1	66.7	3.2	3.7	0.5
Beechworth	24	22	29.2	0	70.8	36.4	0	63.6	2.4	3.5	1.1
Macedon	14	11	35.7	0	28.6	18.2	35.7	81.8	2.3	4.0	1.7
Ballarat	13	13	46.2	0	46.2	46.2	7.7	53.8	2.0	3.4	1.4
Overall	85	70	23.5	0	50.6	34.3	25.9	65.7	2.5	3.6	1.1

Table 2. Percentage of participants that gained from the workshop across all groups.

Benefits	Percentage across all groups (68 responses)
New knowledge that is useful	84
New skills/techniques to apply	56
A change of attitude	29
Increased understanding of issues	85
Increased understanding of other people's opinions	25
Time to think	22
Little or no benefit	0

The response from these tables shows that the growers gained from the experience.

The vintages during which the Protocols were developed were particularly dry; therefore, disease pressure was low. The 2004/2005 vintage was very wet in the period leading up to and during veraison. Also, some areas, eg parts of Yarra Valley, suffered hail damage around Christmas and this damage now showed as *Botrytis* hotspots. The regions were now very keen to have the protocols tested under high-pressure conditions and refinements made to them if necessary. This vintage had weather similar to that experienced when the Alpine Valley growers noticed browning in the Sauvignon Blanc fruit, caused they thought, by other bunch rots, eg *Aspergillus* or *Alternaria* spp.

The regional growers have expressed the wish to identify these other bunch rots and also have a method of identifying the browning should it be the result of another polyphenoloxidase (PPO).

The research team used in this project has worked closely with the growers and Grape Check staff in the Alpine valley, King Valley, Yarra Valley and Mornington Peninsula regions. Growers in these regions have embraced the Botrytis Best Practice Protocols with significant improvement in their *Botrytis* management and reduction in their chemical costs. During the period where the research was focussing on *Botrytis,* it became apparent that growers were confusing *Botrytis* for many other bunch rots, and that some of the bunch rot damage could be attributed to other pathogens. Extensive collections of other fungi were collected along with *Botrytis* isolates when the potential significance of these organisms was realised.

The collection will form the basis of the research in this project because the isolates were collected at times considered important also for *Botrytis* infection or expression, ie flowering, shatter, pre-bunch closure, veraison, harvest and post-harvest.

The observation by Mr Steven Lowe and growers in the King Valley during a period of warm, wet and humid weather between January 30th and February 4th 2001, that *Aspergillus* and *Alternaria* species may be causing problems to the berries of Sauvignon blanc also has led to this current project. Rapid oxidation of juice from this fruit caused significant problems during the wine making process. Tests showed that *Botrytis*-induced laccase was not the polyphenoloxidase present. Mr Lowe found that Mancozeb is registered for use in viticulture but has a 30-day with holding period and, so, cannot be used at harvest.

Management of Botrytis and Other Bunch Rots

At previous workshops, growers expressed concern in not being confident in recognising *Botrytis* let alone other bunch rots. They were interested in workshops in the future where they could learn more about identification and maybe have some book/card system that they could use in the vineyard.

Project Aims and Performance targets

OBJECTIVES:

1. Determine the efficacy of Registered Chemicals against non-Botrytis bunch rots pathogens.

2. Determine the presence of non-laccase PPOs & provide a possible winery test.

3. Run workshops for growers to identify Botrytis from non-Botrytis bunch rots and consider management protocols.

4. Provide growers with a recommended spray programme for the management of non-Botrytis bunch rots.

Literature review

Preliminary and Previous Research

The research team to be used in this project has worked closely with the growers and Grape Check staff in the Alpine valley, King Valley, Yarra Valley and Mornington Peninsula regions. Growers in these regions have embraced the Botrytis best Practice Protocols (Cole *et al.*, (2004a); Cole *et al* (2004b) with significant improvement in their *Botrytis* management and reduction in their chemical costs.

During the period where the research was focussing on *Botrytis,* it became apparent that growers were confusing *Botrytis* for many other bunch rots, and that some of the bunch rot damage could be attributed to other pathogens.

Botrytis bunch rot of grapevines, caused by *Botrytis cinerea* Pers: Fr. is a severe disease at harvest if prevailing environmental conditions favour disease expression. Control of the disease is based on the frequent application of fungicides but disease outbreaks have been associated with the appearance of fungicide resistant strains. In Australia, growers who apply fungicides may still get Botrytis expression at harvest. Botrytis is the one pathogen, which is presently not being controlled because it is a complex, variable, non-host specific fungus with multiple infection pathways. *B. cinerea* also attacks a wide variety of plants in temperate regions and causes significant economic losses. The most common symptom induced by *B. cinerea* is decay and rot in all types of fleshy organs. Due to its wide host range *B. cinerea* is endemic in the natural environment.

The wide host range of the fungus and its ability to infect numerous plant organs and reproduce rapidly in the field hampers disease control. Disease pressure can be reduced by the removal of infested plant material and by providing conditions for proper aeration to lessen the relative humidity around bunches (canopy management) (Stapleton and Grant 1992; Zabadal and Dittmer 1998). Chemical control is one of the major control methods for *B. cinerea*. Benzimidazole and dicarboximide fungicides have been used extensively and resulted in the rapid development of resistant *B. cinerea* populations that has limited their use. The current chemical suite includes iprodione and pyrimethanil (Steel, Somers, and Castillo-Pando 1999). Despite using recommended spray regimes for Botrytis, growers are failing to gain consistent, effective control of bunch rot at harvest resulting in lower quality grape production.

Viret *et al* (2001); Cole *et al* (1999); Cole (2004); Keller *et al* (2003) have shown that infection by *Botrytis* is preferentially through damaged tissue. For example, through the cap scar at flowering and through damaged berry skin nearer to harvest. Berries leaking sugars provide an easily accessible entry for other opportunistic pathogens as well as *Botrytis*. *Aspergillus* species prefer warmer temperatures and some species prefer high sugar substrates. Ripe grape berries provide that habitat.

Polyphenoloxidases (PPO) are catechol oxidases, enzymes that are released by broken cells and are involved in a reaction between colourless polyphenols and oxygen from the air. The

subsequent browning results from cross reactions that form melanin as a final product. PPOs may be present in cell walls or intracellular but at each location may cause browning of tissue (Engelbrecht, 1987). Wine oxidation may be enzymatic or non-enzymatic. Enzymatic oxidation of wine is carried out by two groups of enzymes one of which is laccase resulting from Botrytis infection of grapes (Margalit, 1997).

Methods and Materials

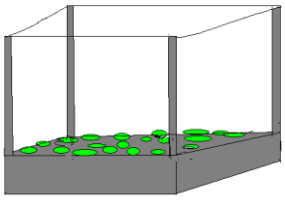
Laboratory trials:
2006: To determine if bunch rot pathogens require berry damage for infection.

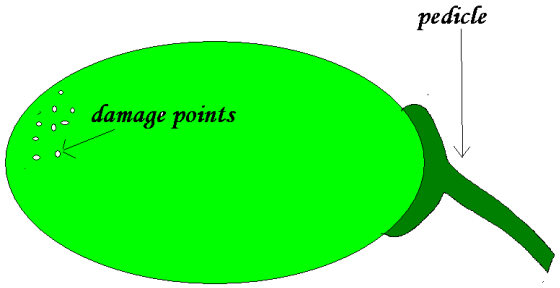
Grape berries with pedicle attached were removed from rachis, surfaced sterilised with 1% bleach and triple washed with sterile distilled water. Berries (25) were damaged at the apical point using a sterile needle to create pin holes; 25 berries were left undamaged.

All berries were placed sideways onto sterilised styrene test tube racks and sprayed with a spore suspension using an atomizer to deliver a known volume and number of spores. Ten berries were sprayed with sterile water as a control giving a total of 60 berries per organism.

The three most frequently isolated bunch rotting organisms were tested; *Alternaria* sp, *Aspergillus niger*, *Botrytis cinerea.* Spore suspensions were made up as near as possible to equal numbers: *A. niger 50* spores/µL in 1000mls; *Alternaria* sp 45 spores/µL in 1000mls; *B. cinerea* 45 spores/µL.

Test tube racks with berries were then covered with cling film and left for 10 days.





2006 Challenging non-Botrytis bunch rots on fungicide amended agars.
The effect of fungicides on non-Botrytis bunch rots under laboratory conditions.

Four fungicides were tested in sets of three with three species of fungi per test to minimise errors in assessments. Culture plates of each organism were subbed and maintained for the duration of the experiment on Potato Dextrose Agar. Isolates from the three different regions are to be used.

Fungicides were amended into Czapek Dox (totally defined medium) and Malt Extract Agar (undefined medium).Five replicates of each fungicide for each isolate were set up (fifteen plates of each fungicide amended agar and 15 non amended plates as controls, per organism, making a total of 90 plates of each agar per set). Agars were made at label rate and after autoclaving were placed into a 50ºC water bath for temperature equilibration.

Fungicides were made according to label rate; filter sterilised and added to 50C agar.

Agars were aseptically pH adjusted for 50C to 5.5 - 6.0. The agars were then left for 3 days (to confirm non-contamination and to allow the surface to dry before inoculation with fungal plugs).Ten by 1mm diameter bores are taken from each fungal plate and placed culture-side down onto the centre of the five replicated plates of each fungicide-amended plate.

Plates were incubated at 25C and then measured with 2 recordings at 90 degrees to one another from colony edge to colony edge using digital calipers and the data recorded after 2 and 7 days.
Results were summarised as:
'no effect' – organism grew and sporulated unchecked by fungicide;
'low effect' – some inhibition expressed as decreased hyphal extension with little or no sporulation;
'mid-effect'- significant inhibition of hyphal extension with no sporulation;
'high effect' – total inhibition of growth.

2005-2006/2006-2007 Glass house trials
Two hundred Sauvignon blanc cuttings were potted and set up in a glass house to produce inflorescences and bunches for a trial to test fungicides against potential pathogens under controlled conditions. All of the cuttings showed fruitful buds at the time of planting. Watering nutrient solution was half-strength Hoagland's' solution or water.

2006-2007/2007-2008 Field trials
Myrtleford (Alpine Valley), Lusatia Park (Yarra Valley) and Mornington Estate (Mornington Peninsula).

Fungal isolates being used have been collected *in situ.*

The aim of these trials was to determine if botryticides and other registered chemicals increase the incidence of other bunch rotting fungi by reducing the levels of naturally occurring beneficials throughout the season.

The bunch rot fungi selected for testing in the field were those most commonly isolated and considered most important by growers interviewed during the course of the project.

Each organism was grown on the most appropriate medium – 10 plates - to give heaviest and quickest sporulation – generally potato dextrose agar - PDA (Amyl Media P/L) or malt extract agar - MEA (Amyl Media P/L). Spores were washed off using sterile 0.1% peptone water and gentle rubbing, collected and diluted to a standardised number – approximately 45-50/μL.

The fungicides were made up to label rates for grapes.

Five chemicals were applied: Rovral (Iprodione) , Scala/Bravo (Chlorothalonil), Macozeb/Dithane, Sumisclex (Procymidone), Switch (Cyprodinil + fludioxonil) to randomised plots overlayed with 4 fungal species, *Alternaria, Aspergillus, Penicillium* and *Botrytis* (as control) - three isolates of each = 12 isolates to be tested.

Management of Botrytis and Other Bunch Rots

Field layout: 12 fungi x 5 chemicals + 5 controls.

Target organisms and fungicides were applied at 80% cap fall, veraison and pre-harvest. Bunches were collected before spraying the target organisms and fungicides and post spraying to determine if levels of target fungi and other environmental microflora were influenced by the particular fungicides.

Following the randomised plot lay-out below, fungal spores were applied to run-off to bunches on the selected vines in the appropriate panels. Forty-eight hours later, fungicides were applied to run-off following the design. Generally about 8 hours later, bunches were picked carefully and transported back to the laboratory where they were moist incubated at ambient temperature for 10 days after which assessments of fungal growth and identification of the fungal species sporulating was carried out. Raw data is presented in Appendix 5.

THIS ENTIRE RESEARCH PROJECT IS PREDICATED ON WET WEATHER DURING THE SEASON.

GWRDC Trial design 2006/2007 - 2007/08 fungicide efficacy against other bunch rots

Row 1		**Row 2**		**Row 3**	
Fungi	chemical	Fungi	chemical	Fungi	chemical
Bot	Rovral	control	Control	Bot	Rovral
Pen	switch	control	control	Pen	switch
pen	Rovral	Bot	Mancozeb	pen	Rovral
Asp	Rovral	Control	Control	Asp	Rovral
Bot	Switch	pen	Sumisclex	Bot	Switch
control	Control	Pen	Mancozeb	control	Control
Bot	scala	Bot	Sumisclex	Bot	scala
Control	Control	Asp	Switch	Control	Control
alt	Mancozeb	alt	Rovral	alt	Mancozeb
Asp	scala	Alt	Mancozeb	Asp	scala
alt	switch	alt	Sumisclex	alt	switch
Asp	Sumisclex	Pen	scala	Asp	Sumisclex
alt	Scala	alt	Scala	alt	Scala
Pen	scala	Asp	Sumisclex	Pen	scala
alt	Sumisclex	alt	switch	alt	Sumisclex
Alt	Mancozeb	Asp	scala	Alt	Mancozeb
alt	Rovral	alt	Mancozeb	alt	Rovral
Asp	Switch	Control	Control	Asp	Switch
Bot	Sumisclex	Bot	scala	Bot	Sumisclex
Pen	Mancozeb	control	Control	Pen	Mancozeb
pen	Sumisclex	Bot	Switch	pen	Sumisclex
Control	Control	Asp	Rovral	Control	Control
Bot	Mancozeb	pen	Rovral	Bot	Mancozeb
control	Control	Pen	switch	control	Control
control	control	Bot	Rovral	control	control

In each panel, 5 bunches from each of the centre two vines. Controls have no fungus, no fungicide.

Panel 1		Panel 2		Panel 3		Panel 4		Panel 5	
F	C	F	C	F	C	F	C	F	C
Bot	Rovral	Pen	Switch	Pen	Rovral	Asp	Povral	Bot	Switch
Control	Control	Bot	Scala	Control	Control	Alt	Manco	Asp	Scala
Alt	Switch	Asp	Sumi	Alt	Scala	Pen	Scala	Alt	Sumi
Asp	Manco	Alt	Rovral	Asp	Switch	Bot	Sumi	Pen	Manco
Pen	Sumi	Control	Control	Bot	Manco	Control	Control	Control	Control

Abbrev:

F	Fungus
C	Chemical
Bot	Botrytis
Alt	Alternaria
Asp	Aspergillus
Pen	Penicillium
Manco	Mancozeb
Sumi	Sumisclex

2005 -Identification of polyphenoloxidase other than laccase causing browning in berries of Sauvignon blanc.

Bunches will be inoculated with isolates from the fungal collection produced during the previous project and incubated in humid conditions to establish infections that may lead to the development of PPOs. Botrytis, and the resultant laccase production, will be used as the control. Should fungal induced browning be achieved, the juice will be tested for the presence of PPOs using HPLC technology at the Chemistry Centre at Monash Clayton.

It is yet to be established that the browning in Sauvignon blanc in the Alpine Valley is the result of fungal activity despite the fact that *Alternaria* and *Aspergillus* spp appears always to be present.

This part of the project was to be carried out by an Honours student. Discussion with Honours coordinators at University of Melbourne and Monash University did not provide a student during the first and second year of the grant.

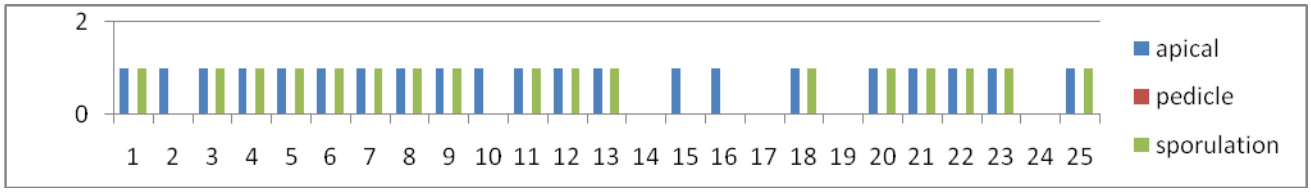
Further discussions were then held with the relevant laboratory at University of Melbourne and the Chemistry Analysis Laboratory at Monash University which did not lead to assistance being offered.

At the same time, in discussions with Mr Steven Lowe, he suggested that the problem seen in the Sauvignon blanc was not biochemical. The syndrome was not found in any of the blocks previously affected subsequent to the 2002 season. Failure of glasshouse vines because of the drought conditions did not allow the various organisms isolated from the same block to be tested. A request was made to University of Melbourne to return money covering this part of the project.

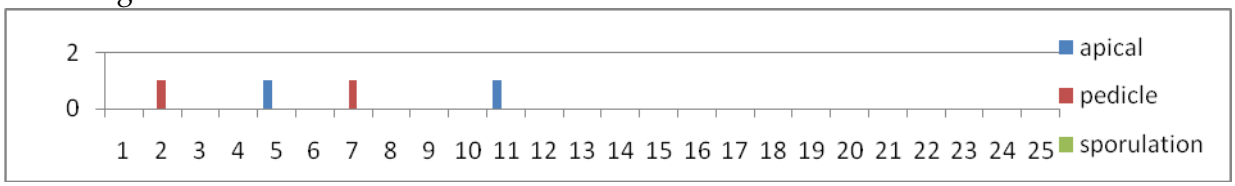
Results

2006: To determine if bunch rot pathogens require berry damage for infection.

Damaged

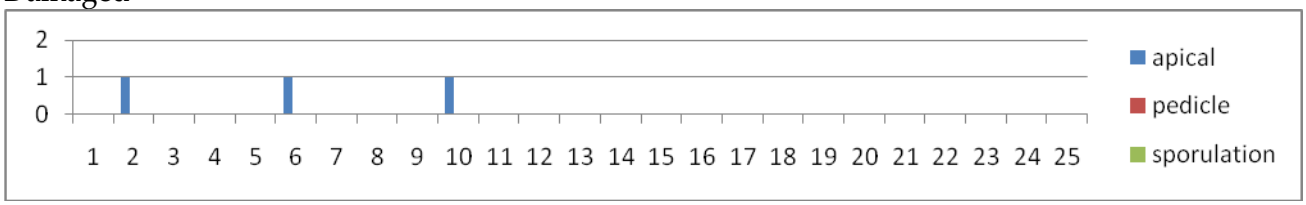


Undamaged

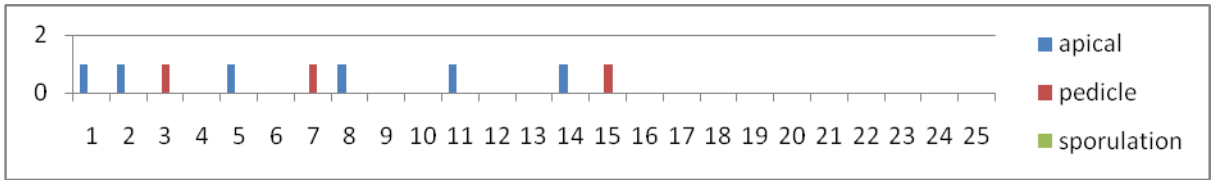


Alternaria sp.
Undamaged has no infection

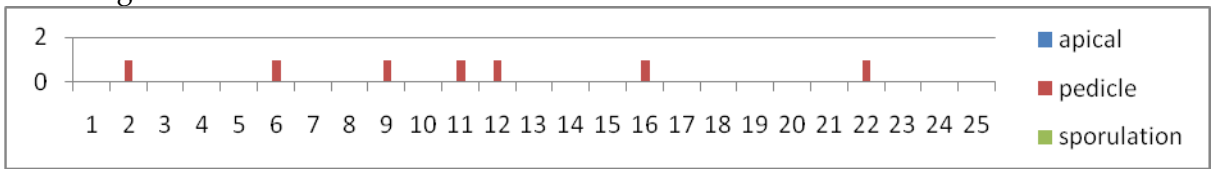
Damaged



Botrytis sp.
Damaged



Undamaged



84% of damaged berries inoculated with *A. niger* on the berry apex away from the pedicel showed infection at the damage points and, of those, 68% sporulated. No obvious infection

was apparent at the pedicel. On the undamaged berries, infection was apparent in 8% at the pedicel and berry apex.

Damaged berries inoculated with *Alternaria* sp spores showed no apparent infection. 2.5% of undamaged berries showed *Alternaria* sp infection at the berry apex.

24% and 28%, respectively, of the damaged berries inoculated with *B. cinerea* showed infection at the berry apex and pedicel.

2006 Challenging non-Botrytis bunch rots on fungicide amended agars
The effect of fungicides on non-Botrytis bunch rots under laboratory conditions.

During the season, many organisms were isolated that are commonly found on the phylloplane of aerial plant parts, not just grapevines. Only those species considered as potential bunch rots and, therefore, requiring consideration by growers were tested against the fungicides. Of these, several are opportunistic in their activity causing bunch rots under the appropriate conditions at harvest, eg, warm, wet or cool, wet weather, bird damage or tight bunches.

The chemicals tested were those used as botryicides in all regions if chemicals were used:
Scala (pyrimethanil) - can result in residues if sprayed after 80% capfall.
Bravo (chlorothanil) - used no later than 80% capfall.
Switch (cyprodinil + fludioxonil) - not recommended within 60 days of harvest and preferably before bunch closure.
Rovral (iprodione) - available for use up to 30 days before harvest and no later than 7 days before harvest.

King & Alpine Valley isolates.

Of the King & Alpine Valleys isolates tested, *Alternaria* showed little affect from Scala, but was totally knocked down by Rovral, Switch and Bravo. *Aspergillus* and *Penicillium* and the yeast, *Rhodotorula rubra*, were totally susceptible to all four fungicides. The *Botrytis* isolate showed a level of resistance to Switch and Bravo, and to a lesser extent, Rovral, but was totally susceptible to Scala. *Rhizopus* was marginally affected by Rovral and Scala but totally susceptible to Switch and Bravo.

ALTERNARIA

Chemical	No Effect	Low Effect	Mid Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

ASPERGILLUS

Chemical	No Effect	Low Effect	Mid Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

BOTRYTIS

Chemical	No Effect	Low Effect	Mid Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

PENICILLIUM

Chemical	No Effect	Low Effect	Mid Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

RHIZOPUS

Chemical	No Effect	Low Effect	Mid Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

YEAST

Chemical	No Effect	Low Effect	Mid Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

Yarra Valley isolates

The Yarra Valley isolates of *Alternaria* and *Aspergillus* showed more resistance to the fungicides than did those of the King and Alpine Valleys. Only Switch was totally effective against *Alternaria* while none of the fungicides knock down completely the *Aspergillus* isolate. Scala and Switch were highly effective against *Botrytis* .*Penicillium* and *Rhodotorula* and *Rhizopus* were totally susceptible to three fungicides and slightly less so, to Rovral.

ALTERNARIA

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

ASPERGILLUS

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

BOTRYTIS

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

PENICILLIUM

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

RHIZOPUS

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

YEAST

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

Mornington Peninsula isolates

Only Switch was totally effective against *Alternaria. Aspergillus, Penicillium,* and *Rhizopus* were affected by three out of four fungicides. This *Botrytis* isolate showed a level of resistance to all but Bravo. As As in the other regions, Rhodotorula was knock down by all the four fungicides.

ALTERNARIA

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

ASPERGILLUS

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

BOTRYTIS

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

PENICILLIUM

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

RHIZOPUS

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

YEAST

Chemical	No Effect	Low Effect	Med Effect	High Effect
ROVRAL				
SCALA				
SWITCH				
BRAVO				

2005-2006/2006-2007 Glass house trials

The glasshouse trials were unsuccessful in both years because of the lack of access to sufficient water to keep the vines growing adequately to produce and hold inflorescences followed by bunches.

2006-2007/2007-2008 Field trials
Myrtleford (Alpine Valley), Lusatia Park (Yarra Valley) and Mornington Estate (Mornington Peninsula).

It must be noted that the organisms represented are only those that can be cultured on the media selected at the temperature chosen for incubation and does not represent the total micorflora present on the vines at any time throughout the season.

The list of organisms isolated during the course of the season included those in low incidence, mostly saprophytes and not of interest to the viticulturist or wine maker from a winemaking perspective. These were found in all three regions.

The following tables were designed as hand-outs to illustrate to the grower workshops the effects of the most commonly used chemicals on the significant bunch rot organisms. Additionally, three beneficials were included to show the effect of the same chemicals on the beneficial micorflora on the phylloplane. Activity of the selected organisms was summarised and recorded as present or absent before spraying with the fungicides and post spraying with fungicides.

In both before fungicide application and after, the target organism applied was isolated in higher numbers than other organisms. The bunch rot organisms were present all through the season but increased in incidence as the season developed, ie as the temperatures and grape sugars increased. The fungicides showed less effect on the target bunch rots but had a serious effect on beneficials.

Organism	Importance to industry
Alternaria	Bunch rot
Aspergillus niger	Bunch rot
Botrytis cinerea	Bunch rot
Cladosporium	Beneficial
Cephalosporum	Saprophyte
Chaetomium	Saprophyte
Epicoccum	Saprophyte
Fusarium	Potential pathogen
Gliocladium	beneficial
Penicillium	Bunch rot
Rhizopus	Bunch rot
Stemphylium	Saprophyte
Trichoderma	Beneficial
Yeast - Rhodotorula	Beneficial

King & Alpine Valleys. Incidence of other bunch rots and beneficial fungi over the season

2 present in high numbers 0 absent 1 present in low numbers

		pre flower	po flower	Pre veraison	po veraison	pre harvest	po harvest
Rovral	Alternaria	2	1	2	2	2	1
Scala		2	1	2	2	2	1
Switch		2	1	2	2	2	1
Mancozeb		2	2	2	2	2	1
Sumisclex		2	1	2	2	2	1
control		2	2	2	2	2	0
Rovral	Aspergillus	2	2	2	2	2	1
Scala		2	2	2	2	2	1
Switch		2	2	2	2	2	1
Mancozeb		2	2	2	2	2	1
Sumisclex		2	2	2	2	2	1
control		2	2	2	2	2	2
Rovral	Botrytis	1	1	2	2	2	1
Scala		1	1	1	1	2	1
Switch		1	1	1	1	2	1
Mancozeb		1	1	1	0	2	1
Sumisclex		1	1	1	1	2	0
control		2	2	1	1	2	2
Rovral	Pencillium	2	1	1	1	2	0
Scala		2	2	2	1	2	1
Switch		2	2	2	0	2	1
Mancozeb		2	2	2	1	2	1
Sumisclex		2	1	2	1	2	0
control		2	2	2	1	2	2
Rovral	Gliocladium	2	0	2	2	0	0
Scala		0	0	0	0	0	0
Switch		2	0	0	0	0	0
Mancozeb		0	0	1	0	0	0
Sumisclex		0	1	1	0	0	0
control		0	0	0	0	0	0
Rovral	Trichoderma	2	0	1	2	1	0
Scala		2	0	1	0	1	0
Switch		2	0	1	0	1	0
Mancozeb		1	0	1	0	1	1
Sumisclex		1	1	1	1	1	0
control		1	1	1	0	1	1
Rovral	Yeast	2	0	1	2	2	0
Scala		2	0	2	0	2	0
Switch		2	0	2	0	2	0
Mancozeb		2	0	2	0	2	0
Sumisclex		2	1	2	0	2	0
control		2	2	2	2	2	2

Yarra Valley. Incidence of other bunch rots and beneficial fungi over the season

2 present in high numbers 0 absent 1 present in low numbers

		pre flower	po flower	pre veraison	po veraison	pre harvest	po harvest
Rovral	Alternaria	2	2	2	2	1	1
Scala		2	2	2	2	2	1
Switch		2	0	2	2	1	1
Mancozeb		2	2	2	2	2	2
Sumisclex		2	2	2	2	1	1
control		2	2	2	2	2	2
Rovral	Aspergillus	2	2	2	2	2	1
Scala		2	2	2	2	2	1
Switch		2	2	2	2	2	1
Mancozeb		2	2	2	2	2	2
Sumisclex		2	2	2	2	2	1
control		2	2	2	2	2	2
Rovral	Botrytis	1	1	1	1	1	1
Scala		1	1	1	0	1	1
Switch		1	1	1	1	1	1
Mancozeb		0	0	1	1	1	2
Sumisclex		2	1	1	2	1	1
control		2	1	0	0	1	1
Rovral	Pencillium	2	1	2	2	2	1
Scala		1	1	2	2	2	1
Switch		1	1	2	1	2	1
Mancozeb		1	1	2	2	2	2
Sumisclex		2	1	2	2	2	2
control		2	1	0	0	2	2
Rovral	Gliocladium	0	0	1	0	0	0
Scala		1	0	1	0	1	0
Switch		1	0	1	0	0	0
Mancozeb		2	0	1	0	1	0
Sumisclex		2	0	1	0	1	0
control		2	0	1	2	0	0
Rovral	Trichoderma	1	0	1	0	1	0
Scala		1	0	0	0	1	0
Switch		1	0	1	0	1	0
Mancozeb		1	0	1	0	0	0
Sumisclex		1	0	1	0	0	0
control		2	0	2	2	2	2
Rovral	Yeast	2	1	2	0	2	1
Scala		2	0	2	0	2	0
Switch		2	0	1	0	2	0
Mancozeb		2	2	2	0	2	1
Sumisclex		2	0	1	0	2	0
control		2	2	2	2	2	2

Mornington Peninsula. Incidence of other bunch rots and beneficial fungi over the season

2 present in high numbers 0 absent 1 present in low numbers

		pre flower	po flower	pre veraison	po veraison	pre harvest	po harvest
Rovral	Alternaria	2	2	2	1	2	1
Scala		2	2	2	2	1	1
Switch		2	2	2	1	1	1
Mancozeb		2	2	2	2	1	1
Sumisclex		2	2	2	2	1	0
control		2	2	2	2	2	1
Rovral	Aspergillus	2	2	2	1	1	1
Scala		2	2	2	1	1	1
Switch		2	2	2	1	1	1
Mancozeb		2	2	2	2	1	1
Sumisclex		2	2	2	2	1	1
control		2	1	2	2	2	1
Rovral	Botrytis	1	1	2	1	1	1
Scala		1	1	2	0	1	1
Switch		1	1	2	0	1	1
Mancozeb		1	1	2	1	1	1
Sumisclex		1	1	2	1	1	1
control		2	2	2	2	1	1
Rovral	Pencillium	2	1	2	2	1	1
Scala		2	2	2	2	1	1
Switch		2	2	2	2	1	1
Mancozeb		2	1	2	2	1	1
Sumisclex		1	1	2	2	1	1
control		2	2	0	0	1	2
Rovral	Gliocladium	0	0	1	0	0	0
Scala		0	0	0	0	0	0
Switch		0	0	0	0	0	0
Mancozeb		0	0	1	0	0	0
Sumisclex		0	0	0	0	0	1
control		2	2	2	2	1	0
Rovral	Trichoderma	1	0	0	0	0	0
Scala		1	0	1	1	0	0
Switch		1	0	1	0	0	0
Mancozeb		0	0	1	1	0	0
Sumisclex		1	0	1	0	0	1
control		1	2	1	2	2	2
Rovral	Yeast	2	0	1	0	1	0
Scala		2	0	1	0	1	1
Switch		2	0	1	0	1	0
Mancozeb		2	1	1	0	0	0
Sumisclex		2	1	1	1	0	1
control		2	2	1	0	2	2

Discussion

All aspects of this project were affected to some extent by the severe drought experienced at all sites during the course of the project. The glass house trials, in particular, provided no data because there was either no, or insufficient, water to maintain the vines to fruiting. The drought conditions also affected the field experiments where it was difficult to apply the fungicides in other than extremely hot temperatures even late in the day.

Although this project considered non-Botrytis bunch rots, *Botrytis* was included as a control because it was present in all the isolations and was used as a control organism for the fungicides.

2006: Infectivity of bunch rot pathogens on undamaged and damaged grape berries.
The organisms were selected for this trial because they were isolated most commonly during the growing seasons in each of the regions. Berry inoculation on damaged and undamaged berries showed that *A. niger* was the most infective and rapidly sporulating pathogen of the three bunch rot organisms tested. *Aspergillus* species grow optimally at higher temperatures experienced at harvest and are seen to dominate on rotted bunches in the regions where these trials were carried out.

Alternaria species are isolated commonly but have not shown an ability to infect through undamaged berry skins in this trial. This suggests that *Alternaria* species come into bunches already damaged by berry splitting or expressing Botrytis damage, i.e. as an opportunistic saprophyte.

B.cinerea showed a preference for damage as a point of entry on the berry flesh and the pedicel. Previous work by Keller *et al* (2003); Viret *et al* (2004) showed that Botrytis preferentially entered the cap scar, a natural wound area of berries, before undamaged berry skin.

2006 Challenging non-Botrytis bunch rots on fungicide amended agars.
Isolates of organisms were selected from the three regions to determine response to the registered chemicals. Some of the isolates recorded a level of resistance to commonly applied chemicals from the dog book – (Agrichemicals registered for use in Australian Vineyards 10/11).

The chemicals tested were those used as botryicides in all regions if chemicals were used. The chemicals tested were:
Scala (pyrimethanil) - can result in residues if sprayed after 80% capfall.
Bravo (chlorothanil) - used no later than 80% capfall.
Switch (cyprodinil + fludioxonil) - not recommended within 60 days of harvest and preferably before bunch closure.
Rovral (iprodione) - available for use up to 30 days before harvest and no later than 7 days before harvest.

Results show that some potential pathogens of lesser importance are seriously affected by fungicides used on a regular basis in some vineyards while other isolates are less affected. An implication of this result could be a shift in the relative impact of previously unimportant pathogens on quality of berries at harvest. It does indicate that use of the registered chemicals may be influencing the activity of otherwise lesser potential pathogens.

Avoid some foliar fertilisers closer than 60 days before harvest because of their effect on wine quality.

2006-2007/2007-2008 Field trials
Myrtleford (Alpine Valley), Lusatia Park (Yarra Valley) and Mornington Estate (Mornington Peninsula).

The list of organisms isolated during the course of the season included those in low incidence, mostly saprophytes and not of interest to the viticulturist or wine maker from a winemaking perspective. These were found in all three regions. However, the trials showed that all these organisms are affected detrimentally by fungicides applied against Botrytis, in particular.

The tables were designed as hand-outs to illustrate to the grower workshops the effects of the most commonly used chemicals on the significant bunch rot organisms. Additionally, three beneficials were included to show the effect of the same chemicals on the beneficial micorflora on the phylloplane. Activity of the selected organisms was summarised and recorded as present or absent before spraying with the fungicides and post spraying with fungicides.

In both before fungicide application and after, the target organism applied was isolated in higher numbers than other organisms. This suggests that the fungicides are not as effective as would be expected. The bunch rot organisms were present all through the season but increased in incidence as the season developed, ie as the temperatures and grape sugars increased. The fungicides showed less effect on the target bunch rots but had a serious effect on beneficials. Species such as *Gliocladium, Trichoderma* and the yeast, *Rhodotorula rubra,* all of which are beneficial species in the phylloplane, were all knocked out by each of the fungicides tested.

There is little variation in response of the bunch rot organisms to any of the fungicides. The fungicides selected are applied against *Botrytis,* and in all three regions, this species showed most effect from the application at each stage in the season. No bunch rot organism was affected to the extent as was the beneficials.

In reality, none of the chemicals tested could be used late in the season, with the exception of Rovral, but these trials show their effect is marginal once the sugars are high and berry ripeness is at harvest brix levels.

These trials, carried out under severe drought conditions, do suggest that the use of fungicides needs to be considered in the light of the damage done to the natural beneficial micorflora. Careful use of canopy management and vineyard management, including use of

irrigation, needs to be part of vineyard management before chemicals are applied. Soil health and vine health would minimise disease expression under most conditions at harvest.

Outcome and Conclusion

Present or absence of polyphenoloxidases:
This project was affected seriously by the drought conditions in all three grape growing regions involved and the laboratory site where the glasshouses are located. Unavailability of water to maintain vines meant that glasshouse trials could not be completed although growing cuttings across two seasons was attempted.

Discussions with Mr. Steven Lowe during the early part of the project suggested that he no longer considered that the syndrome was biochemical. Difficulty in having an Honours student take up the project to determine if polyphenoloxidases were involved resulted in this part of the project being abandoned and a request made to University of Melbourne to return the funding allocated to this aspect of the total project.

Field trials
In the field trials held across the three districts the controls consistently had a larger number of organisms including opportunistic, pathogenic and beneficial genera, showing that all chemicals tested had a detrimental effect on phylloplane fungi. Fungicide applications had minimal affect the bunch rots however there was not a significant difference between these. As they are effectively botryicides, it was expected that *Botrytis* isolates from each region would be most affected although the effect was marginal.

Of greater concern is the impact of each fungicide on the beneficial organisms. Many of these are natural competitors of specific pathogen species and their absence has to compromise the ability of the phylloplane microflora to provide natural protection against pathogen outbreaks resulting from unfavourable weather conditions.

Information cards & sheet
Laminated information cards were produced and given out to growers in the three regions. These displayed the bunch rot organisms on bunches, as seen with x10 magnifier and under x40 on a compound microscope. The single laminated sheet showed the bunch rot fungi as seen in the field or after incubation.

Recommendations

Make use of the Botrytis Best Practice Booklet and CD ROM (see references) for management advice at critical times in vine development. This management will minimise other bunch rots at the same time.

In unfavourable weather conditions, growers must be aware that their best efforts of Botrytis management may not be successful.

Manage canopies to reduce the period of leaf and fruit wetness after an event that favours botrytis development, eg rain, fog, dews.

Manage canopies to provide the most open and accessible fruit zone for light and spray application.

Monitor nutritional status of the soil and vines. Optimal health of the vines and a biologically active soil will minimise damage from pathogens.

Maintain a vineyard regime that results in earlier ripening of fruit.

Appendix 1: Communication

Communication / Extension activities

Workshops:

Alpine Valleys
Yarra Valley
Mornington Peninsula

Laminated information cards and sheet.

As was found with the Botrytis Best Practice workshops, growers need and are looking for good extension workshops to provide guidance in identifying the problem in the vineyard. The research outcomes are available for all the major diseases but translation of the research to the grower is not happening effectively.

More GWRDC funds need to be directed to good and effective extension.

Appendix 2: Intellectual Property

Appendix 3: References read for this project

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Appendix 4: Staff

Principal Research Staff

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Dr Mary Cole

Steve Whitmore

Contributing wine industry personnel

The following people assisted with the project:

Mr Stephen Lowe, Alpine Valleys Vignerons Association
Bob McNamara, Alpine Valleys R & D Subcommittee
Contributing growers in the three regions
Chemistry Department, The University of Melbourne, Parkville campus.

Acknowledgements

Thank-you to all the growers who participated in this project. Thank-you to Steven Lowe who remains enthusiastic about the wine industry and is always generous in his offers of help.

Appendix 5

Bunch Rots in the Alpine Valleys Wine Region

Presented by
Stephen Lowe
Alpine Valleys Vignerons Inc.
Former Grower Services Officer
Victorian Alps Wine Company

Our Experience with Bunch Rots other than Botrytis

30th January – 4th February 2001.
Five day period of warm, wet and humid weather.
Temperatures ranging from 30 - 36° Celsius
Rainfall 46.6mm over 5days, raining during day
Humidity ranging from 75 – 100%
5th February grower reports that he has seen something unusual in his Sauvignon Blanc block
Current baumé level 10.6, target baumé level 11.5

Bunch Rots in the Alpine Valleys



Bunch Rots in the Alpine Valleys



Site Investigation

Vineyard visit raised three main questions.

1. What is this disease ?
2. What effect will it have on grape quality ?
3. How can we manage / control it ?

Detective Work

Looked through pest & disease books / journals
Found two possibilities
1. Aspergillus
2. Alternaria

Contacted IHD Knoxfield, spoke to chemical standards officer and found these two pathogens are widespread in the vegetable industry.
Question. What chemicals do vegetable growers use to control these pathogens?
Answer. Mancozeb
Problem. Although Mancozeb in registered for use in viticulture, withholding period is 30 days so we cannot spray.

Action Plan

Monitor vineyard on a daily basis
Observe the progress of the disease
Harvest just prior to next rainfall event.
Add extra PMS to grape bins (300gms / 3 tonne bin) to prevent oxidation

Bunch Rots in the Alpine Valleys



Bunch Rots in the Alpine Valleys



Bunch Rots in the Alpine Valleys



Bunch Rots in the Alpine Valleys



Winery Issues

Problem.
Rapid juice oxidation post pressing
Action.
Bentonite fining
Protein stabilisation
Maintain molecular SO2 levels at 900 –950 (25 – 30 ppm)
Result.
Loss of delicate Sauvignon Blanc flavours

Economic Ramifications

Winery
Extra costs
Less income due to wine sold as bulk neutral white

Grower
Less income due to penalties being applied

2002 Season

Advised all Sauvignon Blanc growers to spray Mancozeb at flowering (80 % cap fall) tank mix with Scala
Result
Dry, warm conditions throughout harvest
No visual evidence at harvest
Juice oxidation reduced but still evident
Need to find out more about this problem

Post 2002 Vintage

Rang Dr Mary Cole, Monash University and following extensive discussions applied to GWRDC for RITA funding to assist Mary and her team to research these pathogens

Management of other bunch rots.

Presented to:
Alpine Valleys Wine Region – King Valley Vignerons;
Yarra Valley Wine Growers Association; and
Mornington Peninsula Vignerons Association
January 13,15 & 16th 2009

Dr Mary Cole & Mr Steven Whitmore,
The University of Melbourne & Agpath P/L
agpath@iprimus.net.au
0413 013 247.

History leading to Project

Observations by Stephen Lowe

30th January – 4th February 2001.

Five day period of warm, wet and humid weather.
Temperatures ranging from 30 - 36° Celsius
Rainfall 46.6mm over 5days, raining during day
Humidity ranging from 75 – 100%
5th February grower reports that he has seen something unusual in his Sauvignon Blanc block
Current baumé level 10.6, target baumé level 11.5

Bunch observations



Questions to be answered.

1. **What is this disease ?**
2. **What effect will it have on grape quality ?**
3. **How can we manage / control it ?**

Preliminary Information

Found two possibilities
1. Aspergillus
2. Alternaria

Contacted IHD Knoxfield, spoke to chemical standards officer and found these two pathogens are widespread in the vegetable industry.

Question. What chemicals do vegetable growers use to control these pathogens?
Answer. Mancozeb

Problem. Although Mancozeb in registered for use in viticulture, withholding period is 30 days so we cannot spray.

GWRDC project

- Identify the fungi producing polyphenol oxidases (if that is what was causing the problem);
- Determine which registered chemicals are effective against potential bunch rots.
- Use workshops and identification material to inform growers about management of other bunch rots.

Registered chemicals tested under field conditions

- Rovral
- Scala
- Switch
- Mancozeb
- Sumisclex

Bunch rot fungi tested

- Alternaria
- Aspergillus
- Botrytis
- Penicillium
- Rhizopus

Beneficials tested

- Gliocladium
- Trichoderma
- yeasts

Outcomes 1

- Later information suggested that the initial effect was more likely to be sun-burn rather than a PPO taint.
- Mancozeb had no effect on either Aspergillus or Alternaria when applied to run off under field conditions at critical growth stages of the vine, ie flowering and veraison (30 day withholding) but did affect the beneficials later in the season.

Outcomes 2

- Rovral, Scala and Switch had little to no affect on Aspergillus and Alternaria but had significant affect on the beneficials.
- Botrytis was in low levels because of dry conditions. However, when present, none of the chemicals tested affected the level of Botrytis present.
- Beneficial fungi are being killed off by all chemicals tested.
- For any reduction in numbers following a chemical application, the pathogens and beneficials return by the next significant stage in vine growth.

Consideration of problem

- Botrytis is a wide-spread primary pathogen;
- The other bunch-rot fungi are also wide-spread but are more generally saprophytic in their activity than is Botrytis.

Recommendations 1

- ***Treat as for Botrytis :***
- **By managing vines throughout season to reduce damage, congestion, environment.**
- **Because Alternaria and Aspergillus are found in all vineyards in high numbers through the season regardless of weather conditions.**
- **Because Alternaria, Aspergillus & Penicillium species are rarely ever the primary pathogen in a bunch rot environment – usually LBAM, bird damage, tight bunches precede damage by the 2nd pathogens.**
- **Because there is case for using biologicals at harvest as curatives.**

Grape inoculation trials

50 ripe berries inoculated with a spore suspension at pedicle and apical points. 25 undamaged 25 damaged at apical point. 10 control berries sprayed with water only. Results not added as all negative.

Var Sauvignon blanc assessed after 10 days

Aspergillus sp. 50/ul x 1000

Damaged	apical	pedicle	sporulation
1	1		1
2	1		
3	1		1
4	1		1
5	1		1
6	1		1
7	1		1
8	1		1
9	1		1
10	1		
11	1		1
12	1		1
13	1		1
14			
15	1		
16	1		
17			
18	1		1
19			
20	1		1
21	1		1
22	1		1
23	1		1
24			
25	1		1

Undamaged	apical	pedicle	sporulation
1			
2		1	
3			
4			
5	1		
6			
7		1	
8			
9			
10			
11	1		
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Alternaria
sp. 45/ul x 1000

Damaged	apical	pedicle	sporulation
1			
2	1		
3			
4			
5			
6	1		
7			
8			
9			
10	1		
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Undamaged	apical	pedicle	sporulation
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Botrytis 45/ul x 1000

Damaged	Apical	Pedicle	sporulation
1	1		
2	1		
3		1	
4			
5	1		
6			
7		1	
8	1		
9			
10			
11	1		
12			
13			
14	1		
15		1	
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Undamaged	apical	pedicle	sporulation
1			
2		1	
3			
4			
5			
6		1	
7			
8			
9		1	
10			
11		1	
12		1	
13			
14			
15			
16		1	
17			
18			
19			
20			
21			
22		1	
23			
24			
25			

Other bunch rots

fungicide resistance trial

7 days incubation

Media	organism	isolate	rep 1		rep 2		rep 3		rep 4		rep 5	
Czpek Doc	*Alternaria*	1	0	0	0	0	0	0	0	0	0	0
	control		46.6	45.3	40.4	38.9	34.5	35.6				
		2	23.4	18.9	19.4	10.8	14.5	21.3	20.4	15.6	15.5	15.6
	control		41.2	38.5	40.3	39.9	41.3	40.2				
		3	13.6	12.5	15.7	15.9	12.6	13.9	13.7	12.8	10.5	12.6
	control		32.5	29.7	38.4	27.2	41.5	37.2				
	Aspergillus	1	0	0	0	0	0	0	0	0	0	0
	control		19.2	18.3	21.4	20.6	22.7	21.7				
		2	0	0	0	0	0	0	0	0	0	0
	control		20.5	19.8	15	17.4	18.3	18.5				
		3	0	0	0	0	0	0	0	0	0	0
	control		14.5	12.4	12.2	14.9	15.4	16.5				
	Cladosporium											
		1	0	0	0	0	0	0	0	0	0	0
	control		19.7	15.6	22.4	29.7	31	31.2				
		2	0	0	0	0	0	0	0	0	0	0
	control		31.4	34.3	40.2	37.7	36.9	39				
		3	0	0	0	0	0	0	0	0	0	0
	control		20.2	19.4	29.3	33.2	31	32.6				

Media	organism	isolate	rep 1		rep 2		rep 3		rep 4		rep 5	
Malt extract	*Alternaria*	1	0	0	0	0	0	0	0	0	0	0
	control		30.7	29.8	28.6	27.6	26.8	29				
		2	13.4	14.3	13.7	15.5	14.3	16.3	15.1	15.7	13.1	14.3
	control		35.5	33.7	36.1	33.5	41.1	36.2				
		3	21.1	13.5	10.2	13.7	12.2	15.1	13.9	14.2	12.7	13.8
	control		37.6	32.4	40.2	39.7	40.5	41.2				
	Aspergillus	1	0	0	0	0	0	0	0	0	0	0
	control		19.2	20.5	20.7	20.6	18.9	15.1				
		2	0	0	0	0	0	0	0	0	0	0
	control		25.1	23.2	26.3	20.4	19.5	17.2				
		3	0	0	0	0	0	0	0	0	0	0
	control		15.4	19.2	16.3	14.1	14.7	14.9				
	Cladosporium											
		1	0	0	0	0	0	0	0	0	0	0
	control		40.1	39.6	42.3	36.7	34.2	33.5				
		2	0	0	0	0	0	0	0	0	0	0
	control		41.4	39.7	38.6	41.9	43.3	34.2				
		3	0	0	0	0	0	0	0	0	0	0
	control		25.2	24.7	29.2	30.5	27.2	25.7				

other bunch rots

fungicide resistance trial

7 days incubation

Media	organism	isolate	rep 1		rep 2		rep 3		rep 4		rep 5	
Czpek Dox	*Trichoderma*	1	0	0	0	0	0	0	0	0	0	0
	control		76.4	78.9	69.5	67.7	82.5	79.1				
		2	0	0	0	0	0	0	0	0	0	0
	control		80.1	72.4	77.6	78.3	67.4	68.9				
		3	0	0		0	0	0	0	0	0	0
	control		69.7	68.9	79	82.2	74.9	68.4				
	Penicillium	1	0	0	0	0	0	0	0	0	0	0
	control		50.2	49.7	61.4	55.6	53.4	45.6				
		2	0	0	0	0	0	0	0	0	0	0
	control		46.7	45.9	50.1	53.7	67.9	59				
		3	0	0	0	0	0	0	0	0	0	0
	control		49.9	51.2	50.3	47.1	40	39.6				
	Fusarium											
		1	0	0	0	0	0	0	0	0	0	0
	control		12.5	12.9	10.5	11.1	12.8	13.6				
		2	0	0	0	0	0	0	0	0	0	0
	control		12.7	13.8	15.2	12.7	14.8	14.3				
		3	0	0	0	0	0	0	0	0	0	0
	control		13.8	11.6	9.4	9.7	10.8	10.1				

Media	organism	isolate	rep 1		rep 2		rep 3		rep 4		rep 5	
Malt extract	*Trichoderma*	1	0	0	0	0	0	0	0	0	0	0
	control		69.4	77.8	80.1	79.4	77.3	78.9				
		2	0	0	0	0	0	0	0	0	0	0
	control		79.8	72.4	73.8	69.4	70.1	70.6				
		3	0	0		0	0	0	0	0	0	0
	control		68.5	68.9	79.2	80.5	75.9	78.7				
	Penicillium	1	0	0	0	0	0	0	0	0	0	0
	control		50	50.1	63.7	56.6	54.6	60.4				
		2	0	0	0	0	0	0	0	0	0	0
	control		45.6	45.7	49	52.7	59.8	51.9				
		3	0	0	0	0	0	0	0	0	0	0
	control		49.7	50.3	49.7	46.1	40.5	40.3				
	Fusarium											
		1	0	0	0	0	0	0	0	0	0	
	control		12.4	12.5	9.5	10.8	12.3	13.1				
		2	0	0	0	0	0	0	0	0	0	0
	control		11.8	12.9	14.8	13.1	15	13.9				
		3	0	0	0	0	0	0	0	0	0	0
	control		12.9	12.1	9	8.9	11.3	10.7				

other bunch rots

fungicide resistance trial

7 days incubation

Media	organism	isolate	rep 1		rep 2		rep 3		rep 4		rep 5	
Czpek Dox	*Phomopsis*	1	15.6	19.3	29.6	30.9	28.9	27.4	31.7	34.2	24.5	25.6
	control		35.3	35.6	39.6	41.1	45.8	44.7				
		2	0	0	0	0	0	0	0	0	0	0
	control		34.1	34.2	36.5	36.8	44.4	45.3				
		3	35.1	39.6	40.3	41.6	27.4	29.6	37.6	38.7	41.3	42.7
	control		40.9	41.7	45.8	45.2	43.5	43.2				
	Epicoccum	1	0	0	0	0	0	0	0	0	0	0
	control		34.5	35.2	31.7	32.8	31.3	32.4				
		2	0	0	0	0	0	0	0	0	0	0
	control		25.9	25.4	29.7	36.7	35.4	32.1				
		3	0	0	0	0	0	0	0	0	0	0
	control		31.5	31.2	32.1	31.8	31.7	31.9				
	Rhodotorula rubra	1	0	0	0	0	0	0	0	0	0	0
	control		9.8	9.7	9.4	9.4	9.1	9.8				

Media	organism	isolate	rep 1		rep 2		rep 3		rep 4		rep 5	
Malt extract	*Phomopsis*	1	17.5	21.3	21.6	31.3	31.4	31.6	32.1	34.7	32.4	31.2
	control		40	40.1	44.7	44.5	46.9	46.3				
		2	0	0	0	0	0	0	0	0	0	0

control		37.5	37.8	40.8	39.1	47.8	49.4				
	3	38.5	39.4	44.9	47.3	32.6	31.8	37.4	37.2	31.8	31.7
control		43.9	49.7	47.2	46.8	49.2	50.6				
Epicoccum	1	0	0	0	0	0	0	0	0	0	0
control		35.7	34.9	39.2	38.4	38.1	37.4				
	2	0	0	0	0	0	0	0	0	0	0
control		30.5	29.8	31.5	34.8	34.8	37.3				
	3	0	0	0	0	0	0	0	0	0	0
control		32.4	32.4	31	32.6	32.2	32.5				
Rhodotorula											
rubra	1	0	0	0	0	0	0	0	0	0	0
control		9.9	10.4	10.2	9.7	9.2	9.5				

Examples of challenge plates using Rovral as the fungicide as a protective and a curative.









2006-2007/2007-2008 Field trials
Myrtleford (Alpine Valley), Lusatia Park (Yarra Valley) and Mornington Estate (Mornington Peninsula).

Alpine **Flowering**
Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Alternaria	Rovral	1	1	1		1			1			1	1				1
		2	1	1	1				1	1		1	1				1
		3		1					1								
	Scala	1	1						1				1		1		
		2		1					1								
		3		1		1			1		1	1		1		1	
	Switch	1	1			1							1				
		2	1			1											1
		3	1	1	1				1			1					
	Mancozeb	1	1			1			1								
		2				1	1		1								
		3	1	1		1			1				1				
	Sumisclex	1	1	1					1	1			1				1
		2		1	1	1		1	1			1					1
		3	1	1		1			1		1	1					1

	Alpine Pre-spray		Flowering	Organisms found												
			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Aspergillus	Rovral	1	1	1		1				1		1					
		2		1		1							1				
		3	1	1									1				
	Scala	1		1		1			1			1					1
		2	1	1		1			1								
		3		1		1				1		1					
	Switch	1		1		1			1			1					
		2	1	1					1				1			1	
		3	1						1			1	1				
	Mancozeb	1	1	1		1				1		1	1				1
		2		1	1				1	1							
		3	1			1											
	Sumisclex	1	1	1		1			1							1	
		2	1	1		1			1	1		1					
		3		1		1					1	1					

Alpine **Flowering**

Pre-spray **Organisms found**

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Botrytis	Rovral	1	1	1		1						1	1			1	
		2	1						1	1						1	
		3	1	1		1			1	1							
	Scala	1	1	1	1				1								
		2	1												1		1
		3	1	1					1			1					1
	Switch	1	1	1	1	1				1		1					1
		2	1	1		1											1
		3	1			1			1						1		
	Mancozeb	1	1	1		1				1		1					
		2			1	1			1				1			1	1
		3		1		1			1	1						1	
	Sumisclex	1	1	1					1								
		2		1		1			1								
		3	1	1													

	Alpine Pre-spray		**Flowering Organisms found**														
			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Penicillium	Rovral	1	1										1				1
		2	1	1						1		1	1				
		3	1	1		1				1		1					
	Scala	1	1	1	1			1		1							1
		2	1	1		1				1		1					1
		3	1	1		1			1	1		1					
	Switch	1	1	1	1				1							1	
		2	1	1		1			1								
		3	1	1	1	1				1		1	1				1
	Mancozeb	1	1	1		1				1		1					
		2	1	1		1				1							
		3	1			1				1		1					1
	Sumisclex	1		1		1				1		1				1	1
		2	1	1		1			1				1			1	
		3	1	1	1				1			1				1	
Control		1	1	1	1	1		1									1
		2	1	1	1	1		1	1								1
		3	1	1		1											1

Alpine Flowering
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Alternaria	Rovral	1				1			1			1	1			1	
		2	1	1		1						1					
		3			1	1					1						
	Scala	1	1									1	1				
		2	1		1	1											1
		3		1													
	Switch	1	1														
		2		1						1							
		3	1		1	1			1								
	Mancozeb	1	1	1	1	1			1								
		2	1	1													
		3	1			1			1	1			1				
	Sumisclex	1	1	1	1							1	1				
		2	1		1							1					
		3	1		1						1	1					

Alpine **Flowering**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Aspergillus	Rovral	1	1	1	1	1					1						
		2	1							1							
		3		1						1		1					
	Scala	1			1				1	1			1				
		2				1							1				
		3		1									1				
	Switch	1		1		1	1										
		2		1					1								
		3	1		1				1						1		
	Mancozeb	1	1			1				1		1					
		2	1			1						1					
		3		1	1	1			1								
	Sumisclex	1		1		1				1							
		2				1						1					
		3		1	1								1				

Alpine **Flowering**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Botrytis	Rovral	1		1		1							1				
		2		1	1				1	1		1					
		3	1	1		1			1	1	1						
	Scala	1		1		1			1								
		2				1			1								
		3		1													
	Switch	1		1		1											
		2		1		1						1					
		3		1	1							1					
	Mancozeb	1		1	1							1					
		2		1		1						1					
		3				1			1			1					
	Sumisclex	1		1	1			1	1								
		2		1	1				1								
		3		1	1	1			1			1					

Alpine Flowering
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Penicillium	Rovral	1		1					1	1							
		2		1	1				1			1					
		3	1	1		1			1								
	Scala	1	1	1					1			1					
		2	1	1		1			1	1		1					
		3	1	1					1	1							
	Switch	1		1									1				
		2		1								1	1				
		3	1	1		1							1				1
	Mancozeb	1	1	1	1	1			1			1					
		2	1	1	1	1			1								
		3		1	1	1				1							
	Sumisclex	1		1	1					1		1					
		2		1		1			1			1					
		3	1		1	1						1					
Control		1	1	1	1					1		1		1			1
		2	1	1		1			1	1		1		1			1
		3	1	1	1	1						1		1			

Alpine **Veraison**

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1	1	1		1		1	1		1					1
		2	1	1		1										1
		3	1	1		1		1				1				
	Scala	1	1	1				1	1		1				1	1
		2	1	1		1			1		1					
		3	1	1		1			1							1
	Switch	1	1	1		1		1		1						1
		2	1			1			1		1					1
		3	1						1			1				1
	Mancozeb	1	1	1				1								1
		2	1	1	1	1										1
		3		1		1		1			1				1	1
	Sumisclex	1	1	1		1		1								
		2	1	1							1					
		3	1	1		1			1							1

Alpine **Veraison**

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Aspergillus	Rovral	1	1	1		1		1								1
		2	1		1			1								
		3	1	1		1					1					1
	Scala	1	1	1							1					1
		2	1	1		1		1			1					
		3	1	1		1		1								
	Switch	1	1		1				1		1					
		2	1	1		1		1	1		1					
		3	1	1		1		1			1					1
	Mancozeb	1	1	1	1	1									1	
		2			1			1		1						
		3	1			1		1								
	Sumisclex	1	1	1		1		1	1							
		2	1	1		1			1		1					
		3	1	1							1					1

Alpine **Veraison**

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Botrytis	Rovral	1	1	1		1		1								
		2	1	1	1	1		1	1							1
		3	1		1			1								1
	Scala	1	1		1	1		1								1
		2	1			1										
		3	1	1	1			1								
	Switch	1		1		1		1								1
		2		1		1										
		3	1	1	1	1									1	
	Mancozeb	1	1			1		1								1
		2	1	1	1	1					1				1	1
		3	1			1		1	1							
	Sumisclex	1	1	1	1	1		1								
		2	1	1	1	1	1	1								1
		3	1	1		1		1				1			1	1

Alpine **Veraison**

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Penicillium	Rovral	1	1			1		1				1			1	
		2	1	1		1					1					1
		3	1	1		1		1	1							1
	Scala	1	1			1		1								1
		2	1	1							1				1	
		3	1	1				1								1
	Switch	1	1			1		1								
		2	1	1		1		1	1		1					
		3	1					1			1					1
	Mancozeb	1	1	1	1	1		1			1					
		2	1	1	1	1										1
		3	1		1	1										1
	Sumisclex	1	1	1				1	1							1
		2	1	1	1	1										1
		3	1	1	1	1		1							1	1
Control		1	1	1	1	1					1					1
		2	1	1	1	1		1							1	
		3	1	1	1	1			1						1	1

Alpine **Veraison**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1	1					1	1		1					
		2	1	1	1	1		1	1		1					
		3						1								
	Scala	1	1		1	1		1	1							
		2	1	1	1	1										
		3						1								1
	Switch	1	1	1							1					
		2						1			1					1
		3	1	1	1			1								
	Mancozeb	1	1	1	1	1		1	1		1					
		2			1				1							
		3		1				1								
	Sumisclex	1		1				1			1					
		2	1	1	1			1				1				
		3	1			1		1			1					

Alpine **Veraison**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Aspergillus	Rovral	1	1		1						1					
		2		1					1			1				
		3		1												
	Scala	1	1		1			1			1					
		2	1	1												1
		3	1	1					1			1				
	Switch	1	1								1	1				
		2		1		1										1
		3	1		1			1		1						
	Mancozeb	1	1	1		1		1			1	1				
		2			1			1								
		3		1												
	Sumisclex	1	1	1					1							
		2	1			1			1							
		3		1		1					1					

Alpine **Veraison**

Post-spray Organisms found

		Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Botrytis	Rovral 1	1					1			1					
	2	1			1					1					
	3														
	Scala 1	1	1												
	2		1	1			1								
	3		1		1		1	1							
	Switch 1		1				1			1					
	2		1							1					
	3						1								
	Mancozeb 1		1				1								
	2	1	1							1					
	3		1												
	Sumisclex 1	1					1								
	2	1								1					
	3	1								1					

Alpine **Veraison**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Penicillium	Rovral	1			1						1					
		2		1	1	1					1					1
		3		1												
	Scala	1	1					1								
		2	1						1							
		3		1		1										
	Switch	1	1	1												
		2		1								1				
		3	1			1		1			1	1				
	Mancozeb	1	1	1	1			1			1					
		2				1		1	1		1					
		3	1	1							1					
	Sumisclex	1				1		1			1					
		2	1	1	1						1					
		3	1		1				1	1					1	1
Control		1	1	1		1		1	1		1				1	
		2	1			1	1	1			1				1	1
		3	1	1	1				1	1	1					

Alpine
Pre-spray

Harvest
Organisms found

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1	10	10				1								1
		2	75		25	1		1	1			1		1		1
		3	25					1								1
	Scala	1	50			1		1	1		25	1				1
		2	50	25		1		1	1	1						1
		3				1		1			100	1				1
	Switch	1		75		1						1			1	1
		2	25			1								1		1
		3	25			1					50	1				1
	Mancozeb	1		25		1		1			25					1
		2		25		1		1	1							
		3	75	25	50	1		1								
	Sumisclex	1	25	25		1		1			25	1			1	
		2				1						1				
		3				1			1	1		1				1

Alpine **Harvest**

number = percentage of bunch covered for the target organism (Alt, Asp, Bot and Pen)

Pre-spray Organisms found

organisms			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Aspergillus	Chemical	rep														
	Rovral	1			100	1		1	1		50				1	1
		2	25	10	25	1					10				1	1
		3	75	10		1		1				1			1	1
	Scala	1	25					1		1						
		2		25		1		1	1							1
		3	10	25		1					10					
	Switch	1		50	25			1			25	1				
		2			50	1		1							1	
		3				1		1								1
	Mancozeb	1		50		1		1								
		2	25	25				1			5	1				
		3	2	25	25						5	1				1
	Sumisclex	1		25	50	1										
		2			25			1								1
		3	10		15				1				1			

Alpine **Harvest**

Pre-spray Organisms found

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Botrytis	Rovral	1			25				1				1			
		2				1							1			
		3			25	1			1		25					1
	Scala	1	10		50			1	1			1	1		1	1
		2	10			1		1	1			1				1
		3		25	75	1						1				1
	Switch	1				1		1				1				1
		2	25	50		1		1	1			1				1
		3			25			1				1				1
	Mancozeb	1		50	25	1		1				1				1
		2	50			1		1								1
		3	25		25	1		1				1				1
	Sumisclex	1		50		1		1	1	1		1			1	1
		2				1			1	1	10	1		1	1	1
		3		50	25	1		1				1			1	1

Alpine **Harvest**

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Penicillium	Rovral	1			25			1							1	1
		2		75		1		1		1		1				1
		3	100	10		1			1		10	1				1
	Scala	1		25		1			1			1				1
		2	25	100		1		1	1	1		1			1	
		3		50		1		1	1		25	1				
	Switch	1		10		1		1	1		25	1			1	1
		2	10		10	1						1			1	
		3	10	50		1					5	1			1	
	Mancozeb	1		10	15	1		1		1					1	1
		2	50	50								1				
		3				1		1								1
	Sumisclex	1		10	50	1		1				1			1	
		2		100	75	1		1								
		3		10	25	1										
Control		1	25	25	25	1		1	1		25	1			1	1
		2	25	75		1	1	1	1	1						1
		3	10	25	10	1		1			10	1			1	1

Alpine **Harvest**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1	25								50					1
		2						1		1	25					
		3						1								
	Scala	1	25	2		1		1								
		2		50	50	1										
		3				1										1
	Switch	1		25												
		2						1								
		3														
	Mancozeb	1						1			25					
		2									25		1			
		3	25													
	Sumisclex	1	25		25											
		2	10													
		3	10			1										

Alpine **Harvest**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Aspergillus	Rovral	1				1										
		2														
		3	25		50											
	Scala	1									10					1
		2		25				1			10	1				
		3			25			1								
	Switch	1				1					100					1
		2		25												
		3													1	
	Mancozeb	1	25	10												
		2		10		1										
		3														
	Sumisclex	1														
		2														
		3	50			1										

Botrytis	Rovral	1	50					1							
		2	50	25				1							
		3		25	50			1							1
	Scala	1			25			1							
		2													
		3		100											1
	Switch	1	25								50				
		2				1		1							
		3	100							1					
	Mancozeb	1													
		2				1			1						
		3				1									
	Sumisclex	1				1									
		2									25				
		3				1									

Penicillium	Rovral	1														
		2		25												
		3								1						
	Scala	1				1					25					
		2		2	25	1										
		3			25			1	1							
	Switch	1				1		1								
		2	10		10	1						1				
		3		10	25											
	Mancozeb	1														
		2									50	1				
		3														1
	Sumisclex	1		25												
		2	25		25	1					25					
		3	25			1		1			25					
Control		1	50		10											
		2	50	75	25	1		1			25				1	1
		3	25	25	25	1					25					1

Yarra Valley Flowering
Pre-spray Organisms found

		Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep													
Alternaria	Rovral	1	1	1		1		1	1			1				1
		2		1		1		1	1		1					1
		3	1	1		1		1			1					
	Scala	1		1		1		1			1					
		2	1	1		1		1								
		3	1	1	1	1							1			1
	Switch	1		1						1	1					1
		2	1			1					1					
		3						1				1				
	Mancozeb	1	1					1							1	
		2	1	1	1				1		1					1
		3	1	1		1		1								
	Sumisclex	1	1			1		1	1		1					
		2	1	1		1		1			1	1				
		3	1			1		1			1					1

Yarra Valley Flowering
Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Aspergillus	Rovral	1		1	1	1								1		1
		2		1		1		1								1
		3		1								1				
	Scala	1	1	1				1						1		1
		2	1					1			1					
		3	1	1	1	1		1	1					1		1
	Switch	1	1	1		1		1	1		1			1		1
		2	1	1		1		1				1				
		3	1			1		1			1					
	Mancozeb	1	1	1								1				
		2	1	1		1			1		1					1
		3		1		1		1								1
	Sumisclex	1	1	1	1	1		1							1	
		2	1	1		1		1								
		3	1	1		1					1					

Yarra Valley Flowering
Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Botrytis	Rovral	1	1								1					1
		2	1			1		1	1		1				1	1
		3	1	1		1		1	1		1					1
	Scala	1		1					1	1		1				
		2	1	1		1					1					1
		3	1	1	1			1	1		1					1
	Switch	1	1	1	1	1		1	1							
		2	1	1	1				1			1				
		3	1			1		1								
	Mancozeb	1		1				1				1				
		2	1	1		1						1			1	
		3	1	1		1			1		1					1
	Sumisclex	1	1			1			1							1
		2	1			1		1	1		1					1
		3	1	1	1	1										1

Yarra Valley Flowering
Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Penicillium	Rovral	1	1	1	1						1					
		2	1	1		1			1		1	1			1	1
		3		1		1			1		1				1	
	Scala	1	1			1	1		1						1	
		2	1			1		1	1							
		3	1	1	1			1	1		1			1		
	Switch	1	1	1		1		1			1	1				1
		2	1	1		1		1								1
		3	1	1				1	1		1					
	Mancozeb	1	1			1			1						1	1
		2		1					1			1				1
		3	1	1		1		1	1		1					
	Sumisclex	1	1	1	1			1	1		1					
		2	1	1	1	1					1			1	1	
		3	1	1		1			1		1		1			1
Control		1	1	1	1	1		1	1		1	1			1	1
		2	1	1	1	1	1	1	1		1	1			1	1
		3	1	1		1										

Yarra Valley Flowering
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														

Alternaria	Rovral	1	1	1	1			1			1					
		2	1	1		1		1								
		3	1			1		1	1							
	Scala	1	1	1									1			1
		2	1	1		1										
		3	1	1							1					
	Switch	1	1								1					1
		2		1		1						1				
		3	1			1		1								
	Mancozeb	1	1	1	1	1		1								
		2	1	1							1	1				1
		3	1			1		1								1
	Sumisclex	1	1	1	1						1	1				
		2														
		3	1	1	1	1					1					

Yarra Valley Flowering
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Aspergillus	Rovral	1		1		1										
		2	1	1												
		3	1	1		1										
	Scala	1	1					1				1				
		2	1			1		1					1			
		3		1		1					1					
	Switch	1		1		1										
		2		1		1		1								
		3	1	1				1			1	1				
	Mancozeb	1		1		1		1			1	1				
		2	1	1				1			1	1				
		3	1	1		1		1			1					
	Sumisclex	1	1	1		1										
		2	1			1										
		3	1			1						1				

Yarra Valley Flowering
Post-spray Organisms found

organisms															
Botrytis	Chemical	rep	Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
	Rovral	1		1		1		1			1					
		2			1			1			1					
		3		1		1	1									
	Scala	1		1	1			1								
		2	1	1	1	1		1				1				
		3	1	1		1					1	1				
	Switch	1		1		1										
		2			1	1							1			
		3		1	1						1					
	Mancozeb	1	1	1		1					1					
		2		1		1					1	1				
		3	1	1				1								
	Sumisclex	1	1	1	1											
		2														
		3		1		1										

Yarra Valley Flowering
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Penicillium	Rovral	1		1		1										
		2	1					1				1				
		3	1	1		1		1								
	Scala	1	1	1	1	1					1					
		2		1	1	1		1	1		1					
		3	1	1	1			1			1					
	Switch	1		1		1					1					
		2		1		1					1	1				
		3	1	1	1							1				
	Mancozeb	1	1	1				1			1	1				1
		2		1	1	1		1								
		3		1	1	1			1		1					
	Sumisclex	1		1							1	1				
		2		1				1			1					
		3	1	1		1										
Control		1	1	1		1		1		1	1					
		2	1	1	1	1	1	1			1	1				
		3	1	1								1				

Yarra Valley Veraison
Pre-spray Organisms found

		Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast

organisms	Chemical	rep													
Alternaria	Rovral	1	1	1		1		1			1					1
		2	1	1		1		1		1	1					1
		3	1	1		1				1	1					
	Scala	1	1	1		1		1	1		1					
		2	1	1	1	1		1		1	1					
		3	1	1		1		1	1		1					1
	Switch	1	1	1		1		1								
		2	1	1		1			1					1		1
		3		1				1								1
	Mancozeb	1	1	1		1		1			1	1				1
		2	1	1		1					1				1	1
		3	1	1		1					1				1	1
	Sumisclex	1	1			1		1	1		1				1	
		2	1	1				1	1		1					
		3	1	1				1	1							1

Yarra Valley Veraison

Pre-spray Organisms found

organisms															
Aspergillus	Chemical	rep	Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
	Rovral	1	1	1												
		2	1	1				1						1		
		3	1	1		1		1			1			1	1	1
	Scala	1	1	1		1		1			1				1	
		2	1	1				1		1	1					
		3	1	1		1		1	1		1	1				
	Switch	1	1	1	1	1		1	1							
		2	1	1		1		1								1
		3	1	1		1		1			1					1
	Mancozeb	1	1		1	1		1							1	
		2		1		1		1								
		3	1	1		1		1								1
	Sumisclex	1	1	1		1			1					1		
		2	1	1		1			1		1				1	1
		3	1	1		1		1								1

Yarra Valley Veraison

Pre-spray Organisms found

organisms															
Botrytis	Chemical	rep	Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
	Rovral	1	1	1		1		1	1							
		2	1	1		1		1	1							
		3	1	1					1	1						1
	Scala	1	1	1	1	1		1								1
		2		1		1		1							1	1
		3	1	1	1	1					1				1	
	Switch	1	1	1	1			1							1	
		2	1	1		1		1			1	1			1	
		3	1	1	1	1		1								
	Mancozeb	1	1	1	1	1		1								
		2	1	1	1	1		1								1
		3	1	1	1	1		1	1		1					1
	Sumisclex	1	1	1	1	1		1	1	1						
		2		1	1				1	1		1			1	1
		3	1		1	1		1				1				

Yarra Valley Veraison
Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Penicillium	Rovral	1		1		1		1		1	1					
		2	1	1	1	1		1		1	1					1
		3	1	1				1			1					
	Scala	1	1	1		1		1								1
		2	1	1		1					1					
		3	1	1					1		1					
	Switch	1	1	1		1		1			1					
		2	1	1		1		1								
		3	1			1	1	1						1		
	Mancozeb	1	1	1		1			1		1					
		2	1	1		1		1			1					
		3	1	1	1	1		1		1						
	Sumisclex	1	1	1		1		1	1	1						1
		2	1	1		1		1		1						1
		3		1	1	1		1	1							1
Control		1	1	1		1	1	1			1					1
		2	1	1		1	1	1								1
		3		1		1		1	1	1				1		

Yarra Valley Veraison
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1	1	1				1	1		1		1			
		2	1	1	1			1		1	1					
		3						1								
	Scala	1	1			1		1								
		2	1	1	1	1		1	1		1					
		3	1					1			1					
	Switch	1	1	1				1			1					
		2	1	1				1			1					
		3	1	1	1	1		1			1					
	Mancozeb	1	1	1	1	1		1			1					
		2						1								
		3	1						1			1				
	Sumisclex	1	1	1		1										
		2	1	1	1			1			1					
		3	1	1		1					1					

Yarra Valley Veraison
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Aspergillus	Rovral	1	1		1											1
		2	1				1		1		1					
		3	1	1												1
	Scala	1	1		1	1					1					
		2	1	1							1					
		3	1	1		1		1			1					
	Switch	1	1								1					
		2	1	1	1	1										
		3	1		1	1					1					
	Mancozeb	1	1	1	1	1					1					
		2	1	1	1			1								
		3	1					1	1	1						
	Sumisclex	1	1	1		1		1	1							
		2	1	1		1		1	1		1					
		3	1	1		1					1					

Yarra Valley Veraison
Post-spray Organisms found

organisms																
Botrytis	Chemical	rep	Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
	Rovral	1	1			1					1					
		2	1			1					1					
		3	1					1								
	Scala	1	1	1				1	1							
		2		1				1	1		1					
		3	1	1		1		1			1					
	Switch	1		1							1					
		2		1				1								
		3						1								
	Mancozeb	1		1		1										
		2	1	1				1			1					
		3		1		1										
	Sumisclex	1	1	1				1								
		2	1	1				1	1							
		3	1	1				1	1		1					

Yarra Valley Veraison
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Pencillium	Rovral	1	1		1						1					
		2	1	1		1										
		3		1												
	Scala	1	1	1			1	1								
		2	1	1				1			1					
		3	1	1		1		1			1					
	Switch	1	1	1							1					
		2	1	1								1				
		3	1			1					1	1				
	Mancozeb	1	1	1		1					1					
		2		1		1					1					
		3	1	1		1					1					
	Sumisclex	1	1	1		1		1			1					
		2	1	1	1			1	1		1					
		3	1		1	1		1	1	1		1				
Control		1	1	1	1			1			1	1				
		2	1	1	1	1	1	1		1	1					
		3	1	1	1	1	1	1								

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Yarra Valley Harvest
Pre-spray Organisms found

organisms			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
	Chemical	rep														
Alternaria	Rovral	1	50					1			1				1	1
		2	100			1			1							1
		3	50							1	5					1
	Scala	1	25			1		1	1		5					1
		2		25	10	1			1							1
		3				1					10					
	Switch	1	10	25												1
		2		5				1								
		3				1	1	1								
	Mancozeb	1				1		1			25					
		2	10													
		3	50	50						1					1	
	Sumisclex	1	25											1		
		2														
		3				1		1	1							

Yarra Valley Harvest number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray Organisms found

organisms			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Aspergillus	Chemical	rep														
	Rovral	1						1	1	1	25					1
		2			25			1							1	
		3	50	50	2	1		1			25					
	Scala	1			5	1		1								
		2				1		1								
		3		10		1		1			2					1
	Switch	1		50	25	1		1								
		2						1								
		3		10							5					
	Mancozeb	1	10	10		1										
		2			10	0		1			5					
		3		25		1		1			5					
	Sumisclex	1				1										
		2				1									1	
		3				1			1				1		1	

Yarra Valley Harvest number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray Organisms found

organisms															
Botrytis	Chemical	rep	Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
	Rovral	1				1			1		50		1		1	
		2		10		1			1		25		1			
		3				1										
	Scala	1	25		10	11		1	1				1			
		2		50		1		1	1		10					
		3		25		1			1							
	Switch	1				1										
		2		10		1		1			10	1				
		3		50	50	1		1				1				1
	Mancozeb	1		50	25	1		1				1				
		2	5	25				1			10	1			1	
		3		25				1			5	1				
	Sumisclex	1				1				1	5	1				
		2				1						1			1	
		3	25	2	25	1						1				1

Yarra Valley Harvest number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Pencillium	Rovral	1	25	10		1		1				1				1
		2		25		1		1			5	1				
		3		10		1		1				1				1
	Scala	1		2		1										
		2				1										
		3		15		1		1	1	1	10	1				
	Switch	1				1		1				1				
		2	50	50		1		1			10	1				
		3						1			10	1				
	Mancozeb	1		10				1				1				1
		2		25		1			1			1				
		3	50	10		1			1			1				1
	Sumisclex	1			75	1		1			25	1				
		2		25	75	1		1			100					
		3		25		1		1							1	
Control		1	50		75	1		1			25	1				1
		2	75	75		1									1	1
		3	25	25	100	1		1			25	1			1	

Yarra Valley Harvest

Post-spray Organisms

			found													
			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1		10												
		2	50			1					25					
		3	10	10							25					
	Scala	1	25	10		1			1							
		2		10												
		3			25	1										
	Switch	1		10							25					
		2	25	50												
		3	10													
	Mancozeb	1	1			1		1	1		50					
		2	5	10												
		3	1	10												
	Sumisclex	1										1				
		2	10										1			
		3				1			1							1

Yarra Valley Harvest

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Aspergillus	Rovral	1			10			1			25					
		2														
		3			10											
	Scala	1	25			1		1								
		2									25					
		3			25											
	Switch	1				1										
		2														
		3			10						10	1				
	Mancozeb	1		10					1							
		2		10		1										
		3														
	Sumisclex	1						1								
		2				1		1			25				1	
		3	50			1					2					

Yarra Valley Harvest

Post-spray Organisms found

		Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Botrytis	Rovral	1													
		2	50		25	1		1	1							
		3		25		1										
	Scala	1		10	25											
		2														
		3		10	25						10		1			1
	Switch	1			10	1										1
		2				1										
		3	50													
	Mancozeb	1	50			1										
		2	50		10											
		3	25													
	Sumisclex	1								1					1	
		2				1			1							
		3			25	1										

Yarra Valley Harvest

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Penicillium	Rovral	1														
		2	25	25												
		3	25	25		1		1								
	Scala	1	50	10		1		1	1		25					
		2						1							1	
		3			5	1		1		1						
	Switch	1						1			10					
		2	10	5	10						10	1				
		3	10	10	25											
	Mancozeb	1	10								12					
		2			25	1			1		50	1				
		3							1							1
	Sumisclex	1	##		25	1		1								
		2	25	25	25											
		3	25	10	25			1								
Control		1	50	25	10	1					50	1				1
		2	50	25	25			1			50	1			1	1
		3	75		75			1			25					

Mornington Peninsula **Flowering**

Pre-spray

Organisms found

		Alt	Asp	Bot	Clad	Ceph	Chaet	Epi	Fus	Glio	Pen	Rhiz	Rhiz	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1	1	1		1			1								1
		2	1	1					1								
		3	1		1	1				1		1	1				
	Scala	1	1	1					1								1
		2	1	1		1											
		3	1	1								1		1			
	Switch	1		1		1						1					
		2	1	1		1									1		
		3	1	1				1	1								1
	Mancozeb	1	1	1	1	1						1				1	1
		2	1	1		1						1					1
		3	1			1						1					
	Sumisclex	1	1			1	1			1		1					
		2	1			1			1			1					1
		3	1			1			1								1

Mornington Peninsula **Flowering**

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epi	Fus	Glio	Pen	Rhiz	Rhiz	Stem	Trich	Yeast
organisms	Chemical	rep															
Aspergillus	Rovral	1	1	1	1								1				1
		2	1										1				1
		3	1									1	1				
	Scala	1	1	1	1	1			1			1					
		2	1									1					
		3	1	1		1						1					
	Switch	1	1	1					1	1		1					1
		2		1					1								1
		3	1	1		1			1	1							1
	Mancozeb	1		1		1				1		1	1		1		
		2	1	1		1				1		1					
		3	1	1		1											1
	Sumisclex	1	1	1		1											1
		2	1	1		1	1		1			1				1	
		3	1	1								1					

Mornington Peninsula **Flowering**

Pre-spray Organisms found

organisms Bot	Chemical	rep	Alt	Asp	Bot	Clad	Ceph	Chaet	Epi	Fus	Glio	Pen	Rhiz	Rhiz	Stem	Trich	Yeast
	Rovral	1	1	1	1							1					
		2	1			1						1	1				1
		3	1			1			1								
	Scala	1	1	1		1			1	1						1	
		2	1			1			1			1					1
		3	1		1				1								
	Switch	1	1	1		1			1								
		2	1	1	1	1			1	1		1	1			1	
		3	1	1	1	1				1			1				1
	Mancozeb	1	1		1	1							1				1
		2		1		1							1				
		3	1	1	1				1			1	1				
	Sumisclex	1	1	1		1			1			1				1	
		2	1		1	1			1								
		3				1				1							1

Mornington Peninsula **Flowering**

Pre-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epi	Fus	Glio	Pen	Rhiz	Rhiz	Stem	Trich	Yeast
organisms	Chemical	rep															
Penicillium	Rovral	1	1	1		1				1							1
		2	1	1		1			1			1					1
		3	1	1		1						1	1				1
	Scala	1	1	1		1		1				1				1	
		2	1			1			1								
		3	1	1		1						1					1
	Switch	1	1	1		1				1		1					
		2	1	1		1			1			1				1	
		3	1	1	1				1			1				1	
	Mancozeb	1	1	1					1			1				1	1
		2	1	1		1			1			1					
		3	1	1		1				1		1					
	Sumisclex	1	1	1		1				1		1					
		2							1	1			1			1	1
		3		1					1			1					
Control		1	1	1	1	1			1	1							1
		2	1	1		1	1		1			1				1	
		3	1	1	1	1				1		1	1				

Mornington Peninsula **Flowering**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Cepha	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Alternaria	Rovral	1	1	1	1	1											1
		2		1	1	1											
		3	1			1			1								
	Scala	1	1	1		1						1				1	
		2	1	1		1											
		3	1	1		1			1				1		1		
	Switch	1	1	1	1												
		2		1								1		1			
		3				1				1							
	Mancozeb	1	1			1			1				1			1	
		2	1	1		1			1				1	1			
		3	1		1	1		1	1			1					
	Sumisclex	1	1	1	1	1						1					
		2	1	1			1			1							
		3	1														

Mornington Peninsula **Flowering**
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep															
Alternaria	Rovral	1	1	1	1	1											1
		2		1	1	1											
		3	1			1			1								
	Scala	1	1	1		1						1				1	
		2	1	1		1											
		3	1	1		1			1				1		1		
	Switch	1	1	1	1												
		2		1								1		1			
		3				1				1							
	Mancozeb	1	1			1			1				1			1	
		2	1	1		1			1				1	1			
		3	1		1	1		1	1			1					
	Sumisclex	1	1	1	1	1						1					
		2	1	1			1			1							
		3	1														

Mornington Peninsula **Flowering**

Post-spray Organisms found

		Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Apergillus	2	1	1									1				
	3	1	1								1					
Scala	1		1	1	1						1		1			
	2		1		1			1			1					
	3		1		1											
Switch	1	1	1		1										1	
	2		1					1								
	3		1	1				1			1					
Mancozeb	1				1			1				1				
	2	1	1	1	1							1				
	3		1		1						1					
Sumisclex	1		1		1			1						1		
	2		1		1			1								
	3	1	1		1			1								

Mornington Peninsula **Flowering**
Post-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Bot	Rovral	1	1	1		1			1			1					
		2			1	1			1			1					
		3		1	1	1		1				1					
	Scala	1		1		1						1					
		2	1	1					1			1					
		3		1		1			1								
	Switch	1		1	1	1											
		2	1	1	1	1				1		1	1				
		3	1		1	1			1			1	1				
	Mancozeb	1	1	1	1	1						1					
		2		1		1											
		3		1		1			1				1	1			
	Sumisclex	1		1		1											
		2		1	1	1											
		3		1		1							1				

Mornington Peninsula **Flowering**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Ceph	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Penicillium	Rovral	1	1	1		1			1			1					1
		2		1		1			1			1					
		3	1	1	1	1			1			1					
	Scala	1	1	1								1	1				
		2	1	1		1						1					
		3	1			1			1			1					
	Switch	1	1			1			1								
		2		1					1			1					
		3		1					1							1	
	Mancozeb	1	1	1					1	1							
		2		1	1								1				
		3		1		1						1					
	Sumisclex	1		1					1				1	1			
		2	1	1		1						1	1	1	1		
		3		1	1	1											
Control		1	1	1		1			1			1		1			
		2	1	1	1	1						1	1	1			
		3		1		1			1				1	1		1	

Mornington Peninsula **Veraison**

Pre-spray

Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizo	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1		1				1	1							1
		2	1	1		1						1				
		3	1			1				1	1					
	Scala	1	1			1										
		2	1	1		1		1							1	
		3	1	1		1		1								
	Switch	1	1	1		1						1				1
		2	1	1	1	1				1	1					1
		3	1	1		1		1			1			1		
	Mancozeb	1	1	1		1			1				1			1
		2		1		1			1							
		3	1	1		1									1	
	Sumisclex	1	1	1	1	1									1	
		2	1	1				1								
		3	1	1				1			1					

Mornington Peninsula **Veraison**

Pre-spray

			Organisms found												
			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizo	Stem	Trich	Yeast
organisms	Chemical	rep														
Aspergillus	Rovral	1	1	1		1		1		1						
		2	1	1		1		1		1		1				
		3	1	1	1	1		1				1				
	Scala	1	1	1	1	1		1								1
		2	1	1	1	1			1		1					
		3	1	1		1			1							
	Switch	1		1		1		1	1							
		2	1	1				1		1		1			1	
		3	1	1		1		1	1		1					1
	Mancozeb	1	1	1							1				1	1
		2	1	1		1					1					
		3	1	1		1		1								
	Sumisclex	1	1	1		1		1	1			1				
		2	1	1		1						1				1
		3	1	1		1					1					

Mornington Peninsula **Veraison**

Pre-spray

			Organisms found												
			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizo	Stem	Trich	Yeast
organisms	Chemical	rep														
Botrytis	Rovral	1	1			1		1	1							
		2	1	1		1		1			1					
		3	1	1	1	1					1	1				1
	Scala	1	1	1	1	1						1			1	
		2	1	1	1							1				1
		3	1	1	1	1										
	Switch	1	1	1	1	1		1	1		1					
		2	1		1	1										1
		3			1	1										
	Mancozeb	1	1	1	1	1		1			1				1	
		2	1	1	1	1		1	1		1	1				
		3	1	1	1	1		1			1					1
	Sumisclex	1	1	1	1	1		1		1						
		2	1	1	1	1		1	1							
		3	1	1		1		1	1							

Mornington Peninsula **Veraison**

Pre-spray

			Organisms found													
			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizo	Stem	Trich	Yeast
organisms	Chemical	rep														
Penicillium	Rovral	1		1	1	1		1			1					
		2		1	1	1					1					
		3		1		1					1					
	Scala	1	1	1		1		1	1		1					1
		2	1	1		1		1			1			1	1	1
		3	1	1		1		1			1			1	1	
	Switch	1	1	1		1		1							1	
		2	1	1					1	1						
		3	1	1				1	1		1					
	Mancozeb	1	1	1		1		1	1							
		2	1	1	1	1		1			1					1
		3	1	1	1			1	1	1						
	Sumisclex	1	1	1		1			1							
		2	1	1		1			1	1	1					
		3	1	1		1						1				
Control		1	1	1		1		1	1						1	
		2	1	1				1	1		1					1
		3	1	1		1				1					1	

Mornington Peninsula

Post Spray **Veraison**

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Aspergillus	Rovral	1	1	1		1		1		1						
		2	1	1		1		1		1		1				
		3	1	1	1	1		1				1				
	Scala	1	1	1	1	1		1								1
		2	1	1	1	1			1		1					
		3	1	1		1			1							
	Switch	1		1		1		1	1							
		2	1	1				1		1		1			1	
		3	1	1		1		1	1		1					1
	Mancozeb	1	1	1							1				1	1
		2	1	1		1					1					
		3	1	1		1		1								
	Sumisclex	1	1	1		1		1	1			1				
		2	1	1		1						1				1
		3	1	1		1					1					

Mornington Peninsula
Post Spray **Veraison**

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Botrytis	Rovral	1	1			1		1	1							
		2	1	1		1		1			1					
		3	1	1	1	1					1	1				1
	Scala	1	1	1	1	1						1			1	
		2	1	1	1							1				1
		3	1	1	1	1										
	Switch	1	1	1	1	1		1	1		1					
		2	1		1	1										1
		3			1	1										
	Mancozeb	1	1	1	1	1		1			1				1	
		2	1	1	1	1		1	1		1	1				
		3	1	1	1	1		1			1					1
	Sumisclex	1	1	1	1	1		1		1						
		2	1	1	1	1		1	1							
		3	1	1		1		1	1							

Mornington Peninsula
Post Spray **Veraison**

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
Penicillium	Rovral	1		1	1	1		1			1					
		2		1	1	1					1					
		3		1		1					1					
	Scala	1	1	1		1		1	1		1					1
		2	1	1		1		1			1			1	1	1
		3	1	1		1		1			1			1	1	
	Switch	1	1	1		1		1							1	
		2	1	1					1	1						
		3	1	1				1	1		1					
	Mancozeb	1	1	1		1		1	1							
		2	1	1	1	1		1			1					1
		3	1	1	1			1	1	1						
	Sumisclex	1	1	1		1			1							
		2	1	1		1			1	1	1					
		3	1	1		1						1				
Control		1	1	1		1		1	1						1	
		2	1	1				1	1		1					1
		3	1	1		1				1					1	

Mornington Peninsula **Harvest**

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray

Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhizo	Rhiz	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1	25					1			10	1				
		2	50	50		1									1	1
		3			15					1						
	Scala	1				1		1	1							
		2		25		1										1
		3				1					5			1		
	Switch	1		5	10						5	1		1		
		2	25	5				1			5	1				
		3				1	1	1				1			1	
	Mancozeb	1				1		1	1							1
		2			5						1					1
		3	75	75						1						
	Sumisclex	1		50										1		
		2									10	1				1
		3	20			1		1	1							1

Mornington Peninsula **Harvest**

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray

			Organisms found												
		Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhizo	Rhiz	Stem	Trich	Yeast
Aspergillus	Rovral	1		100				1	1	1					1	1
		2		50				1							1	
		3		50		1		1								
	Scala	1				1		1			50	1				1
		2				1		1								
		3	25	5		1		1								
	Switch	1		50		1		1						1		
		2						1							1	
		3										1				
	Mancozeb	1				1						1				
		2				1		1								
		3		25				1								1
	Sumisclex	1														
		2				1									1	
		3	25			1									1	

Mornington Peninsula **Harvest**

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray

			Organisms found												
		Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhizo	Rhiz	Stem	Trich	Yeast
Botrytis	Rovral	1				1					25				1	
		2	50		50	1			1						1	1
		3		75		1									1	1
	Scala	1				1		1				1			1	
		2			25			1								
		3		25							25					
	Switch	1		25	25	1										
		2	25	25		1		1				1				
		3	2			1		1								1
	Mancozeb	1	5	25		1		1						1		
		2			10			1							1	
		3						1								
	Sumisclex	1				1				1						
		2	25			1						1				1
		3			25	1					10	1				

Mornington Peninsula **Harvest**

number = percentage of bunch covered for the target organism (alt, Asp, Bot and Pen)

Pre-spray

Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhizo	Rhiz	Stem	Trich	Yeast
Penicillium	Rovral	1						1								
		2						1								
		3		5		1		1				1				1
	Scala	1	2			1					25					1
		2		75												
		3				1		1	1	1				1		
	Switch	1				1		1			50	1				
		2	5	75		1		1				1				
		3	5	50	50	1		1			25					
	Mancozeb	1		75				1			50				1	1
		2				1			1		75	1				
		3		50	25	1			1			1				
	Sumisclex	1		50		1		1			50					
		2	25	50		1		1			25					1
		3		50		1		1								1
Control		1	50	50		1		1		1	25					
		2	75	100	50	1		1			25				1	1
		3	25	25		1			1		25	1		1	1	1

Mornington Peninsula **Harvest**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Alternaria	Rovral	1						1			5					
		2	25	10	10	1									1	
		3		25	25					1						
	Scala	1				1		1	1					1		
		2		25								1				
		3				1					5					
	Switch	1														
		2	10													
		3		50			1	1				1			1	
	Mancozeb	1				1		1	1				1			
		2		25	25						10					
		3								1						
	Sumisclex	1		50	25											
		2									50					
		3	25			1		1								1

Mornington Peninsula **Harvest**

Post-spray Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Aspergillus	Rovral	1		75				1							1	
		2		50											1	
		3						1			25					
	Scala	1				1		1			25					
		2														
		3		5												
	Switch	1				1										
		2						1							1	
		3														
	Mancozeb	1			50							1				
		2				1		1								
		3		25				1								
	Sumisclex	1			75								1			
		2				1									1	
		3	50			1					5	1			1	

Mornington Peninsula Post-spray **Harvest**

			Organisms found												
			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Botrytis	Rovral	1													1	
		2	50			1			1						1	
		3		25		1								1	1	
	Scala	1						1				1		1	1	
		2										1				
		3		50							10					
	Switch	1			25	1										
		2	10	25		1						1				
		3														
	Mancozeb	1				1										
		2										1			1	
		3														
	Sumisclex	1								1						
		2	10			1										
		3			25	1										

Mornington Peninsula

Harvest

Post-spray

Organisms found

			Alt	Asp	Bot	Clad	Chaet	Epic	Fus	Glio	Pen	Rhiz	Rhizoc	Stem	Trich	Yeast
organisms	Chemical	rep														
Penicillium	Rovral	1			25			1								
		2						1								
		3		5		1						1				
	Scala	1				1										
		2														
		3				1		1	1	1						
	Switch	1									50					
		2		25	10							1				
		3		25	50						25					
	Mancozeb	1	25	50							20				1	
		2				1			1		75	1				
		3		50	75				1							
	Sumisclex	1		25		1		1								
		2	25	10												
		3	25					1								
Control		1	50	50	50	1			1		75				1	
		2	75	50	25	1	1	1	1		100	1			1	
		3	50			1		1	1		25	1			1	